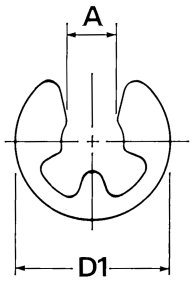
E-Clips Standard Series

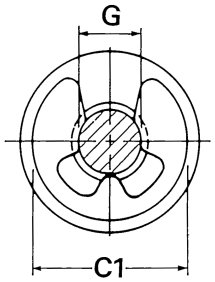
Standard material - carbon spring steel. Standard finish - phosphate & oil

All dimensions in mm

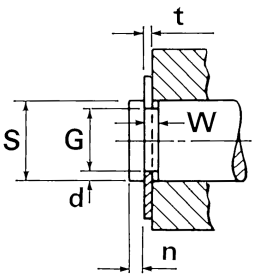
Standard material - carbon spring steel. Standard finish - phosphate and oil.

Sizes printed in blue are preferred sizes





Circlip in groove



D1500 *This size in Beryllium copper only

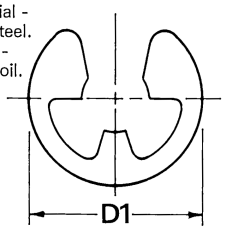
† Thrust load calculations see pages 9 & 10

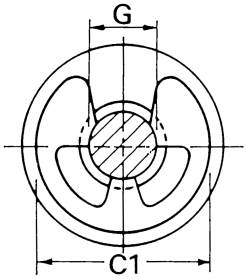
SIZE CODE	B.S. Ref	Shaft (S) S.	Tol.	Groove (G) G.	Tol.	W.	Tol.	n (min)	d Nom	Circlip (F) t	Tol.	D1	C1	A	Tol.	Tc† (N)	Tg† (N)	Appli-cator	BASE
*0008	008MS	1.20	±0.20	0.8	+0.00 −0.04	0.24	+0.04 −0.00	0.4	0.20	0.20	±0.02	1.95	2.25	0.58	±0.04	63	30	—	—
0012	012MS	1.70	±0.30	1.2		0.34		0.6	0.25	0.30		2.90	3.25	1.01		203	53	28	DR 1.2
0015	015MS	2.25	±0.25	1.5	+0.00 −0.06	0.44		0.8	0.38	0.40		3.85	4.25	1.28		358	105	21A	DR 1.5
0019	019MS	2.75		1.9		0.54		1.0	0.43	0.50		4.40	4.8	1.61		546	145	22	DR 1.9
0023	023MS	3.50	±0.50	2.3		0.64		1.0	0.60	0.60		5.90	6.3	1.94		835	260	3C	DR 2.3
0032	032MS	4.50		3.2		0.64	+0.05 −0.00	1.0	0.65	0.60		6.80	7.3	2.70		1070	365	AM9	DR 3.2
0040	040MS	6.00		4.0	+0.00 −0.075	0.74		1.2	1.00	0.70		8.80	9.3	3.34		1670	745	23B	DR 4
0050	050MS	7.00	±1.00	5.0		0.74		1.2	1.00	0.70		10.75	11.3	4.11	±0.048	1950	870	7B	DR 5
0060	060MS	8.00		6.0		0.74		1.2	1.00	0.70		11.75	12.3	5.26		2220	995	24	DR 6
0070	070MS	9.50	±1.50	7.0		0.94		1.5	1.25	0.90		13.80	14.3	5.84		3400	1480	15	FR 7
0080	080MS	10.50		8.0	+0.00 −0.09	1.05		1.8	1.25	1.00		15.60	16.3	6.52		4170	1630	AM20	FR 8
0090	090MS	12.00	±2.00	9.0		1.15		2.0	1.50	1.10		18.20	18.8	7.63	±0.058	5250	2240	25	FR 9
0100	100MS	13.00		10.0		1.25		2.0	1.50	1.20		19.65	20.4	8.32		6200	2430	26	FR 10
0120	120MS	15.50	±2.50	12.0	+0.00 −0.11	1.35	+0.08 −0.00	2.5	1.75	1.30	±0.03	22.65	23.4	10.45	±0.07	8010	3370	27	FR 12
0150	150MS	20.00	±4.00	15.0		1.55		3.0	2.50	1.50		28.60	29.4	12.61		11900	6220	20B	FR 15
0190	190MS	25.50	±5.50	19.0	+0.00 −0.13	1.85		3.5	3.25	1.75		36.70	37.6	15.92		17700	10300	32A	FR 19
0240	240MS	31.50	±6.50	24.0		2.05		4.0	3.75	2.00		43.65	44.6	21.88	±0.084	25000	14700	—	—

All dimensions in inches

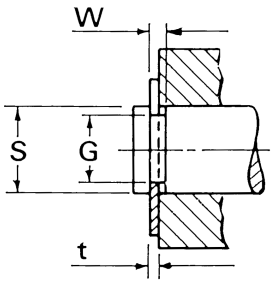
Standard material - carbon spring steel. Standard finish - phosphate and oil.

Sizes printed in blue are preferred sizes





Circlip in groove



N1500

*This size in Beryllium copper only

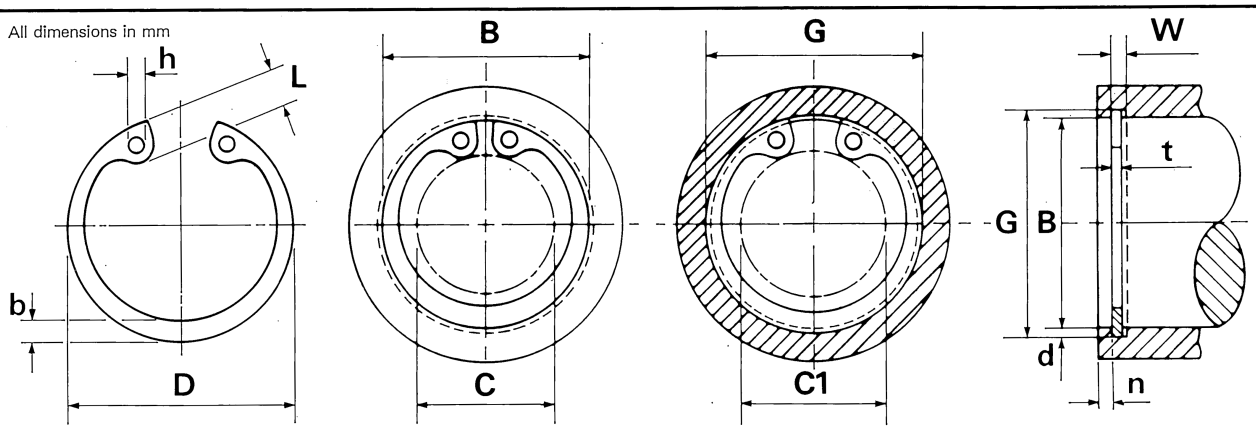
† Thrust load calculations see pages 9 & 10

SIZE CODE	B.S. Ref.	Shaft (S) S	Tol.	Groove (G) G	Tol.	W	Tol.	Circlip (F) D1	C1	t	Tol.	Tc† (lb.f)	Tg† (lb.f)	Appli-cator	Base	SIZE CODE
*X004	028PS	.040	+.010 −.000	.026		.012		.079	.090	.010		15	5	—	—	X004
X006	—	.062		.052		.012		.140	.150	.010	±.001	36	6	AM2	SF2	X006
0006	054PS	.062		.052		.012		.156	.165	.010		36	6	AM3	SF3	0006
Y006	—	.062	+.030 −.000	.052		.023		.187	.200	.020		72	6	—	—	Y006
X009	—	.094		.074		.018	+.002 −.000	.230	.245	.015		81	17	AM7	SF4	X009
0009	076PS	.094		.074		.018		.187	200	.015		81	17	AM5	SF5	0009
X011	081A2	.110		.079		.018		.375	.390	.015		95	32	AM6	SF6	X011
0012	097PS	.125		.095	+.002 −.000	.018		.230	.240	.015		108	35	AM7	SF7	0012
X014	104PS	.140	+.040 −.000	.102		.018		.203	.214	.015		121	50	AM8	SF8	X014
Y014	112A1	.140		.110		.018		.250	.265	.015		121	39	AM10	SF10	Y014
0014	107A1	.140		.105		.029		.270	.285	.025		202	46	AM9	SF9	0014
0015	118A1	.156	+.050 −.000	.116		.029		.282	.295	.025		225	58	AM11	SF11	0015
X017	129PS	.172		.127		.029		.312	.325	.025		248	72	AM12	SF12	X017
X018	—	.188	+.060 −.000	.125		.029		.375	.390	.025		271	110	AM13	SF13	X018
0018	149PS	.188		.147		.029		.335	.350	.025	±.002	271	72	AM14	SF14	0018
X021	190PS	.219		.188		.029		.437	.450	.025		316	63	AM15	SF15	X021
0025	212PS	.250		.210		.029		.527	.540	.025		361	93	AM16	SF16	0025
X031	252PS	.312	+.100 −.000	.250		.029	+.003 −.000	.500	.520	.025		450	180	AM16	SF17	X031
0037	306PS	.375		.303		.039		.660	.680	.035		757	252	AM18	SF18	0037
0043	346PS	.438		.343		.039		.687	.710	.035		885	388	AM19	SF19	0043
X043	383A1	.438		.380	+.003 −.000	.039		.600	.620	.035		884	237	AM20	SF20	X043
0050	399PS	.500		.396		.046		.800	.820	.042		1210	485	AM21	SF21	0050
0062	488PS	.625		.485		.046		.940	.960	.042		1510	816	AM22	SF22	0062
X074	628A1	.744	+.120 −.000	.625		.056		1.000	1.020	.050		2160	1190	AM23	SF23	X074
0075	583PS	.750		.580		.056		1.120	1.140	.050		2520	1630	AM24	SF24	0075
0087	678PS	.875		.675		.056		1.300	1.320	.050		2840	1370	AM25	SF25	0087
X098	—	.984		.835		.056		1.500	1.530	.050		4250	1210	AM26	SF26	X098
X118	—	1.188	+.200 −.000	1.079	+.005 −.000	.068	+.004 −.000	1.626	1.670	.062	±.003	4920	1860	AM27	SF27	X118
X137	—	1.375		1.230		.068		1.875	1.920	.062		4920	1860	—	—	X137

Standard Internal Circlips Metric Specifications Standard

material - carbon spring steel. Standard finish - phosphate & oil

All dimensions in mm



Sizes printed in blue are preferred sizes

Alternative lug for larger sizes

Most sizes over 200 mm are without lugs

Beam configuragion on some larger sizes

† Thrust load calculations see pages 9 & 10

SIZE CODE	Bore B	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	Wt. (kg/k)	Tc† (N)	Tg† (N)
0080	8	8.4	+0.09 −0.00	0.90		0.6	0.2	0.80	+0.00 −0.05	8.7		3.0	3.6	2.4	1.1	1.0	0.11	6200	600
0090	9	9.4		0.90		0.6	0.2	0.80		9.8		3.7	4.4	2.5	1.3	1.0	0.17	7000	680
0095	9.5	9.9		1.10		0.6	0.2	1.00		10.3		3.2	3.9	3.0	1.3	1.2	0.22	9300	720
0100	10	10.4		1.10		0.6	0.2	1.00		10.8		3.3	4.0	3.2	1.4	1.2	0.24	9700	750
0110	11	11.4		1.10		0.6	0.2	1.00		11.8	+0.36 −0.10	4.1	4.8	3.3	1.5	1.2	0.30	10700	830
0120	12	12.5	+0.11 −0.00	1.10		0.8	0.3	1.00		13.0		4.9	5.7	3.4	1.7	1.5	0.34	11700	1130
0130	13	13.6		1.10		0.9	0.3	1.00		14.1		5.4	6.4	3.6	1.8	1.5	0.39	12700	1470
0140	14	14.6		1.10		0.9	0.3	1.00		15.1		6.2	7.2	3.7	1.9	1.7	0.45	13600	1580
0150	15	15.7		1.10		1.1	0.4	1.00		16.2		7.2	8.3	3.7	2.0	1.7	0.48	14600	1980
0160	16	16.8		1.10		1.2	0.4	1.00		17.3		8.0	9.2	3.8	2.0	1.7	0.54	15600	2410
0170	17	17.8		1.10		1.2	0.4	1.00		18.3		8.8	10.0	3.9	2.1	1.7	0.59	16600	2560
0180	18	19.0		1.10		1.5	0.5	1.00		19.5		9.4	10.8	4.1	2.2	2.0	0.61	17500	3390
0190	19	20.0	+0.13 −0.00	1.10		1.5	0.5	1.00		20.5	+0.42 −0.13	10.4	11.8	4.1	2.2	2.0	0.72	18500	3580
0200	20	21.0		1.10		1.5	0.5	1.00		21.5		11.2	12.6	4.2	2.3	2.0	0.75	19500	3770
0210	21	22.0		1.10		1.5	0.5	1.00		22.5		12.2	13.6	4.2	2.4	2.0	0.84	20400	3960
0220	22	23.0		1.10		1.5	0.5	1.00		23.5		13.2	14.6	4.2	2.5	2.0	0.86	21400	4150
0230	23	24.1		1.30		1.7	0.6	1.20		24.6		14.2	15.7	4.2	2.5	2.0	1.20	26900	4770
0240	24	25.2		1.30		1.8	0.6	1.20		25.9	+0.42 −0.21	14.8	16.4	4.4	2.6	2.0	1.21	28000	5430
0250	25	26.2	+0.21 −0.00	1.30		1.8	0.6	1.20		26.9		15.5	17.2	4.5	2.7	2.0	1.33	29200	5650
0260	26	27.2		1.30		1.8	0.6	1.20	+0.00 −0.06	27.9		16.1	17.8	4.7	2.8	2.0	1.35	30400	5880
0270	27	28.4		1.30		2.1	0.7	1.20		29.1		17.1	19.0	4.7	2.9	2.0	1.55	31600	7130
0280	28	29.4		1.30		2.1	0.7	1.20		30.1		17.9	19.8	4.8	2.9	2.0	1.64	32700	7390
0290	29	30.4		1.30		2.1	0.7	1.20		31.1		18.9	20.8	4.8	3.0	2.0	1.74	33900	7650
0300	30	31.4		1.30		2.1	0.7	1.20		32.1		19.9	21.8	4.8	3.0	2.0	1.87	35100	7920
0310	31	32.7		1.30	+0.14 −0.00	2.6	0.9	1.20		33.4		20.0	22.3	5.2	3.2	2.5	2.20	36200	9930
0320	32	33.7		1.30		2.6	0.9	1.20		34.4	+0.50 −0.25	20.6	22.9	5.4	3.2	2.5	1.98	37400	10300
0330	33	34.7		1.30		2.6	0.9	1.20		35.5		21.6	23.9	5.4	3.3	2.5	2.13	36800	10600
0340	34	35.7		1.60		2.6	0.9	1.50		36.5		22.6	24.9	5.4	3.3	2.5	2.88	49700	10900
0350	35	37.0		1.60		3.0	1.0	1.50		37.8		23.6	26.2	5.4	3.4	2.5	2.93	51100	13200
0360	36	38.0	+0.25 −0.00	1.60		3.0	1.0	1.50		38.8		24.6	27.2	5.4	4.0	2.5	3.23	52600	13600
0370	37	39.0		1.60		3.0	1.0	1.50		39.8		25.4	28.0	5.5	3.2	2.5	2.98	54100	13900
0380	38	40.0		1.60		3.0	1.0	1.50		40.8		26.4	29.0	5.5	3.7	2.5	3.54	55500	14300
0400	40	42.5		1.85		3.8	1.3	1.75		43.5		27.8	30.9	5.8	3.9	2.5	4.63	56600	18800
0410	41	43.5		1.85		3.8	1.3	1.75		44.5	+0.90 −0.39	28.6	31.7	5.9	4.0	2.5	5.37	58000	19300
0420	42	44.5		1.85		3.8	1.3	1.75		45.5		29.6	32.7	5.9	4.1	2.5	5.21	59500	19800
0450	45	47.5		1.85		3.8	1.3	1.75		48.5		32.0	35.1	6.2	4.3	2.5	5.88	63700	21200
0470	47	49.5		1.85		3.8	1.3	1.75		50.5		33.5	36.7	6.4	4.4	2.5	6.13	66500	22100
0480	48	50.5		1.85		3.8	1.3	1.75		51.5		34.5	37.7	6.4	4.5	2.5	6.31	68000	22600
0500	50	53.0		2.15		4.5	1.5	2.00		54.2		36.3	40.0	6.5	4.6	2.5	8.01	80900	28300
0510	51	54.0		2.15		4.5	1.5	2.00		55.2		37.3	41.0	6.5	4.7	2.5	8.72	82500	28800
0520	52	55.0		2.15		4.5	1.5	2.00		56.2		37.9	41.6	6.7	4.7	2.5	8.91	84100	29400
0550	55	58.0		2.15		4.5	1.5	2.00		59.2		40.7	44.4	6.8	5.0	2.5	9.44	89000	31100
0560	56	59.0		2.15		4.5	1.5	2.00		60.2		41.7	45.4	6.8	5.1	2.5	9.75	90600	31700
0570	57	60.0	+0.30 −0.00	2.15		4.5	1.5	2.00	+0.00 −0.07	62.2	+1.10 −0.46	42.7	46.4	6.8	5.1	2.5	9.56	92200	32200
0580	58	61.0		2.15		4.5	1.5	2.00		62.2		43.5	47.2	6.9	5.2	2.5	10.36	93800	32800
0600	60	63.0		2.15		4.5	1.5	2.00		64.2		44.7	48.4	7.3	5.4	2.5	11.15	97100	33900
0620	62	65.0		2.15		4.5	1.5	2.00		66.2		46.7	50.4	7.3	5.5	2.5	11.59	100000	35100
0630	63	66.0		2.15		4.5	1.5	2.00		67.2		47.7	51.4	7.3	5.6	2.5	11.78	102000	35600
0640	64	67.0		2.15		4.5	1.5	2.00		68.2		48.7	52.4	7.3	5.2	2.5	16.80	104000	36200
0650	65	68.0		2.65		4.5	1.5	2.50		69.2		49.0	52.8	7.6	5.8	3.0	17.71	131000	36800

Standard material - carbon spring steel. Standard finish - phosphate and oil.

Standard Internal Circlips Metric Specifications Standard

material - carbon spring steel. Standard finish - phosphate & oil

SIZE CODE	Bore	Groove (G)						Circlip (F)									Wt.	Tc†	Tg†
	B	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	(kg/k)	(N)	(N)
0670	67	70.0		2.65		4.5	1.5	2.50		72.5		50.8	54.6	7.7	6.0	3.0	17.71	136000	37900
0680	**68**	**71.0**		**2.65**		**4.5**	**1.5**	**2.50**		**72.5**		**51.6**	**55.4**	**7.8**	**6.1**	**3.0**	**17.72**	**138000**	**38500**
0700	70	73.0		2.65		4.5	1.5	2.50	+0.00	74.5	+1.10	53.6	57.4	7.8	6.2	3.0	17.65	142000	39600
0720	**72**	**75.0**	+0.30	**2.65**		**4.5**	**1.5**	**2.50**	−0.07	**76.5**	−0.46	**55.6**	**59.4**	**7.8**	**6.4**	**3.0**	**19.70**	**146000**	**40700**
0750	**75**	**78.0**	−0.00	**2.65**		**4.5**	**1.5**	**2.50**		**79.5**		**58.6**	**62.4**	**7.8**	**6.6**	**3.0**	**20.62**	**152000**	**42400**
0760	76	79.0		2.65	+0.14	4.5	1.5	2.50		80.7		59.6	63.4	7.8	6.1	3.0	22.68	154000	43000
0780	78	81.0		2.65	−0.00	4.5	1.5	2.50		82.5		60.1	64.0	8.5	6.8	3.0	22.46	158000	44100
0800	**80**	**83.5**		**2.65**		**5.3**	**1.8**	**2.50**		**85.5**		**62.1**	**66.5**	**8.5**	**7.0**	**3.0**	**21.38**	**162000**	**52800**
0820	82	85.5		2.65		5.3	1.8	2.50		87.5		64.1	68.5	8.5	6.2	3.0	22.27	166000	54100
0850	**85**	**88.5**		**3.15**		**5.3**	**1.8**	**3.00**		**90.5**		**66.9**	**71.3**	**8.6**	**7.2**	**3.5**	**31.78**	**206000**	**56100**
0880	88	91.5	+0.35	3.15		5.3	1.8	3.00		93.5		69.9	74.3	8.6	7.4	3.5	32.94	214000	58100
0900	**90**	**93.5**	−0.00	**3.15**		**5.3**	**1.8**	**3.00**	+0.00	**95.5**	+1.30	**71.9**	**76.3**	**8.6**	**7.6**	**3.5**	**33.35**	**218000**	**59400**
0920	92	95.5		3.15		5.3	1.8	3.00	−0.08	97.5	−0.54	73.7	78.1	8.7	7.8	3.5	35.72	223000	60700
0950	95	98.5		3.15		5.3	1.8	3.00		100.5		76.5	80.9	8.8	8.1	3.5	38.88	231000	62700
0980	98	101.5		3.15		5.3	1.8	3.00		103.5		79.0	83.5	9.0	8.3	3.5	42.16	238000	64700
1000	**100**	**103.5**		**3.15**		**5.3**	**1.8**	**3.00**		**105.5**		**80.6**	**85.1**	**9.2**	**8.4**	**3.5**	**43.41**	**243000**	**66000**
1020	102	106.0		4.15		6.0	2.0	4.00		108.0		82.0	87.0	9.5	8.5	3.5	55.20	330000	76900
1050	105	109.0		4.15		6.0	2.0	4.00		112.0		85.0	90.0	9.5	8.7	3.5	59.20	340000	79200
1080	108	112.0	+0.54	4.15		6.0	2.0	4.00		115.0		88.0	93.0	9.5	8.9	3.5	62.60	350000	81400
1100	**110**	**114.0**	−0.00	**4.15**		**6.0**	**2.0**	**4.00**		**117.0**		**88.2**	**93.2**	**10.4**	**9.0**	**3.5**	**71.75**	**356000**	**82900**
1120	112	116.0		4.15		6.0	2.0	4.00		119.0		90.0	95.0	10.5	9.1	3.5	70.68	362000	84400
1150	115	119.0		4.15		6.0	2.0	4.00		122.0		93.0	98.0	10.5	9.3	3.5	73.16	372000	86700
1200	**120**	**124.0**		**4.15**		**6.0**	**2.0**	**4.00**		**127.0**		**96.9**	**102.0**	**11.0**	**9.7**	**3.5**	**80.40**	**388000**	**90500**
1250	**125**	**129.0**		**4.15**		**6.0**	**2.0**	**4.00**		**132.0**		**101.9**	**107.0**	**11.0**	**10.0**	**4.0**	**81.20**	**405000**	**94300**
1270	127	131.0		4.15		6.0	2.0	4.00		135.0		103.9	109.0	11.0	10.0	4.0	80.80	411000	95800
1300	**130**	**134.0**		**4.15**		**6.0**	**2.0**	**4.00**		**137.0**		**106.9**	**112.0**	**11.0**	**10.2**	**4.0**	**85.13**	**421000**	**98000**
1350	135	139.0		4.15		6.0	2.0	4.00	+0.00	142.0	+1.50	111.5	116.0	11.2	10.5	4.0	94.79	437000	102000
1400	**140**	**144.0**	+0.63	**4.15**		**6.0**	**2.0**	**4.00**	−0.10	**147.0**	−0.63	**116.5**	**121.0**	**11.2**	**10.7**	**4.0**	**98.61**	**453000**	**106000**
1450	145	149.0	−0.00	4.15	+0.18	6.0	2.0	4.00		152.0		121.0	126.0	11.4	10.9	4.0	106.50	469000	109000
1500	**150**	**155.0**		**4.15**	−0.00	**7.5**	**2.5**	**4.00**		**158.0**		**124.8**	**131.0**	**12.0**	**11.2**	**4.0**	**106.80**	**485000**	**141000**
1550	155	160.0		4.15		7.5	2.5	4.00		164.0		129.8	136.0	12.0	11.4	4.0	128.00	502000	146000
1600	**160**	**165.0**		**4.15**		**7.5**	**2.5**	**4.00**		**169.0**		**132.7**	**139.0**	**13.0**	**11.6**	**4.0**	**130.50**	**518000**	**151000**
1650	165	170.0		4.15		7.5	2.5	4.00		174.5		137.7	144.0	13.0	11.8	4.0	132.00	534000	156000
1700	**170**	**175.0**		**4.15**		**7.5**	**2.5**	**4.00**		**179.5**		**141.6**	**148.0**	**13.5**	**12.0**	**4.0**	**149.50**	**550000**	**160000**
1750	175	180.0		4.15		7.5	2.5	4.00		184.5		146.6	153.0	13.5	12.0	4.0	158.50	566000	165000
1800	**180**	**185.0**		**4.15**		**7.5**	**2.5**	**4.00**		**189.5**		**150.2**	**156.0**	**14.2**	**13.0**	**4.0**	**168.00**	**583000**	**170000**
1850	185	190.0		4.15		7.5	2.5	4.00		194.5		155.2	161.0	14.2	13.0	4.0	177.50	599000	174000
1900	190	195.0		4.15		7.5	2.5	4.00		199.5		160.2	166.0	14.3	13.0	4.0	184.00	615000	179000
1950	195	200.0		4.15		7.5	2.5	4.00		204.5	+1.70	165.2	171.0	14.2	13.0	4.0	189.60	631000	184000
2000	200	205.0	+0.72	4.15		7.5	2.5	4.00		209.5	−0.72	170.2	176.0	14.3	13.0	4.0	196.00	647000	188000
2100	210	216.0	−0.00	5.15		9.0	3.0	5.00		222.0		180.2	187.0	14.2	14.0	4.0	263.00	739000	237000
2200	220	226.0		5.15		9.0	3.0	5.00		232.0		190.2	197.0	14.2	14.0	4.0	276.00	774000	249000
2300	**230**	**236.0**		**5.15**		**9.0**	**3.0**	**5.00**		**242.0**		**200.2**	**207.0**	**14.2**	**14.0**	**4.0**	**291.00**	**809000**	**260000**
2400	**240**	**246.0**		**5.15**		**9.0**	**3.0**	**5.00**		**252.0**		**210.2**	**217.0**	**14.2**	**14.0**	**4.0**	**304.00**	**845000**	**271000**
2500	250	256.0		5.15		9.0	3.0	5.00	+0.00	262.0		220.2	227.0	14.2	14.0	4.0	318.50	880000	283000
2600	260	268.0		5.15		12.0	4.0	5.00	−0.12	275.0	+2.00	226.0	235.0	16.2	16.0	5.0	385.00	915000	392000
2700	270	278.0	+0.81	5.15		12.0	4.0	5.00		285.0	−0.81	236.0	245.0	16.2	16.0	5.0	401.50	950000	407000
2800	**280**	**288.0**	−0.00	**5.15**		**12.0**	**4.0**	**5.00**		**295.0**		**246.0**	**255.0**	**16.2**	**16.0**	**5.0**	**417.50**	**985000**	**422000**
2900	290	298.0		5.15		12.0	4.0	5.00		305.0		256.0	265.0	16.2	16.0	5.0	433.40	1020000	437000
3000	300	308.0		5.15		12.0	4.0	5.00		315.0		266.0	275.0	16.2	16.0	5.0	446.00	1060000	452000
3100	310	320.0		6.20		15.0	5.0	6.00		327.0		267.8	279.0	20.2	20.0	6.0	658.50	1310000	584000
3200	320	330.0		6.20		15.0	5.0	6.00		337.0		277.8	289.0	20.2	20.0	6.0	682.00	1350000	603000
3300	330	340.0		6.20		15.0	5.0	6.00		347.0		287.8	299.0	20.2	20.0	6.0	705.00	1390000	622000
3400	340	350.0		6.20		15.0	5.0	6.00		357.0		297.8	309.0	20.2	20.0	6.0	729.00	1440000	641000
3500	350	360.0	+0.89	6.20	+0.22	15.0	5.0	6.00	+0.00	367.0	+2.50	307.8	319.0	20.2	20.0	6.0	752.50	1480000	660000
3600	360	370.0	−0.00	6.20	−0.00	15.0	5.0	6.00	−0.18	377.0	−1.00	317.8	329.0	20.2	20.0	6.0	769.00	1520000	679000
3700	370	380.0		6.20		15.0	5.0	6.00		387.0		327.8	339.0	20.2	20.0	6.0	793.00	1560000	697000
3800	380	390.0		6.20		15.0	5.0	6.00		397.0		337.8	349.0	20.2	20.0	6.0	817.00	1610000	716000
3900	390	400.0		6.20		15.0	5.0	6.00		407.0		347.8	359.0	20.2	20.0	6.0	838.50	1650000	735000
4000	400	410.0		6.20		15.0	5.0	6.00		417.0		357.8	369.0	20.2	20.0	6.0	862.50	1690000	754000

Reference to table headings

A = Free gap
a = Radial depth
B = Bore diameter
b = Beam dimension
C = Clearance on shaft or in bore
C1= Clearance in groove
D = Free diameter (working)
D1= Free diameter (non functional)
d = Groove depth
E = End of play take-up
F = Circlip details
G = Groove diameter
H = Height
h = Hole diameter
L = Lug depth
n = Edge margin
n1= Shaft or bore face to retained face
r = radius
S = Shaft diameter
Tc= Thrust load for circlip
Tg= Thrust load of groove
W = Groove width
w = Wing dimention
Wt= Weight
X = Outer groove wall to retained face
t = thickness

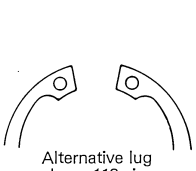
Abbreviations used

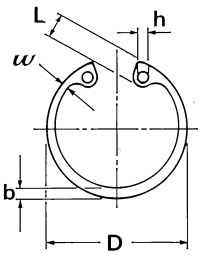
B.S. = British Standars
dec. = Decimal
frac. = Fraction
kg/k = kilograms per thousand
lb.f = Pounds force
lb/k = Pounds per thousand
max. = Maximum
N = Newton
Nom. = Nominal
Tol. = Tolerance

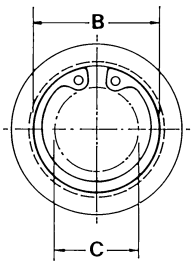
Standard Internal Circlips Imperial Specifications

Standard material - carbon spring steel. Standard finish - phosphate & oil

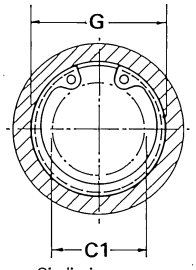
All dimensions in inches



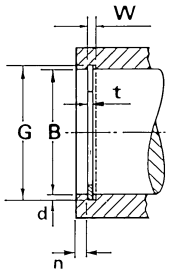




Circlip in bore



Circlip in groove



† Thrust load calculations see pages 9 & 10

*These circlips should not be used as direct substitutes for British Standard Imperial sizes

SIZE CODE	Bore (B) B (frac)	Bore (B) B (dec)	Groove (G) G	Groove (G) Tol.	Groove (G) W	Groove (G) Tol.	Groove (G) n (min)	Groove (G) d ~	Circlip (F) t	Circlip (F) Tol.	Circlip (F) D	Circlip (F) Tol.	Circlip (F) C	Circlip (F) C1	Circlip (F) L (max)	Circlip (F) b ~	Circlip (F) w ~	Circlip (F) h (min)	Wt. (lb/k)	Tc† (lb.f)	Tg† (lb.f)
0025	1/4	.250	.268	±.001	.018	+.002 −.000	.027	.009	.015	±.002	.280	+.010 −.005	.11	.13	.068	.025	.015	.029	0.08	530	130
0031	5/16	.312	.330		.018		.027	.009	.015		.346		.17	.19	.069	.033	.018	.029	0.11	660	160
0037	3/8	.375	.397	±.002	.029		.033	.011	.025		.415		.20	.22	.085	.040	.028	.039	0.25	1320	235
0043	7/16	.438	.461		.029		.036	.012	.025		.482		.23	.25	.101	.049	.029	.039	0.37	1550	285
0045	29/64	.453	.477		.029		.036	.012	.025		.498		.25	.27	.101	.050	.030	.045	0.43	1600	310
0050	1/2	.500	.530		.039		.045	.015	.035		.548		.26	.29	.117	.053	.035	.045	0.70	2470	425
0051	—	.512	.542		.039		.045	.015	.035		.560		.27	.30	.119	.053	.035	.045	0.77	2530	435
0056	9/16	.562	.596		.039		.051	.017	.035		.620		.28	.32	.137	.053	.035	.045	0.86	2780	540
0062	5/8	.625	.665		.039		.060	.020	.035		.694		.35	.39	.137	.060	.035	.060	1.0	3090	705
0068	11/16	.688	.732		.039		.066	.022	.035		.763		.41	.45	.137	.063	.036	.060	1.2	3400	855
0075	3/4	.750	.796		.039	+.003 −.000	.069	.023	.035		.831		.45	.50	.147	.070	.040	.060	1.3	3710	975
0077	—	.777	.825	±.003	.046		.072	.024	.042		.859		.47	.52	.151	.074	.044	.060	1.7	4610	1050
0081	13/16	.812	.862		.046		.075	.025	.042		.901		.49	.53	.160	.077	.044	.060	1.9	4820	1150
0086	—	.866	.920		.046		.081	.027	.042		.961		.54	.59	.160	.081	.045	.060	2.0	5140	1320
0087	7/8	.875	.931		.046		.084	.028	.042		.971		.55	.60	.160	.084	.045	.060	2.1	5190	1390
0090	—	.901	.959		.046		.087	.029	.042		1.000	+.015 −.010	.58	.63	.160	.087	.047	.060	2.2	5350	1480
0093	15/16	.938	1.000		.046		.093	.031	.042		1.041		.61	.67	.160	.091	.050	.060	2.4	5570	1640
0100	1	1.000	1.066		.046		.099	.033	.042		1.111		.68	.74	.160	.104	.052	.060	2.7	5940	1870
0102	—	1.023	1.091		.046		.102	.034	.042		1.136		.70	.76	.160	.106	.054	.060	2.8	6070	1970
0106	1.1/16	1.062	1.130		.056		.102	.034	.050		1.180		.69	.75	.185	.110	.055	.076	3.7	7500	2040
0112	1.1/8	1.125	1.197		.056		.108	.036	.050		1.249		.75	.82	.185	.116	.057	.076	4.0	7950	2290
0118	1.3/16	1.188	1.262		.056		.111	.037	.050		1.319		.81	.88	.185	.120	.058	.076	4.3	8400	2490
0125	1.1/4	1.250	1.330		.056		.120	.040	.050		1.388	+.025 −.020	.88	.95	.185	.124	.062	.076	4.8	8850	2830
0131	1.5/16	1.312	1.396	±.004	.056		.126	.042	.050		1.456		.94	1.02	.185	.130	.062	.076	5.0	9300	3120
0137	1.3/8	1.375	1.461		.056		.129	.043	.050		1.526		1.00	1.08	.185	.130	.063	.076	5.1	9700	3340
0143	1.7/16	1.438	1.528		.056		.135	.045	.050		1.596		1.06	1.15	.185	.133	.065	.076	5.8	10200	3660
0145	—	1.456	1.548		.056		.138	.046	.050		1.616		1.08	1.17	.185	.133	.065	.076	6.0	10300	3790
0150	1.1/2	1.500	1.594		.056	+.004 −.000	.141	.047	.050		1.660		1.13	1.22	.185	.133	.066	.076	6.1	10600	3990
0156	1.9/16	1.562	1.658		.068		.144	.048	.062		1.734		1.15	1.24	.205	.160	.079	.076	9.1	11400	4240
0162	1.5/8	1.625	1.725		.068		.150	.050	.062		1.804		1.21	1.31	.205	.160	.080	.076	10.1	11800	4590
0165	—	1.653	1.755		.068		.153	.051	.062		1.835		1.24	1.34	.205	.167	.083	.076	10.4	12100	4760
0168	1.11/16	1.688	1.792		.068		.156	.052	.062		1.874		1.27	1.38	.205	.170	.085	.076	10.8	12300	4960
0175	1.3/4	1.750	1.858	±.005	.068		.162	.054	.062		1.942	+.035 −.025	1.34	1.44	.205	.175	.082	.076	11.5	12800	5340
0181	1.13/16	1.812	1.922		.068		.165	.055	.062		2.012		1.40	1.51	.205	.170	.084	.091	12.0	13200	5630
0185	—	1.850	1.962		.068		.168	.056	.062		2.054		1.44	1.55	.205	.170	.085	.091	12.8	13500	5860
0187	1.7/8	1.875	1.989		.068		.171	.057	.062		2.072		1.46	1.58	.205	.170	.085	.091	12.8	13700	6040
0193	1.15/16	1.938	2.056		.068		.177	.059	.062		2.141		1.52	1.64	.205	.165	.079	.091	13.3	14100	6470
0200	2	2.000	2.122		.068		.183	.061	.062		2.210		1.59	1.71	.205	.170	.085	.091	13.0	14600	6900
0206	2.1/16	2.062	2.186		.086		.186	.062	.078		2.280		1.61	1.73	.225	.186	.091	.091	18.0	18900	7230
0212	2.1/8	2.125	2.251		.086		.189	.063	.078		2.350		1.65	1.78	.236	.195	.096	.091	19.4	19500	7570
0218	2.3/16	2.188	2.318		.086		.195	.065	.078		2.415		1.71	1.84	.236	.199	.098	.091	19.6	20000	8040
0225	2.1/4	2.250	2.382		.086		.198	.066	.078		2.490		1.77	1.91	.236	.203	.107	.091	21.8	20600	8400
0231	2.5/16	2.312	2.450		.086		.207	.069	.078		2.560		1.84	1.98	.236	.205	.106	.091	22.6	21200	9020
0237	2.3/8	2.375	2.517		.086		.213	.071	.078		2.630		1.90	2.04	.236	.207	.108	.091	23.8	21700	9540
0244	2.7/16	2.440	2.584		.086		.216	.072	.078		2.702	+.040 −.030	1.96	2.11	.236	.205	.104	.108	25.3	22300	10100
0250	2.1/2	2.500	2.648		.086		.222	.074	.078	±.003	2.775		2.02	2.17	.236	.210	.103	.108	29.3	22900	13000
0256	2.9/16	2.562	2.714		.103		.228	.076	.093		2.844		2.02	2.18	.268	.222	.109	.108	30.4	28000	11000
0262	2.5/8	2.625	2.781		.103		.234	.078	.093		2.910		2.08	2.24	.268	.226	.118	.108	34.5	28600	11600
0268	2.11/16	2.688	2.848		.103		.240	.080	.093		2.980		2.15	2.31	.268	.236	.122	.108	36.2	29300	12200
0275	2.3/4	2.750	2.914		.103		.246	.082	.093		3.050		2.18	2.34	.284	.234	.114	.108	35.5	30000	12800
0281	2.13/16	2.812	2.980		.103		.252	.084	.093		3.121		2.24	2.40	.284	.230	.115	.108	39.2	30800	13400
0287	2.7/8	2.875	3.051	±.006	.103	+.005 −.000	.264	.088	.093		3.191		2.30	2.47	.284	.240	.125	.108	41.0	31500	14300
0300	3	3.000	3.182		.103		.273	.091	.093		3.325		2.43	2.60	.284	.250	.124	.108	42.5	32900	15400
0306	3.1/16	3.062	3.248		.120		.279	.093	.109		3.418		2.46	2.64	.299	.254	.126	.123	54.4	39300	16100
0312	3.1/8	3.125	3.315		.120		.285	.095	.109		3.488		2.52	2.71	.299	.260	.129	.123	56.0	40100	16800
0315	—	3.149	3.348		.120		.288	.096	.109		3.523		2.55	2.74	.299	.260	.129	.123	57.1	40400	17100
0325	3.1/4	3.250	3.446		.120		.294	.098	.109		3.623		2.65	2.84	.299	.269	.135	.123	59.9	41700	18000
0334	3.11/32	3.346	3.546		.120		.300	.100	.109		3.734	±.055	2.69	2.89	.323	.276	.140	.123	63.0	43000	18900
0347	3.15/32	3.469	3.675		.120		.309	.103	.109		3.857		2.77	2.96	.350	.294	.143	.123	69.0	44500	20200
0350	3.1/2	3.500	3.710		.120		.315	.105	.109		3.890		2.80	2.90	.350	.294	.143	.123	71.0	44900	20800
0354	—	3.543	3.776		.120		.321	.107	.109		3.936		2.84	3.07	.350	.292	.142	.123	72.1	45500	21400
0362	3.5/8	3.625	3.841		.120		.324	.108	.109		4.024		2.92	3.13	.350	.298	.149	.123	73.0	46500	22100
0375	3.3/4	3.750	3.974		.120		.336	.112	.109		4.157		3.04	3.26	.350	.309	.155	.123	78.0	48200	23700
0387	3.7/8	3.875	4.107		.120		.348	.116	.109		4.291	±.065	3.17	3.40	.350	.312	.165	.123	87.1	49800	25400
0393	3.15/16	3.938	4.174		.120		.354	.118	.109		4.358		3.23	3.46	.350	.319	.166	.123	87.9	50600	26300

Standard material - carbon spring steel. Standard finish - phosphate and oil.

Standard Internal Circlips Imperial Specifications

Standard material - carbon spring steel. Standard finish - phosphate & oil

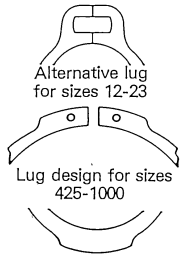
SIZE CODE	Bore (B)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	B (frac)	B (dec)	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	ω ~	h (min)	(lb/k)	(lb.f)	(lb.f)
0400	4	4.000	4.240		.120		.360	.120	.109		4.424		3.24	3.47	.378	.330	.166	.123	95.0	51400	27100
0412	4.1/8	4.125	4.365		.120		.360	.120	.109		4.558		3.36	3.60	.378	.330	.171	.123	97.0	53000	28000
0425	4.1/4	4.250	4.490		.120		.360	.120	.109		4.691		3.49	3.72	.378	.335	.180	.123	100	54600	28800
0433	—	4.331	4.571	± .006	.120	+ .005 − .000	.360	.120	.109	± .003	4.756		3.50	3.73	.413	.345	.180	.151	107	55600	29400
0450	4.1/2	4.500	4.740		.120		.360	.120	.109		4.940		3.67	3.90	.413	.351	.181	.151	111	57800	30500
0462	4.5/8	4.625	4.865		.120		.360	.120	.109		5.076		3.79	4.03	.413	.360	.185	.151	119	59400	31400
0475	4.3/4	4.750	4.995		.120		.366	.122	.109		5.213	± .065	3.92	4.16	.413	.370	.175	.151	124	61000	32800
0500	5	5.000	5.260		.120		.390	.130	.109		5.485		4.10	4.36	.445	.395	.218	.151	136	64200	36800
0525	5.1/4	5.250	5.520		.139		.405	.135	.125		5.770		4.31	4.58	.465	.408	.212	.151	175	77300	40100
0537	5.3/8	5.375	5.650		.139		.405	.135	.125		5.910		4.44	4.71	.465	.408	.198	.151	179	78800	41000
0550	5.1/2	5.500	5.770	± .007	.139	+ .006 − .000	.405	.135	.125	± .004	6.066		4.56	4.83	.465	.408	.200	.151	189	81000	42000
0575	5.3/4	5.750	6.020		.139		.405	.135	.125		6.336		4.81	5.08	.465	.408	.198	.151	195	84700	43900
0600	6	6.000	6.270		.139		.405	.135	.125		6.620		5.06	5.33	.465	.416	.223	.151	204	88400	45800
0625	6.1/4	6.250	6.530		.174		.420	.140	.156		6.895		5.34	5.61	.454	.441	.213	.182	263	114900	49500
0650	6.1/2	6.500	6.790		.174		.435	.145	.156		7.170	± .080	5.59	5.87	.454	.441	.244	.182	281	119500	53300
0662	6.5/8	6.625	6.925		.174		.450	.150	.156		7.308		5.71	6.01	.454	.441	.220	.182	300	121700	56200
0675	6.3/4	6.750	7.055		.174		.456	.152	.156		7.445		5.73	6.03	.508	.456	.224	.182	325	124000	58000
0700	7	7.000	7.315		.174		.471	.157	.156		7.720		5.91	6.22	.540	.485	.258	.182	344	128600	62200
0725	7.1/4	7.250	7.575		.209		.486	.162	.187		7.995		6.10	6.42	.570	.490	.238	.182	428	159700	66400
0750	7.1/2	7.500	7.840		.209		.510	.170	.187		8.270		6.35	6.69	.570	.507	.282	.182	476	165200	72100
0775	7.3/4	7.750	8.100	± .008	.209	+ .008 − .000	.525	.175	.187	± .005	8.545		6.62	6.97	.560	.500	.241	.182	520	170700	76700
0800	8	8.000	8.360		.209		.540	.180	.187		8.820		6.79	7.15	.600	.550	.280	.182	555	152700	81400
0825	8.1/4	8.250	8.620		.209		.555	.185	.187		9.095		7.04	7.41	.600	.548	.260	.182	603	157500	86300
0850	8.1/2	8.500	8.880		.209		.570	.190	.187		9.285	± .090	7.23	7.60	.632	.573	.277	.182	634	162300	91300
0875	8.3/4	8.750	9.145		.209		.591	.197	.187		9.558		7.48	7.88	.632	.576	.283	.182	653	167000	97700
0900	9	9.000	9.405		.209		.606	.202	.187		9.830		7.73	8.13	.632	.592	.294	.182	732	171800	103000
0925	9.1/4	9.250	9.668		.209		.627	.209	.187		10.102		7.98	8.39	.632	.622	.299	.182	767	176600	109000
0950	9.1/2	9.500	9.930		.209		.645	.215	.187		10.375		8.23	8.65	.632	.622	.354	.182	803	181400	116000
0975	9.3/4	9.750	10.190		.209		.660	.220	.187		10.648		8.50	8.93	NO	.622	.295	.182	833	186200	121300
1000	10	10.000	10.450		.209		.675	.225	.187		10.920		8.75	9.19	LUG	.622	.295	.182	863	191000	127200

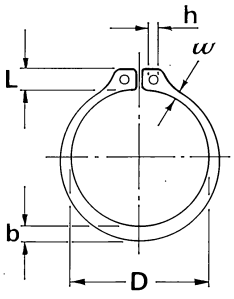
Standard External Circlips Imperial Specifications

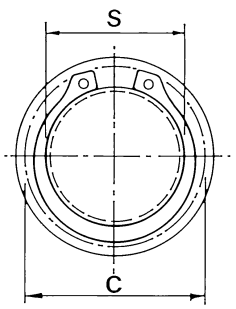
Standard material - carbon spring steel. Standard finish - phosphate & oil

All dimensions in inches

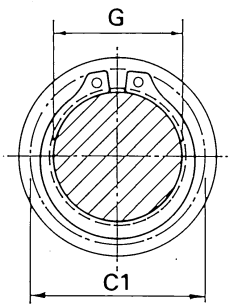
*These circlips should not be used as direct substitutes for British Standard Imperial sizes



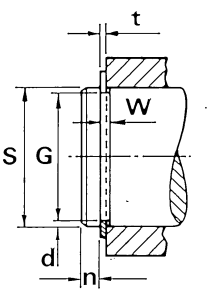




Circlip on shaft



Circlip in groove



*Sizes 12-23 Beryllium copper only

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft (S)		Groove (G)						Circlip (F)										Wt.	Tc†	Tg†
	S (frac)	S (dec)	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	ω ~	h (min)	(lb/k)	(lb.f)	(lb.f)
*0012	1/8	.125	.117		.012		.014	.004	.010	± .001	.112		.22	.214	.048	.018	.011	.024	0.018	110	28
*0015	5/32	.156	.146		.012		.017	.005	.010		.142		.27	.260	.056	.026	.016	.024	0.037	130	44
*0018	3/16	.188	.175		.018	+ .002	.022	.007	.015		.168	+ .002	.30	.286	.052	.025	.016	.023	0.059	240	69
*0019	—	.197	.185	± .0015	.018	− .000	.020	.006	.015		.179	− .004	.32	.307	.058	.026	.016	.024	0.063	250	67
*0021	7/32	.219	.205		.018		.023	.007	.015		.196		.34	.324	.058	.028	.017	.024	0.074	280	87
*0023	15/64	.236	.222		.018		.023	.007	.015		.215		.36	.341	.058	.030	.019	.024	0.086	310	93
0025	1/4	.250	.230		.029		.032	.010	.025		.225		.45	.43	.083	.035	.025	.039	0.21	880	141
0027	—	.276	.255		.029		.035	.010	.025		.250		.48	.46	.084	.035	.024	.039	0.25	980	164
0028	9/32	.281	.261		.029		.033	.010	.025	± .002	.256		.49	.47	.083	.038	.025	.039	0.24	990	160
0031	5/16	.312	.290		.029		.036	.011	.025		.281	+ .002	.54	.52	.090	.040	.026	.039	0.27	1100	194
0034	11/32	.344	.321	± .002	.029	+ .003	.038	.012	.025		.309	− .005	.57	.55	.090	.042	.026	.039	0.31	1210	224
0035	—	.354	.330		.029	− .000	.038	.012	.025		.320		.59	.57	.090	.046	.029	.039	0.35	1250	240
0037	3/8	.375	.352		.029		.038	.012	.025		.338		.61	.59	.091	.050	.030	.039	0.39	1320	244
0039	—	.394	.369		.029		.041	.013	.025		.354		.62	.60	.090	.052	.031	.039	0.42	1390	278
0040	13/32	.406	.382		.029		.039	.012	.025		.366		.63	.61	.090	.054	.033	.039	0.43	1430	275

Standard material - carbon spring steel. Standard finish - phosphate and oil.

Standard External Circlips Imperial Specifications

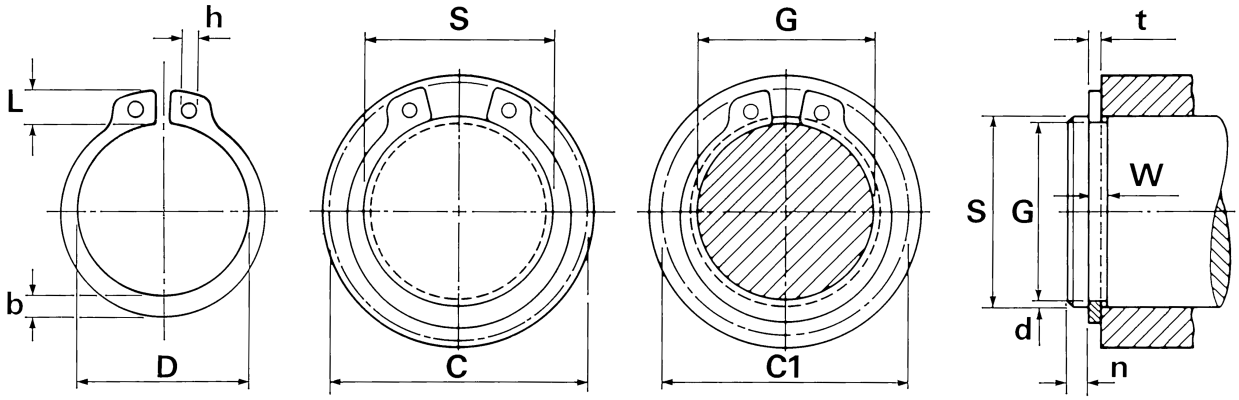
Standard material - carbon spring steel. Standard finish - phosphate & oil

SIZE CODE	Shaft (S) S (frac)	S (dec)	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	w ~	h (min)	Wt. (lb/k)	Tc† (lb.f)	Tg† (lb.f)
0043	7/16	.438	.412		.029		.042	.013	.025		.395	+.002 −.005	.66	.64	.091	.055	.033	.039	0.50	1550	322
0046	15/32	.469	.443		.029		.042	.013	.025		.428		.68	.66	.091	.060	.035	.039	0.54	1660	345
0050	1/2	.500	.468	± .002	.039		.051	.016	.035		.461		.77	.74	.111	.065	.040	.045	0.91	2470	452
0055	—	.551	.519		.039		.051	.016	.035		.509		.81	.78	.111	.053	.036	.045	0.90	2730	500
0056	9/16	.562	.530		.039		.051	.016	.035		.521		.82	.79	.111	.072	.041	.045	1.10	2780	508
0059	19/32	.594	.559		.039		.057	.017	.035		.550		.86	.83	.112	.076	.043	.045	1.20	2940	588
0062	5/8	.625	.588		.039		.060	.018	.035		.579		.90	.87	.113	.080	.045	.045	1.30	3090	654
0066	43/64	.672	.631		.039	+.003 −.000	.066	.020	.035		.621		.93	.89	.113	.082	.043	.045	1.40	3320	780
0068	11/16	.688	.646		.046		.068	.021	.042		.635	+.005 −.010	1.01	.97	.140	.084	.048	.050	1.80	4080	817
0075	3/4	.750	.704		046		.074	.023	.042		.693		1.09	1.05	.140	.092	.051	.050	2.10	4450	975
0078	25/32	.781	.733	± .003	046		.076	.024	.042		.722		1.12	1.08	.140	.094	.052	.050	2.2	4600	1060
0081	13/16	.812	.762		046		.080	.025	.042		.751		1.15	1.10	.140	.096	.054	.050	2.5	4800	1150
0087	7/8	.875	.821		.046		.085	.027	.042	± .002	.810		1.21	1.16	.141	.104	.057	.050	2.8	5200	1340
0093	15/16	.938	.882		.046		.088	.028	.042		.867		1.34	1.29	.170	.110	.063	.076	3.1	5600	1480
0098	63/64	.984	.926		.046		.091	.029	.042		.910		1.39	1.34	.171	.114	.065	.076	3.5	5800	1610
0100	1	1.000	.940		.046		.094	.030	.042		.925		1.41	1.35	.171	.116	.065	.076	3.6	5900	1700
0102	—	1.023	.961		.046		.097	.031	.042		.946		1.43	1.37	.172	.118	.066	.076	3.9	6100	1790
0106	1.1/16	1.062	.998		.056		.102	.032	.050		.982		1.50	1.44	.185	.122	.069	.076	4.8	7500	1920
0112	1.1/8	1.125	1.059		.056		.105	.033	.050		1.041		1.55	1.49	.186	.128	.071	.076	5.1	7900	2100
0118	1.3/16	1.188	1.118		.056		.111	.035	.050		1.098		1.61	1.54	.186	.132	.072	.076	5.6	8400	2350
0125	1.1/4	1.250	1.176	± .004	.056		.117	.037	.050		1.156	+.010 −.015	1.69	1.62	.187	.140	.076	.076	5.9	8800	2610
0131	1.5/16	1.312	1.232		.056		.126	.040	.050		1.214		1.75	1.67	.187	.146	.077	.076	6.8	9300	2970
0137	1.3/8	1.375	1.291		.056		.132	.042	.050		1.272		1.80	1.72	.188	.152	.082	.076	7.2	9700	3270
0143	1.7/16	1.438	1.350		.056		.138	.044	.050		1.333		1.87	1.79	.188	.160	.086	.076	8.1	10200	3580
0150	1.1/2	1.500	1.406		.056	+.004 −.000	.147	.047	.050		1.387		1.99	1.90	.218	.168	.091	.118	9.0	10600	3990
0156	1.9/16	1.562	1.468		.068		.148	.047	.062		1.446		1.95	1.85	.189	.180	.098	.100	11.7	10700	4150
0162	1.5/8	1.625	1.529		.068		.151	.048	.062		1.503		2.17	2.08	.189	.180	.097	.100	12.8	11100	4410
0168	1.11/16	1.688	1.589		.068		.156	.049	.062		1.560		2.04	1.95	.205	.197	.099	.100	13.2	11500	4720
0175	1.3/4	1.750	1.650		.068		.157	.050	.062		1.618		2.11	2.01	.205	.197	.101	.100	13.8	11900	4950
0177	—	1.772	1.669	± .005	.068		.162	.051	.062		1.618	+.013 −.020	2.19	2.09	.205	.197	.102	.100	14.1	12100	5160
0181	1.13/16	1.812	1.708		.068		.163	.052	.062		1.675		2.23	2.13	.205	.197	.095	.100	14.7	12400	5330
0187	1.7/8	1.875	1.769		.068		.166	.053	.062		1.735		2.29	2.19	.205	.197	.104	.100	15.5	12800	5620
0196	—	1.968	1.857		.068		.174	.055	.062		1.819		2.39	2.27	.205	.197	.106	.123	18.2	13400	5170
0200	2	2.000	1.886		.068		.178	.057	.062		1.850		2.48	2.36	.232	.224	.108	.123	19.2	13600	6450
0206	2.1/16	2.062	1.946		.086		.183	.058	.078		1.906		2.52	2.40	.225	.217	.111	.123	22.6	17700	6760
0212	2.1/8	2.125	2.003		.086		.192	.061	.078		1.964		2.61	2.48	.236	.228	.120	.123	24.4	18200	7330
0215	2.5/32	2.156	2.032		.086		.195	.062	.078		1.993		2.62	2.49	.225	.217	.113	.123	26.6	18500	7560
0225	2.1/4	2.250	2.120		.086		.204	.065	.078		2.081	+.015 −.025	2.87	2.74	.225	.217	.116	.123	26.0	19300	8270
0231	2.5/16	2.312	2.178		.086		.210	.067	.078		2.139		2.94	2.81	.225	.217	.118	.123	28.4	19800	8760
0237	2.3/8	2.375	2.239		.086		.213	.068	.078		2.197		2.86	2.72	.236	.228	.119	.123	27.9	20400	9130
0243	2.7/16	2.438	2.299		.086		.217	.069	.078		2.255		2.92	2.78	.236	.228	.120	.123	29.4	20900	9580
0250	2.1/2	2.500	2.360		.086		.219	.070	.078		2.313		2.98	2.84	.236	.228	.122	.123	29.7	21400	9900
0255	—	2.559	2.419		.086		.219	.070	.078		2.377		3.09	2.94	.258	.250	.130	.123	31.7	21900	10100
0262	2.5/8	2.625	2.481		.086		.225	.072	.078		2.428		3.11	2.96	.236	.228	.120	.123	35.0	22500	10700
0268	2.11/16	2.688	2.541		.086		.230	.073	.078		2.485		3.32	3.18	.273	.246	.129	.123	36.0	23000	11200
0275	2.3/4	2.750	2.602		.103		.231	.074	.093	± .003	2.543		3.33	3.18	.284	.276	.145	.123	47.0	28100	11500
0287	2.7/8	2.875	2.721		.103	+.005 −.000	.240	.077	.093		2.659		3.42	3.26	.268	.260	.133	.123	48.4	29400	12500
0293	2.15/16	2.938	2.779		.103		.247	.079	.093		2.717		3.49	3.32	.268	.260	.125	.123	50.0	30000	13200
0300	3	3.000	2.838		.103		.252	.081	.093		2.775		3.55	3.38	.268	.260	.138	.123	51.5	30700	13700
0306	3.1/16	3.062	2.898		.103		.255	.082	.093		2.832		3.61	3.44	.268	.260	.131	.123	56.8	31300	14200
0312	3.1/8	3.125	2.957	± .006	.103		.261	.084	.093		2.892		3.75	3.57	.305	.272	.141	.123	57.9	32000	14800
0315	3.5/32	3.156	2.986		.103		.264	.085	.093		2.920		3.74	3.56	.284	.276	.143	.123	59.0	32300	15200
0325	3.1/4	3.250	3.076		.103		.270	.087	.093		3.006		3.83	3.65	.284	.276	.145	.123	61.9	33200	16000
0334	3.11/32	3.346	3.166		.103		.279	.090	.093		3.092	+.020 −.030	3.93	3.74	.284	.276	.147	.123	63.9	34200	17000
0343	3.7/16	3.438	3.257		.103		.280	.090	.093		3.179		4.02	3.83	.284	.276	.130	.123	65.9	35200	17600
0350	3.1/2	3.500	3.316		.120		.285	.092	.109		3.237		4.15	3.96	.320	.285	.148	.123	71.9	42000	18200
0354	—	3.543	3.357		.120		.288	.093	.109		3.277		4.20	4.00	.320	.288	.149	.123	72.9	42500	18600
0362	3.5/8	3.625	3.435		.120		.294	.095	.109		3.352		4.28	4.09	.323	.315	.153	.123	76.0	43400	19500
0368	3.11/16	3.688	3.493		.120		.301	.097	.109		3.410		4.31	4.11	.335	.302	.156	.123	80.0	44200	20300
0375	3.3/4	3.750	3.552		.120		.306	.099	.109		3.468		4.44	4.23	.337	.310	.160	.123	82.9	44900	21000
0387	3.7/8	3.875	3.673		.120		.312	.101	.109		3.584		4.56	4.35	.335	.318	.163	.123	87.9	46400	22100
0393	3.15/16	3.938	3.734		.120		.315	.102	.109		3.642		4.60	4.39	.323	.318	.163	.123	95.0	47200	22700
0400	4	4.000	3.792		.120		.321	.104	.109		3.700		4.72	4.50	.352	.344	.176	.123	100	47900	23500
0425	4.1/4	4.250	4.065		.120		.287	.092	.109		3.989		4.91	4.72	.323	.318	.176	.123	112	50900	22200
0437	4.3/8	4.375	4.190		.120		.287	.092	.109		4.106		5.04	4.84	.323	.318	.181	.123	115	52400	22900
0450	4.1/2	4.500	4.310		.120		.294	.095	.109		4.223		5.16	4.96	.323	.285	.128	.123	100	53900	24200
0475	4.3/4	4.750	4.550		.120		.309	.100	.109		4.458		5.47	5.26	.437	.303	.152	.123	113	56900	26900
0500	5	5.000	4.790		.120		.324	.105	.109		4.692		5.72	5.50	.445	.360	.186	.151	149	59900	29700
0525	5.1/4	5.250	5.030		.139		.339	.110	.125		4.927		6.18	5.95	.457	.372	.211	.151	188	72200	32700
0550	5.1/2	5.500	5.265	± .007	.139	+.006 −.000	.363	.117	.125	± .004	5.162	+.020 −.040	6.43	6.19	.457	.390	.209	.151	196	75600	36500
0575	5.3/4	5.750	5.505		.139		.378	.122	.125		5.396		6.68	6.43	.457	.408	.220	.151	199	79000	39800
0600	6	6.000	5.745		.139		.393	.127	.125		5.631		6.93	6.67	.457	.381	.171	.151	212	82500	43300
0625	6.1/4	6.250	5.985		.174		.409	.132	.156		5.866	+.020 −.050	7.28	7.01	.508	.396	.176	.151	281	107000	46800
0650	6.1/2	6.500	6.225		.174		.425	.137	.156		6.100		7.53	7.25	.508	.438	.236	.151	322	112000	50500
0675	6.3/4	6.750	6.465		.174		.440	.142	.156		6.335		7.78	7.49	.508	.456	.246	.182	356	116000	54400
0700	7	7.000	6.705		.174		.455	.147	.156		6.570		8.03	7.73	.508	.460	.256	.182	388	120000	58400
0750	7.1/2	7.500	7.180		.209	+.008 −.000	.492	.160	.187	± .005	7.039		8.78	8.45	.632	.507	.269	.182	534	143000	67900
0800	8	8.000	7.660		.209		.522	.170	.187		7.508		9.27	8.93	.632	.540	.275	.182	628	153000	76900
0850	8.1/2	8.500	8.140		.209		.552	.180	.187		7.977	+.020 −.160	9.78	9.41	.632	.573	.300	.182	700	163000	86500
0900	9	9.000	8.620		.209		.582	.190	.187		8.445		10.25	9.87	No Lugs	.609	.410	.182	756	172000	96700
0950	9.1/2	9.500	9.100		.209		.612	.200	.187		8.915		10.78	10.38		.625	.420	.182	820	181000	107400
1000	10	10.000	9.575		.209		.650	.212	.187		9.385		11.27	10.85	.632	.625	.370	.182	964	191000	120200

Standard External Circlips Metric Specifications

Standard material - carbon spring steel. Standard finish - phosphate & oil

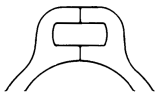
All dimensions in mm



Circlip on shaft

Circlip in groove

Lug for sizes 3 to 9 mm



Alternative lug for sizes 4-8 mm

Most sizes over 185 mm are without lugs

Beam configuration on some larger sizes

Sizes printed in blue are preferred sizes

† Thrust load calculations see pages 9 & 10

SIZE CODE	Shaft S	Groove (G) G	Tol.	W	Tol.	n (min)	d ~	Circlip (F) t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	Wt. (kg/k)	Tc† (N)	Tg† (N)
0030	3	2.8	+0.00 −0.04	0.50		0.3	0.10	0.40		2.7		7.0	6.6	1.9	0.8	1.0	0.02	1170	110
0040	4	3.8		0.50		0.3	0.10	0.40		3.7	+0.04 −0.15	8.6	8.2	2.2	0.9	1.0	0.03	1600	150
0050	5	4.8	+0.00 −0.048	0.70		0.3	0.10	0.60	+0.00 −0.05	4.7		10.3	9.8	2.5	1.1	1.0	0.08	2900	190
0060	6	5.7		0.80		0.5	0.15	0.70		5.6		11.7	11.1	2.7	1.3	1.2	0.13	4100	340
0070	7	6.7		0.90		0.5	0.15	0.80		6.5	+0.06 −0.18	13.5	12.9	3.1	1.4	1.2	0.18	5500	400
0080	8	7.6	+0.00 −0.06	0.90		0.6	0.20	0.80		7.4		14.7	14.0	3.2	1.5	1.2	0.20	6200	600
0090	9	8.6		1.10		0.6	0.20	1.00		8.4		16.0	15.2	3.3	1.7	1.2	0.32	8800	680
0100	10	9.6		1.10		0.6	0.20	1.00		9.3		17.0	16.2	3.3	1.8	1.5	0.40	9700	750
0110	11	10.5		1.10		0.8	0.25	1.00		10.2		18.0	17.1	3.3	1.8	1.5	0.41	10700	1040
0120	12	11.5		1.10		0.8	0.25	1.00		11.0		19.0	18.1	3.3	1.8	1.7	0.45	11700	1130
0130	13	12.4		1.10		0.9	0.30	1.00		11.9		20.2	19.2	3.4	2.0	1.7	0.52	12700	1470
0140	14	13.4		1.10		0.9	0.30	1.00		12.9	+0.10 −0.36	21.4	20.4	3.5	2.1	1.7	0.56	13600	1580
0150	15	14.3	+0.00 −0.11	1.10		1.1	0.35	1.00		13.8		22.6	21.5	3.6	2.2	1.7	0.62	14600	1980
0160	16	15.2		1.10		1.2	0.40	1.00		14.7		23.8	22.6	3.7	2.2	1.7	0.69	15600	2410
0170	17	16.2		1.10		1.2	0.40	1.00		15.7		25.0	23.8	3.8	2.3	1.7	0.77	16600	2560
0180	18	17.0		1.30		1.5	0.50	1.20		16.5		26.2	24.8	3.9	2.4	2.0	0.99	21000	3390
0190	19	18.0		1.30		1.5	0.50	1.20		17.5		27.2	25.8	3.9	2.5	2.0	1.10	22200	3580
0200	20	19.0		1.30		1.5	0.50	1.20		18.5		28.4	27.0	4.0	2.6	2.0	1.18	23400	3770
0210	21	20.0	+0.00 −0.13	1.30		1.5	0.50	1.20		19.5	+0.13 −0.42	29.6	28.2	4.1	2.7	2.0	1.26	24500	3960
0220	22	21.0		1.30		1.5	0.50	1.20		20.5		30.8	29.4	4.2	2.8	2.0	1.39	25700	4150
0230	23	22.0		1.30		1.5	0.50	1.20		21.5		32.0	30.6	4.3	2.9	2.0	1.54	26900	4340
0240	24	22.9		1.30		1.7	0.55	1.20	+0.00 −0.06	22.2		33.2	31.7	4.4	3.0	2.0	1.52	28000	4980
0250	25	23.9		1.30		1.7	0.55	1.20		23.2		34.2	32.7	4.4	3.0	2.0	1.70	29200	5180
0260	26	24.9	+0.00 −0.21	1.30		1.7	0.55	1.20		24.2		35.5	33.9	4.5	3.1	2.0	1.75	30400	5390
0270	27	25.6		1.30	+0.14 −0.00	2.1	0.70	1.20		24.9	+0.21 −0.42	36.7	34.8	4.6	3.1	2.0	1.89	31600	7130
0280	28	26.6		1.60		2.1	0.70	1.50		25.9		37.9	36.0	4.7	3.2	2.0	2.47	40900	7390
0290	29	27.6		1.60		2.1	0.70	1.50		26.9		39.1	37.2	4.8	3.4	2.0	2.75	42400	7650
0300	30	28.6		1.60		2.1	0.70	1.50		27.9		40.5	38.6	5.0	3.5	2.0	2.93	43800	7920
0320	32	30.3		1.60		2.6	0.85	1.50		29.6		43.0	40.7	5.2	3.6	2.5	3.02	46700	10300
0330	33	31.3		1.60		2.6	0.85	1.50		30.5		44.0	41.7	5.2	3.7	2.5	3.30	48200	10600
0340	34	32.3		1.60		2.6	0.85	1.50		31.5	+0.25 −0.50	45.4	43.1	5.4	3.8	2.5	3.72	49700	10900
0350	35	33.0		1.60		3.0	1.00	1.50		32.2		46.8	44.2	5.6	3.9	2.5	3.78	51100	13200
0360	36	34.0		1.85		3.0	1.00	1.75		33.2		47.8	45.2	5.6	4.0	2.5	4.55	51400	13600
0380	38	36.0		1.85		3.0	1.00	1.75		35.2		50.2	47.6	5.8	4.2	2.5	5.08	54800	14300
0400	40	37.5	+0.00 −0.25	1.85		3.8	1.25	1.75		36.5		52.6	49.5	6.0	5.0	2.5	5.54	56600	18800
0420	42	39.5		1.85		3.8	1.25	1.75		38.5		55.7	52.5	6.5	5.0	2.5	5.99	59500	19800
0450	45	42.5		1.85		3.8	1.25	1.75		41.5		59.1	55.9	6.7	5.0	2.5	6.75	63700	21200
0460	46	43.5		1.85		3.8	1.25	1.75		42.5	+0.39 −0.90	60.1	56.9	6.7	5.0	2.5	7.24	65100	21700
0470	47	44.5		1.85		3.8	1.25	1.75		43.5		61.3	58.1	6.8	5.0	2.5	7.30	66500	22100
0480	48	45.5		1.85		3.8	1.25	1.75		44.5		62.5	59.3	6.9	5.0	2.5	7.51	67900	22600
0500	50	47.0		2.15		4.5	1.50	2.00		45.8		64.5	60.8	6.9	5.5	2.5	9.88	80900	28300
0520	52	49.0		2.15		4.5	1.50	2.00		47.8		66.7	63.0	7.0	5.5	2.5	9.53	84100	29400
0540	54	51.0		2.15		4.5	1.50	2.00		49.8		69.0	65.2	7.1	5.5	2.5	10.30	87400	30500
0550	55	52.0		2.15		4.5	1.50	2.00		50.8		70.2	66.4	7.2	5.5	2.5	10.41	89000	31100
0560	56	53.0	+0.00 −0.30	2.15		4.5	1.50	2.00	+0.00 −0.07	51.8	+0.46 −1.10	71.6	67.6	7.3	5.5	2.5	10.50	90600	31700
0580	58	55.0		2.15		4.5	1.50	2.00		53.8		73.6	69.6	7.3	5.6	2.5	12.47	93800	32800
0600	60	57.0		2.15		4.5	1.50	2.00		55.8		75.6	71.8	7.4	5.8	2.5	13.69	97100	33900
0620	62	59.0		2.15		4.5	1.50	2.00		57.8		77.8	74.0	7.5	6.0	2.5	12.36	100000	35100
0630	63	60.0		2.15		4.5	1.50	2.00		58.8		79.0	75.2	7.6	6.2	2.5	13.10	102000	35600
0650	65	62.0		2.65		4.5	1.50	2.50		60.8		81.4	77.6	7.8	6.3	3.0	20.44	131000	36800

Standard material - carbon spring steel. Standard finish - phosphate and oil.

SUPASEAL (UK) LTD

Standard External Circlips Metric Specifications

Standard material - carbon spring steel. Standard finish - phosphate & oil

SIZE CODE	Shaft	Groove (G)						Circlip (F)									Wt.	Tc†	Tg†
	S	G	Tol.	W	Tol.	n (min)	d ~	t	Tol.	D	Tol.	C	C1	L (max)	b ~	h (min)	(kg/k)	(N)	(N)
0670	67	64.0	+0.00 −0.30	2.65	+0.14 −0.00	4.5	1.50	2.50	+0.00 −0.07	62.5	+0.46 −1.10	83.6	79.8	7.9	6.4	3.0	20.43	135000	37900
0680	68	65.0		2.65		4.5	1.50	2.50		63.5		84.4	81.0	8.0	6.5	3.0	19.55	138000	38500
0700	**70**	**67.0**		**2.65**		**4.5**	**1.50**	**2.50**		**65.5**		**87.0**	**83.2**	**8.1**	**6.6**	**3.0**	**22.13**	**142000**	**39600**
0720	72	69.0		2.65		4.5	1.50	2.50		67.5		89.2	85.4	8.2	6.8	3.0	21.60	146000	40700
0750	75	72.0		2.65		4.5	1.50	2.50		70.5		92.7	88.8	8.4	7.0	3.0	24.65	152000	42400
0770	77	74.0		2.65		4.5	1.50	2.50		72.5		94.9	91.0	8.5	7.2	3.0	24.26	156000	43500
0780	78	75.0		2.65		4.5	1.50	2.50		73.5		96.1	92.2	8.6	7.3	3.0	28.10	158000	44100
0800	80	76.5		2.65		5.3	1.75	2.50		74.5		98.1	93.7	8.6	7.4	3.0	26.68	162000	52800
0820	82	78.5		2.65		5.3	1.75	2.50		76.5		100.3	95.9	8.7	7.6	3.0	28.35	166000	54100
0850	85	81.5		3.15		5.3	1.75	3.00		79.5		103.3	98.9	8.7	7.8	3.5	35.40	206000	56100
0880	88	84.5	+0.00 −0.35	3.15		5.3	1.75	3.00	+0.00 −0.08	82.5		106.5	102.0	8.8	8.0	3.5	39.85	214000	58100
0900	**90**	**86.5**		**3.15**		**5.3**	**1.75**	**3.00**		**84.5**		**108.5**	**104.0**	**8.8**	**8.2**	**3.5**	**38.89**	**218000**	**59400**
0950	95	91.5		3.15		5.3	1.75	3.00		89.5		114.8	111.0	9.4	8.6	3.5	42.39	231000	62700
0980	98	94.5		3.15		5.3	1.75	3.00		91.5		118.6	114.0	9.8	9.0	3.5	54.00	238000	64700
1000	**100**	**96.5**		**3.15**		**5.3**	**1.75**	**3.00**		**94.5**		120.2	**116.0**	**9.6**	**9.0**	**3.5**	**48.86**	**243000**	**66000**
1020	102	98.0	+0.00 −0.54	4.15		6.0	2.00	4.00	+0.00 −0.10	95.0	+0.54 −1.30	122.4	118.0	9.7	9.2	3.5	68.73	330000	76900
1050	105	101.0		4.15		6.0	2.00	4.00		98.0		126.2	122.0	10.1	9.3	3.5	73.16	340000	79200
1080	108	104.0		4.15		6.0	2.00	4.00		100.0		129.0	124.0	10.0	9.5	3.5	83.45	349000	81400
1100	**110**	**106.0**		**4.15**		**6.0**	**2.00**	**4.00**		**103.0**		**131.2**	**127.0**	**10.1**	**9.6**	**3.5**	**75.24**	**356000**	**82900**
1150	115	111.0		4.15		6.0	2.00	4.00		108.0		137.3	133.0	10.6	9.8	3.5	78.65	327000	86700
1200	120	116.0	+0.00 −0.63	4.15	+0.18 −0.00	6.0	2.00	4.00		113.0	+0.63 −1.50	143.1	138.0	11.0	10.2	3.5	85.58	388000	90500
1250	125	121.0		4.15		6.0	2.00	4.00		118.0		149.0	144.0	11.4	10.4	4.0	99.62	404000	94200
1300	130	126.0		4.15		6.0	2.00	4.00		123.0		154.4	150.0	11.6	10.7	4.0	98.10	421000	98000
1350	135	131.0		4.15		6.0	2.00	4.00		128.0		159.8	155.0	11.8	11.0	4.0	113.40	437000	102000
1400	140	136.0		4.15		6.0	2.00	4.00		133.0		165.2	160.0	12.0	11.2	4.0	119.18	453000	106000
1450	145	141.0		4.15		6.0	2.00	4.00		138.0		170.6	166.0	12.2	11.5	4.0	128.53	470000	109000
1500	150	145.0		4.15		7.5	2.50	4.00		142.0		177.3	171.0	13.0	11.8	4.0	132.80	485000	141000
1550	155	150.0		4.15		7.5	2.50	4.00		146.0		182.3	176.0	13.0	12.0	4.0	136.06	501000	146000
1600	160	155.0		4.15		7.5	2.50	4.00		151.0		188.0	182.0	13.3	12.2	4.0	137.50	518000	151000
1650	165	160.0		4.15		7.5	2.50	4.00		155.5		193.4	187.0	13.5	12.5	4.0	151.96	534000	156000
1700	**170**	**165.0**	+0.00 −0.72	**4.15**		**7.5**	**2.50**	**4.00**		**160.5**		**198.4**	**192.0**	**13.5**	**12.9**	**4.0**	**169.00**	**550000**	**160000**
1750	175	170.0		4.15		7.5	2.50	4.00		165.5		203.4	197.0	13.5	12.9	4.0	173.70	566000	165000
1800	**180**	**175.0**		**4.15**		**7.5**	**2.50**	**4.00**		**170.5**		**210.0**	**204.0**	**14.2**	**13.5**	**4.0**	**188.00**	**582000**	**170000**
1850	185	180.0		4.15		7.5	2.50	4.00		175.5		215.2	209.0	14.3	13.5	4.0	193.00	598000	174000
1900	190	185.0		4.15		7.5	2.50	4.00		180.5		220.0	214.0	14.2	14.0	4.0	203.00	615000	179000
1950	195	190.0		4.15		7.5	2.50	4.00		185.5		225.0	219.0	14.2	14.0	4.0	209.50	631000	184000
2000	**200**	**195.0**		**4.15**		**7.5**	**2.50**	**4.00**		**190.5**		**230.0**	**224.0**	**14.2**	**14.0**	**4.0**	**214.00**	**647000**	**188000**
2050	205	199.0		5.15		9.0	3.00	5.00		193.0		235.0	228.0	14.2	14.0	4.0	278.00	721000	232000
2100	210	204.0		5.15		9.0	3.00	5.00		198.0	+0.72 −1.70	240.0	233.0	14.2	14.0	4.0	285.00	739000	238000
2200	220	214.0		5.15		9.0	3.00	5.00		208.0		250.0	243.0	14.2	14.0	4.0	298.50	775000	249000
2300	**230**	**224.0**	+0.00 −0.81	**5.15**		**9.0**	**3.00**	**5.00**	+0.00 −0.12	**218.0**		**260.0**	**253.0**	**14.2**	**14.0**	**4.0**	**312.00**	**809000**	**260000**
2400	**240**	**234.0**		**5.15**		**9.0**	**3.00**	**5.00**		**228.0**		**270.0**	**263.0**	**14.2**	**14.0**	**4.0**	**326.00**	**844000**	**271000**
2500	250	244.0		5.15		9.0	3.00	5.00		238.0		280.0	272.0	14.2	14.0	4.0	340.00	880000	283000
2600	260	252.0		5.15		12.0	4.00	5.00		245.0		294.0	285.0	16.2	16.0	5.0	414.00	915000	392000
2700	270	262.0		5.15		12.0	4.00	5.00		255.0		304.0	295.0	16.2	16.0	5.0	430.50	950000	407000
2800	280	272.0	+0.00 −0.89	5.15		12.0	4.00	5.00		265.0	+0.81 −2.00	314.0	305.0	16.2	16.0	5.0	446.50	985000	422000
2900	290	282.0		5.15		12.0	4.00	5.00		275.0		324.0	315.0	16.2	16.0	5.0	463.00	1020000	437000
3000	300	292.0		5.15		12.0	4.00	5.00		285.0		334.0	325.0	16.2	16.0	5.0	479.00	1056000	452000
3100	310	300.0		6.20		15.0	5.00	6.00		293.0		352.2	341.0	20.2	20.0	6.0	710.50	1309000	584000
3200	320	310.0		6.20		15.0	5.00	6.00		303.0		362.2	351.1	20.2	20.0	6.0	734.00	1351000	603000
3300	330	320.0	+0.00 −0.89	6.20	+0.22 −0.00	15.0	5.00	6.00	+0.00 −0.18	313.0	+1.00 −2.50	372.2	361.0	20.2	20.0	6.0	757.00	1393000	622000
3400	340	330.0		6.20		15.0	5.00	6.00		323.0		382.2	371.0	20.2	20.0	6.0	780.00	1436000	641000
3500	350	340.0		6.20		15.0	5.00	6.00		333.0		392.2	381.0	20.2	20.0	6.0	805.00	1478000	660000
3600	360	350.0		6.20		15.0	5.00	6.00		343.0		402.2	391.0	20.2	20.0	6.0	827.00	1520000	679000
3700	370	360.0		6.20		15.0	5.00	6.00		353.0		412.2	401.0	20.2	20.0	6.0	850.00	1562000	697000
3800	380	370.0		6.20		15.0	5.00	6.00		363.0		422.2	411.0	20.2	20.0	6.0	873.00	1604000	716000
3900	390	380.0		6.20		15.0	5.00	6.00		373.0		432.2	421.0	20.2	20.0	6.0	896.00	1646000	735000
4000	400	390.0		6.20		15.0	5.00	6.00		383.0		442.2	431.0	20.2	20.0	6.0	919.00	1689000	754000