

ring types for end-play take-up

GENERAL INFORMATION

In many assemblies, dimensional tolerances in ring thickness, groove location or the over-all length of the machine components being retained add up to a degree of clearance, or "end-play," between the abutting surfaces of the ring and the retained part. The Truarc retaining rings described below were designed to take-up this end-play.

Two types are available: bowed rings, for *resilient* end-play take-up, and beveled rings, for *rigid* end-play take-up. Bowed rings are available for both axial and radial assembly; beveled are limited to the axial type.

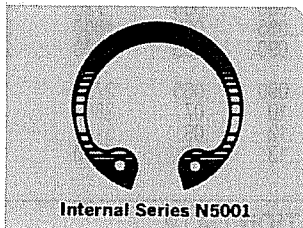
MATERIALS AND FINISHES

Standard material for all rings in this section except Series 5101-18 through -23 is carbon spring steel (SAE 1060-1090). Series 5101 rings in sizes -18 through -23 are available only in beryllium copper (Alloy #25, CDA #172).

Standard finish for unplated carbon spring steel rings is a black, corrosion-retardant *phosphate coating*. For other available materials and finishes, see pages 8 and 11.

RESILIENT END-PLAY TAKE-UP: BOWED RINGS

- **Axial Assembly: Series N5001* 5101 ***
(Data Charts begin on Pages 68 and 70)



Internal Series N5001



External Series 5101

*Available on special order only.

Truarc Series N5001 and 5101 bowed rings are designed to take-up end-play resiliently and to dampen vibrations and oscillations. They are intended for relatively small assemblies involving shaft, bore or housing diameters up to 1.5".

The rings are similar in construction to the basic internal and external rings described on Page 23. (N5001 rings, for example, incorporate the same features as the N5000 type.) The Series N5001 and 5101 differ from the basic flat rings in that they are bowed around an axis normal to the diameter bisecting the ring gap. This bowed construction makes it possible for the rings to take up end-play caused by tolerances in groove location and/or the dimensions of the retained parts, and to compensate for wear in the assembly.

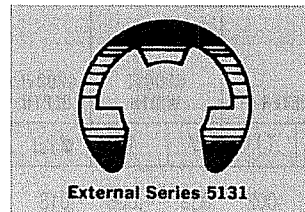
While bowed rings provide resilient end-play take-up in an axial direction, they maintain a tight grip radially against the bottom of the groove. For optimum ring performance, the bowed side must be oriented properly in relation to the abutting surface of the retained part. Series N5001 internal rings should be assembled with the *convex* surface against the retained part; Series 5101 external rings should be installed with the *concave* surface abutting the part.

In addition to providing resilient end-play take-up in machine assemblies, the bowed rings may be used to prevent rattle in machine linkages and provide spring tension on adjusting screws. They may be used also to salvage assemblies originally designed for flat rings where the groove has been cut too wide.

• Assembly Tools

Series N5001 and 5101 bowed rings may be assembled and disassembled rapidly with Truarc pliers similar to those used for flat rings. See Pages 93-95 for size ranges, specifications and dimensions.

- **Radial Assembly: Series 5131, 5139 ***
(Data Charts, pages 65 and 66)



External Series 5131



External Series 5139

* Series 5139 rings are available on special order only

The Series 5131 bowed E-ring is a radially-assembled ring similar in construction to the flat Series 5133 E-ring illustrated on Page 47. It differs from the flat ring in that it is bowed cylindrically in the same manner as the axially-installed types described above.

The Series 5131 is designed to provide resilient end-play take-up in an axial direction while maintaining a tight grip against the bottom of the groove. For optimum ring performance, it should be installed with the *concave* surface abutting the retained part. The ring is *not* recommended for use as shoulder against rotating parts, since rotation may cause the ring to become dislodged from the groove. For such applications, the Series 5139 Prong-Lock® ring described below should be used.

The series 5131 bowed E-ring can be assembled rapidly by hand with the Truarc Applicator Illustrated on Page 98. The rings are *not* available stacked.

The Series 5139 Prong-Lock ring is a radially-installed ring which is locked positively in its groove by means of two prongs extending from the inner circumference to the open end. It has high thrust-load capacity and is especially suitable for use as a shoulder against rotating parts. (To prevent marring the shaft or retained part, it is recommended the ring be used with hard or hardened materials and parts.) The ring's bowed construction provides resilient end-play take-up and makes less critical the tolerances required for the parts being fastened. Because the ring functions as a spring as well as a shoulder, it eliminates the need for springs, bowed washers and other accessory fastening devices often used in assemblies with rotating parts.

The Series 5139 may be assembled and disassembled with a screwdriver as illustrated below, or with the special Truarc applicator shown on Page 98. It is available stacked in sizes -12 through -31 for high-speed installation with the Truarc dispenser described on Page 99.

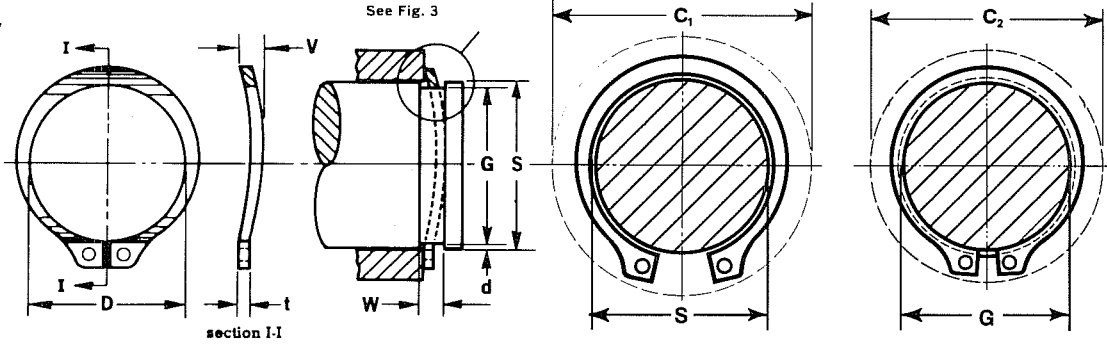
BOWED
external series
5101*



WALDES
TRUARC®
RETAINING
RINGS

*Available on special order only

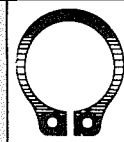
TRUARC TOOLS
SPEED ASSEMBLY,
LOWER COSTS.



SHAFT DIAMETER			MIL-R-21248a MS 16628 EXTERNAL SERIES 5101	TRUARC RING DIMENSIONS				GROOVE DIMENSIONS				APPLICATION DATA				
Dec. equiv. inch	Approx. fract. equiv. inch	Approx. mm		Thickness <i>t</i> applies only to unplated rings. For plated and stainless steel (Type H) rings, add .002" to the listed maximum thickness.		Approx. weight per 1000 pieces	T.I.R. (total indicator reading) is the maximum allowable deviation of concentricity between groove and shaft.		Nominal groove depth	CLEARANCE DIAMETER		ALLOW. THRUST LOAD (lbs.) Sharp corner abutment				
				FREE DIA.	THICKNESS		DIAMETER	WIDTH		When sprung over shaft <i>S</i>	When sprung into groove <i>G</i>	RINGS (standard material) Safety factor = 4	GROOVES (Cold Rolled steel shafts) Safety factor = 2			
<i>S</i>	<i>S</i>	<i>S</i>	<i>D</i>	tol.	<i>t</i>	tol.	lbs.	<i>G</i>	tol.	<i>W</i>	tol.	<i>d</i>	<i>C</i> ₁	<i>C</i> ₂	<i>P</i> _r	<i>P</i> _g
.188	3/16	4.8	▲ 5101-18	.168	.015		.059	.175		.030		.006	.298	.286	240	80
.197	—	5.0	▲ 5101-19	.179	.015		.063	.185	±.0015	.030		.006	.319	.307	250	85
.219	7/32	5.6	▲ 5101-21	.196	.015		.074	.205	±.0015 T.I.R.	.030		.007	.338	.324	280	110
.236	3/8	6.0	▲ 5101-23	.215	.015		.086	.222		.030		.007	.355	.341	310	120
.250	1/4	6.4	5101-25	.225	.025		.21	.230		.040		.010	.45	.43	590	175
.276	—	7.0	5101-27	.250	.025		.23	.255		.040		.010	.48	.46	650	195
.281	5/32	7.1	5101-28	.256	.025		.24	.261		.040		.010	.49	.47	660	200
.312	3/8	7.9	5101-31	.281	.025		.27	.290		.040		.011	.54	.52	740	240
.344	1/2	8.7	5101-34	.309	.025		.31	.321		.040		.011	.57	.55	800	265
.354	—	9.0	5101-35	.320	.025		.35	.330		.040		.012	.59	.57	820	300
.375	3/8	9.5	5101-37	.338	.025		.39	.352	±.002 T.I.R.	.040		.012	.61	.59	870	325
.394	—	10.0	5101-39	.354	.025		.42	.369		.040		.012	.62	.60	940	335
.406	1/2	10.3	5101-40	.366	.025		.43	.382		.040		.012	.63	.61	950	350
.438	3/4	11.1	5101-43	.395	.025		.50	.412		.040		.013	.66	.64	1020	400
.469	1/2	11.9	5101-46	.428	.025		.54	.443		.040		.013	.68	.66	1100	450
.500	1/2	12.7	5101-50	.461	.035		.91	.468	±.002 T.I.R.	.055		.016	.77	.74	1650	550
.551	—	14.0	5101-55	.509	.035		.90	.519	±.004 T.I.R.	.055		.016	.81	.78	1800	600
.562	3/8	14.3	5101-56	.521	.035		1.1	.530		.055		.016	.82	.79	1850	650
.594	1/2	15.1	5101-59	.550	.035		1.2	.559		.055		.017	.86	.83	1950	750
.625	3/8	15.9	5101-62	.579	.035	±.002	1.3	.588		.055		.018	.90	.87	2060	800
.669	—	17.0	5101-66	.621	.035		1.4	.629		.055		.020	.93	.89	2200	950
.672	7/16	17.1	5101-66	.621	.035		1.4	.631		.055		.020	.93	.89	2200	950
.688	1/2	17.5	5101-68	.635	.042	±.005	1.8	.646		.062		.021	1.01	.97	3400	1000
.750	3/4	19.0	5101-75	.693	.042	±.010	2.1	.704	±.003 T.I.R.	.062		.023	1.09	1.05	3700	1200
.781	7/16	19.8	5101-78	.722	.042		2.2	.733	±.004 T.I.R.	.062		.024	1.12	1.08	3900	1300
.812	1/2	20.6	5101-81	.751	.042		2.5	.762		.062		.025	1.15	1.10	4000	1450
.875	3/8	22.2	5101-87	.810	.042		2.8	.821		.062		.027	1.21	1.16	4300	1650
.938	1/2	23.8	5101-93	.867	.042		3.1	.882		.062		.028	1.34	1.29	4650	1850
.984	7/16	25.0	5101-98	.910	.042		3.5	.926		.062		.029	1.39	1.34	4850	2000
1.000	1	25.4	5101-100	.925	.042		3.6	.940		.062		.030	1.41	1.35	4950	2100
1.023	—	26.0	5101-102	.946	.042		3.9	.961		.062		.031	1.43	1.37	5050	2250
1.062	1 1/16	27.0	5101-106	.982	.050		4.8	.998		.070		.032	1.50	1.44	6200	2400
1.125	1 1/8	28.6	5101-112	1.041	.050		5.1	1.059		.070		.033	1.55	1.49	6600	2600
1.188	1 1/8	30.2	5101-118	1.098	.050		5.6	1.118		.070		.035	1.61	1.54	7000	2950
1.250	1 1/4	31.7	5101-125	1.156	.050	±.010	5.9	1.176	±.004 T.I.R.	.070		.037	1.69	1.62	7350	3250
1.312	1 1/4	33.3	5101-131	1.214	.050	±.015	6.8	1.232	±.005 T.I.R.	.070		.040	1.75	1.67	7750	3700
1.375	1 1/2	34.9	5101-137	1.272	.050		7.2	1.291		.070		.042	1.80	1.72	8100	4100
1.438	1 1/2	36.5	5101-143	1.333	.050		8.1	1.350		.070		.044	1.87	1.79	8500	4500
1.500	1 1/2	38.1	5101-150	1.387	.050		9.0	1.406		.070		.047	1.99	1.90	8800	5000
1.625	1 3/8	41.3	5101-162	1.503	.062	±.003	13.2	1.529	±.005 T.I.R.	.096		.048	2.17	2.08	11850	5500
1.750	1 3/4	44.4	5101-175	1.618	.062		15.3	1.650	±.005 T.I.R.	.096		.050	2.31	2.21	12800	6200

NOTE: Rings should not be overexpanded during installation. If groove has been machined to recommended diameter, play between the ring and groove after installation indicates the ring has been expanded excessively; this may lead to application failure.

WALDES TRUARC®
RETAINING RINGS



BOWED
external series
5101*

*Available on special order only

FIG. 1:
MAXIMUM ALLOWABLE
CORNER RADIUS ($R_{max.}$)
AND CHAMFER ($Ch_{max.}$)

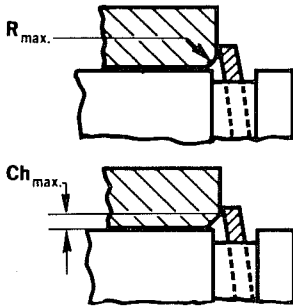
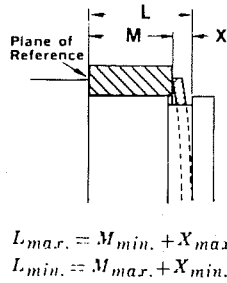


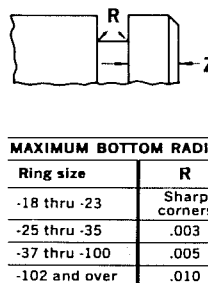
FIG. 2:
LOCATION OF OUTER
GROOVE WALL



$$L_{max.} = M_{min.} + X_{max.}$$

$$L_{min.} = M_{max.} + X_{min.}$$

FIG. 3:
ENLARGED DETAIL
OF GROOVE PROFILE
AND EDGE MARGIN (Z)



Ring size	R
-18 thru -23	Sharp corners
-25 thru -35	.003
-37 thru -100	.005
-102 and over	.010

FIG. 4:
SUPPLEMENTARY
RING
DIMENSIONS

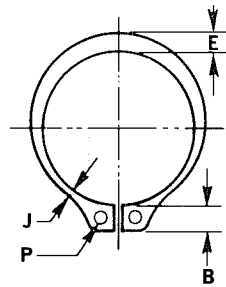
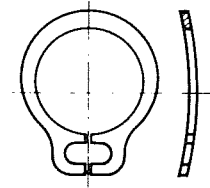


FIG. 5:
RING CONFIGURATION
Sizes -18 thru -23



SUPPLEMENTARY APPLICATION DATA

SUPPLEMENTARY RING DIMENSIONS

EXTERNAL SERIES 5101	See Fig. 2 above and Page 73										(Fig. 4)								MAX. GAGGING DIA. Ring installed in groove						
	Maximum allowable corner radii and chamfers of retained parts (Fig. 1) See Page 15		Allow. assembly load with $R_{max.}$ or $Ch_{max.}$ See Page 15	Overall bow height	Distance from outer groove wall to face of retained part.		Resilient take-up of tolerances of L and M	Approx. force required to flatten rings	Edge margin (Fig. 3) See Page 15	Calculated RPM limits (Std. ring mat'l.) Apply req'd. safety factor	LUG		LARGE SECTION		SMALL SECTION		HOLE DIAMETER								
	$R_{max.}$	$Ch_{max.}$			P_r (lbs.)	V					$X_{min.}$	$X_{max.}$	B	tol.	E	tol.	J	tol.		P	tol.	K			
▲ 5101-18	.014	.0085	105	.036	.020	.028	.008	20	.018	80000	.050	±.002	.025	±.002	.016	±.002	.025	±.002	.218						
▲ 5101-19	.0145	.009	105		.020	.028		20	.018	80000	.056		.026		.016		.026		.229						
▲ 5101-21	.015	.009	105		.020	.028		15	.021	80000	.056		.028		.017		.026		.252						
▲ 5101-23	.0165	.010	105		.020	.028		15	.021	80000	.056		.030		.019		.026		.272						
5101-25	.018	.011	470		.030	.038		50	.030	80000	.080		.035		.025		.041		.290						
5101-27	.0175	.0105	470	.047	.030	.038	.008	50	.031	76000	.081	±.003	.035	±.003	.024	±.003	.041	±.010 -.002	.315						
5101-28	.020	.012	470		.030	.038		50	.030	74000	.080		.038		.0255		.041		.326						
5101-31	.020	.012	470		.030	.038		50	.033	70000	.087		.040		.026		.041		.357						
5101-34	.021	.0125	470		.030	.038		45	.033	64000	.087		.042		.0265		.041		.390						
5101-35	.023	.014	470		.030	.038		45	.036	62000	.087		.046		.029		.041		.405						
5101-37	.026	.0155	470		.030	.038		45	.036	60000	.088		.050		.0305		.041		.433						
5101-39	.027	.016	470		.030	.038		40	.037	56500	.087		.052		.031		.041		.452						
5101-40	.0285	.017	470		.030	.038		40	.036	55000	.087		.054		.033		.041		.468						
5101-43	.029	.0175	470		.030	.038		35	.039	50000	.088		.055		.033		.041		.501						
5101-46	.031	.018	470		.030	.038		35	.039	42000	.088		.060		.035		.041		.540						
5101-50	.034	.020	910	.063	.042	.053	.011	90	.048	40000	.108	±.004	.065	±.004	.040	±.004	.047	±.015 -.002	.574						
5101-55	.027	.0165	910		.042	.053		85	.048	36000	.108		.053		.036		.047		.611						
5101-56	.038	.023	910		.042	.053		80	.048	35000	.108		.072		.041		.047		.644						
5101-59	.0395	.0235	910		.042	.053		70	.052	32000	.109		.076		.043		.047		.680						
5101-62	.0415	.025	910		.042	.053		60	.055	30000	.110		.080		.045		.047		.715						
(.669) 5101-66	.040	.024	910		.073	.042		.053	.011	50	.060		29000		.110		±.005		.082	±.005	.043	±.005	.047	±.015 -.002	.756
(.672) 5101-66	.040	.024	910			.042		.053		50	.060		29000		.110				.082		.043		.047		.758
5101-68	.042	.025	1340			.049		.060		70	.063		28000		.136				.084		.048		.052		.779
5101-75	.046	.0275	1340			.049		.060		65	.069		26500		.136				.092		.051		.052		.850
5101-78	.047	.028	1340			.049		.060		60	.072		25500		.136				.094		.052		.052		.883
5101-81	.047	.028	1340	.085		.049	.060	.011		55	.075	24500	.136	±.006	.096	±.006		.054	±.006		.052		±.015 -.002		.914
5101-87	.051	.035	1340		.049	.060	45		.081	23000	.137	.104	.057		.052		.987								
5101-93	.055	.033	1340		.049	.060	40		.084	21500	.166	.110	.063		.078		1.054								
5101-98	.056	.0335	1340		.049	.060	40		.087	20500	.167	.114	.0645		.078		1.106								
5101-100	.057	.034	1340		.049	.060	35		.090	20000	.167	.116	.065		.078		1.122								
5101-102	.058	.035	1340		.085	.049	.060		.011	35	.093	19500	.168		±.006		.118	±.006		.066	±.006	.078		±.015 -.002	1.147
5101-106	.060	.036	1950			.057	.068			60	.096	19000	.181				.122			.069		.078			1.192
5101-112	.063	.038	1950			.057	.068			55	.099	18800	.182				.128			.071		.078			1.261
5101-118	.064	.0385	1950			.057	.068			50	.105	18000	.182				.132			.072		.078			1.325
5101-125	.068	.041	1950			.057	.068			45	.111	17000	.183				.140			.076		.078			1.396
5101-131	.068	.041	1950	.115 ±.015		.057	.068	.011		40	.120	16500	.183	±.006		.146	±.006		.0765	±.006		.078	±.015 -.002		1.458
5101-137	.072	.043	1950		.057	.068	35		.126	16000	.184	.152	.082		.078	1.529									
5101-143	.076	.045	1950		.057	.068	30		.132	15000	.184	.160	.086		.078	1.600									
5101-150	.079	.047	1950		.057	.068	30		.141	14800	.214	.168	.091		.120	1.668									
5101-162	.087	.052	3000		.069	.094	55		.144	13200	.235	.180	.097		.125	1.812									
5101-175	.091	.054	3000		.069	.094	50		.150	12200	.237	.188	.101		.125	1.945									