DANLY

BALL BEARING GUIDING ELEMENTS

Danly offers the widest range of ball, or linear, guiding elements. These are available as options on all Danly die sets. These elements overcome the lubrication problems associated with precision tooling or high speed press applications by providing almost frictionless action coupled with stability. Ball bearing bushes require much less maintenance. A coating of refined mineral oil (of viscosity 290/340 SSU @ 100°F containing "EP" additives and rust inhibitors), after periodic cleaning will maintain accuracy and life. There are many applications for which Danly ball bearing bushes can move loads freely over a distance. For boring sizes see pages 4/10 and 4/11.

BALL BEARING GUIDE PILLAR

— Made from vacuum degassed alloy steel
— Hardened to RC 60-64
— Smooth, hard-wearing surface assures free rolling of balls
— Incorporates unique mounting of ball cage to give free rotation through 360°, eliminating scoring or tracking of guide pillar surface

STRAIGHT SLEEVE BUSH

— Made from vacuum degassed alloy steel
— Hardened to RC 60-64
— Wring fit, retained with bonding compound to avoid bush close-in
— Completely interchangeable

BALL BEARING CAGE

— Made from heat-treated aluminium alloy with tough, wear-resistant qualities
— Ball bearings made from vacuum degassed fatigue-resistant steel, thoroughly inspected for roundness, smooth finish, and dimensional tolerance
— Spiral pattern of balls to minimise cracking or grooving and assure uniform wear

STRIPPER PLATE CAGE BUSHING

— Designed for use with ball bushed die sets where intermediate/stripper plate is guided on pillars
— Manufactured to the same standards as other Danly ball bearing products

DEMOUNTABLE BALL BEARING PILLARS

— Quickly and easily removed for punch or die regrinds
— No distortion of guide pillar hole or centre distances
— Interchangeable
— Other features as straight ball bearing guide pillar

DEMOUNTABLE GUIDE BUSHES

— Quickly and easily removed for punch or die regrinds
— Assured perpendicularity of bush axis to die surface
— Interchangeable

BA BUSHES

— Supplied with matching ball bearing cage to same standard as above
— For use with 'S' type pillar, or any other Danly ballbearing pillar
— Interchangeable • Maximises die space • Spares available
— Easily removed for punch or die regrinds

HBA RETAINED CAGES

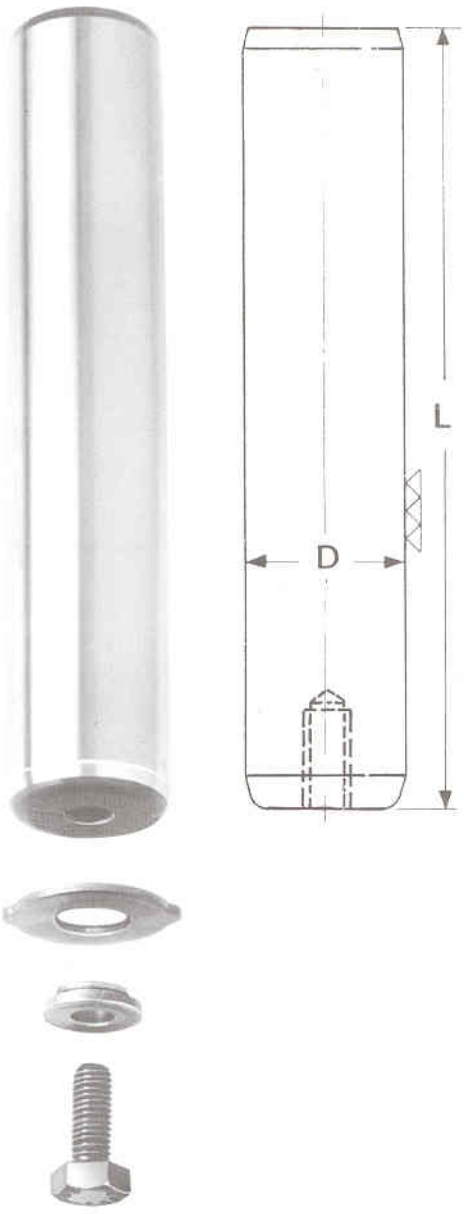
— Permanently retained cage (supplied) suspended from bush in correct position for re-engagement
— Designed for latest generation high speed presses
— Interchangeable, and easily removable. Spares available

BAC BUSHES

— Supplied with matching ball bearing cage to suit customer's stroke
— Slide fit in bored hole, retained with bonding compound to avoid bush close-in
— Interchangeable. Cage and bush available separately

BALL BEARING GUIDE PILLARS

GUIDE PILLAR THREAD SIZES		RECOMMENDED SEATING TORQUE
NOM. DIA. "D"	THREAD SIZE	Kg-M
24-32	M6	0,90
40-50-63-80	M10	4,40



D	18	19	24	25
L	Cat. No.	Cat. No.	Cat. No.	Cat. No.
100	5-1810-82	5-1910-82	5-2410-82	5-2510-82
110	5-1811-82	5-1911-82	5-2411-82	5-2511-82
120	5-1812-82	5-1912-82	5-2412-82	5-2512-82
130	5-1813-82	5-1913-82	5-2413-82	5-2513-82
140	5-1814-82	5-1914-82	5-2414-82	5-2514-82
150	5-1815-82	5-1915-82	5-2415-82	5-2515-82
160	5-1816-82	5-1916-82	5-2416-82	5-2516-82
170	5-1817-82	5-1917-82	5-2417-82	5-2517-82
180	5-1818-82	5-1918-82	5-2418-82	5-2518-82
190	5-1819-82	5-1919-82	5-2419-82	5-2519-82
200	5-1820-82	5-1920-82	5-2420-82	5-2520-82
220			5-2422-82	5-2522-82
240			5-2424-82	5-2524-82
260			5-2426-82	5-2526-82
280			5-2428-82	5-2528-82

D	30	32	40	42
L	Cat. No.	Cat. No.	Cat. No.	Cat. No.
130	5-3013-82	5-3213-82	5-4013-82	5-4213-82
140	5-3014-82	5-3214-82	5-4014-82	5-4214-82
150	5-3015-82	5-3215-82	5-4015-82	5-4215-82
160	5-3016-82	5-3216-82	5-4016-82	5-4216-82
170	5-3017-82	5-3217-82	5-4017-82	5-4217-82
180	5-3018-82	5-3218-82	5-4018-82	5-4218-82
190	5-3019-82	5-3219-82	5-4019-82	5-4219-82
200	5-3020-82	5-3220-82	5-4020-82	5-4220-82
220	5-3022-82	5-3222-82	5-4022-82	5-4222-82
240	5-3024-82	5-3224-82	5-4024-82	5-4224-82
260	5-3026-82	5-3226-82	5-4026-82	5-4226-82
280	5-3028-82	5-3228-82	5-4028-82	5-4228-82
320	5-3032-82	5-3232-82	5-4032-82	5-4232-82
360			5-4036-82	5-4236-82

D	50	52	63	80
L	Cat. No.	Cat. No.	Cat. No.	Cat. No.
160	5-5016-82	5-5216-82		
180	5-5018-82	5-5218-82		
200	5-5020-82	5-5220-82	5-6320-82	
220	5-5022-82	5-5222-82	5-6322-82	
240	5-5024-82	5-5224-82	5-6324-82	5-8024-82
260	5-5026-82	5-5226-82	5-6326-82	5-8026-82
280	5-5028-82	5-5228-82	5-6328-82	5-8028-82
320	5-5032-82	5-5232-82	5-6332-82	5-8032-82
330	5-5033-82	5-5233-82		
360	5-5036-82	5-5236-82	5-6336-82	5-8036-82
400	5-5040-82	5-5240-82	5-6340-82	5-8040-82
450	5-5045-82	5-5245-82	5-6345-82	5-8045-82
500			5-6350-82	5-8050-82

Guide pillars are drilled and tapped at bottom for retention of ball cage by washer/assembly.

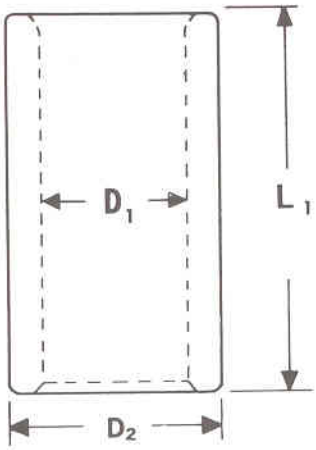
Pillar supplied with screw, bush and washer, for details see page 4/16

ORDERING

State catalogue number from chart above

DANLY

STRAIGHT SLEEVE BALL BEARING BUSHES



NOM. PILLAR DIA. mm	D_1 mm NOM. I. D.	D_2 mm NOM. O. D.	L_1 mm LENGTH	CATALOGUE NUMBER
25	33	45	65	6 - 2506 - 86
			80	6 - 2508 - 86
			95	6 - 2509 - 86
			110	6 - 2511 - 86
			130	6 - 2513 - 86
32	40	54	80	6 - 3208 - 86
			95	6 - 3209 - 86
			110	6 - 3211 - 86
			130	6 - 3213 - 86
			150	6 - 3215 - 86
			170	6 - 3217 - 86
40	48	65	80	6 - 4008 - 86
			95	6 - 4009 - 86
			110	6 - 4011 - 86
			130	6 - 4013 - 86
			150	6 - 4015 - 86
			170	6 - 4017 - 86
			190	6 - 4019 - 86
			215	6 - 4021 - 86
50	62	81	110	6 - 5011 - 86
			130	6 - 5013 - 86
			150	6 - 5015 - 86
			170	6 - 5017 - 86
			190	6 - 5019 - 86
			215	6 - 5021 - 86
			240	6 - 5024 - 86
			265	6 - 5026 - 86
63	75	95	150	6 - 6315 - 86
			170	6 - 6317 - 86
			190	6 - 6319 - 86
			215	6 - 6321 - 86
			240	6 - 6324 - 86
			265	6 - 6326 - 86
80	92	112	150	6 - 8015 - 86
			170	6 - 8017 - 86
			190	6 - 8019 - 86
			215	6 - 8021 - 86
			240	6 - 8024 - 86
			265	6 - 8026 - 86

INSTALLATION INSTRUCTIONS

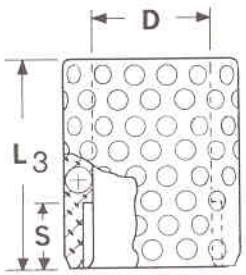
In order to avoid bush close-in which occurs as a result of a press fit, these bushes are manufactured to a sliding fit (see boring chart page 4/1 C and must be retained with a bonding compound. Prior to bonding, all surfaces must be thoroughly degreased and wiped dry. When so installed it is not necessary to hone the bush bore and the fit will be correct.

We recommend that parallels are placed between the inner faces of the die set to ensure correct alignment whilst the bonding compound sets. Please contact our sales office if you require further information.

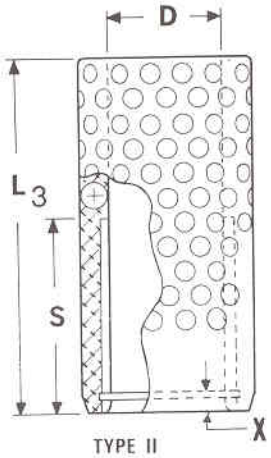
ORDERING

State catalogue number from chart above

BALL BEARING CAGES



TYPE I
For Type I
Ball Bearing Bush
Assembly



TYPE II
For Types II and III
Ball Bearing Bush
Assemblies

NOM. PILLAR DIA.	TYPE I				TYPE II		
D mm	L_3 mm	S mm	CATALOGUE NUMBER	L_3 mm	S mm	X mm	CATALOGUE NUMBER
25	36	11,5	6-2503-81				
	48	17,5	6-2504-81				
				55	31		6-2505-82
				70	40		6-2507-82
				90	47	4,2	6-2509-82
				100	55		6-2510-82
				110	65		6-2511-82
32	36	11,5	6-3203-81				
	48	17,5	6-3204-81				
				70	40		6-3207-82
				90	47		6-3209-82
				105	55	4,2	6-3210-82
				115	65		6-3211-82
				125	75		6-3212-82
				135	85		6-3213-82
40	48	17,5	6-4004-81				
	60	23,5	6-4006-81				
				70	40		6-4007-82
				85	48		6-4008-82
				105	56	5,8	6-4010-82
				115	66		6-4011-82
				125	76		6-4012-82
				135	86		6-4013-82
				145	96		6-4014-82
				155	106		6-4015-82
50	70	28,5	6-5007-81				
	84	35,5	6-5008-81				
				105	56		6-5010-82
				120	65		6-5012-82
				140	76		6-5014-82
				150	86		6-5015-82
				160	96	7,0	6-5016-82
				170	106		6-5017-82
				185	121		6-5018-82
				195	133		6-5019-82
63	98	42,5	6-6309-81				
				145	76		6-6314-82
				165	86		6-6316-82
				180	96	7,0	6-6318-82
				190	106		6-6319-82
				205	121		6-6320-82
				215	131		6-6321-82
80	98	42,5	6-8009-81				
				145	76		6-8014-82
				165	86		6-8016-82
				180	96	8,5	6-8018-82
				190	106		6-8019-82
				205	121		6-8020-82
				215	132		6-8021-82

MISCELLANEOUS COMPONENT PARTS

NOM. PILLAR DIA. mm	 STOP WASHER-RETAINER		 BUSH-STOP WASHER	 SCREW-HEX, HEAD CAP	 SNAP RING-BALL BEARING CAGES	PACKAGE, ONE EACH: STOP WASHER-RETAINER SCREW-HEX, HEAD CAP	PACKAGE, ONE EACH: STOP WASHER-RETAINER BUSH-STOP WASHER SCREW-HEX, HEAD CAP SNAP RING
	USED WITH ASSEMBLY TYPE						
	I	II AND III	II AND III	I-II AND III	II AND III	I	
25	6 - 2500 - 85	6 - 2500 - 83	6 - 2500 - 84	6 - 0620 - 933 { M6 x 16 DIN 933 8G OR 10K }	6 - 2500 - 86	6 - 0025 - 81	6 - 0025 - 82
32	6 - 3200 - 85	6 - 3200 - 83			6 - 3200 - 86	6 - 0032 - 81	6 - 0032 - 82
40	6 - 4000 - 85	6 - 4000 - 83	6 - 4000 - 84	6 - 1025 - 933 { M10 x 25 DIN 933 8G OR 10K }	6 - 4000 - 86	6 - 0040 - 81	6 - 0040 - 82
50	6 - 5000 - 85	6 - 5000 - 83			6 - 5000 - 86	6 - 0050 - 81	6 - 0050 - 82
63	6 - 6300 - 85	6 - 6300 - 83			6 - 6300 - 86	6 - 0063 - 81	6 - 0063 - 82
80	6 - 8000 - 85	6 - 8000 - 83			6 - 8000 - 86	6 - 0080 - 81	6 - 0080 - 82

Ball cages are mounted to drilled and tapped guide pillars by a special washer assembly which permits cage to rotate freely around guide pillar, when not under pre-load.

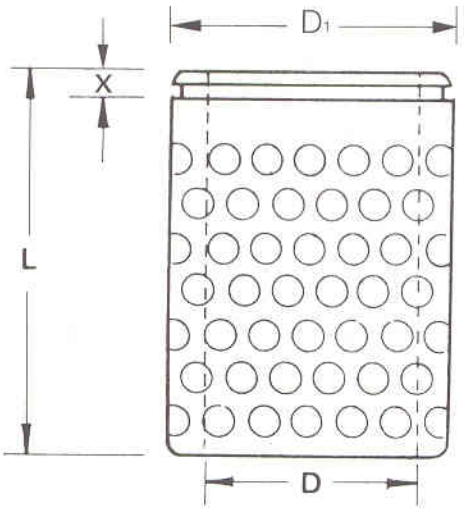
Cage supplied with snap ring.

ORDERING

State catalogue number from chart above

DANLY

BRASS BALL BEARING CAGES

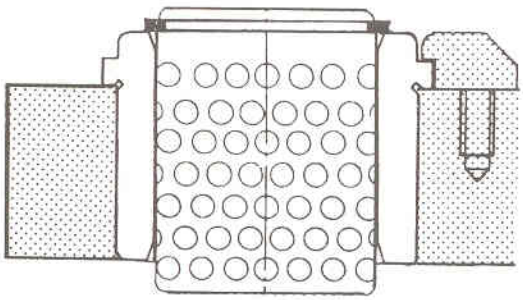


A circlip is provided with each ball cage

D mm	D_1 mm	X mm	L mm	CATALOGUE NUMBER
32	40	4	43	6-3204-84
			48	6-3205-84
			88	6-3209-84
			105	6-3210-84
40	48	4	48	6-4005-84
			60	6-4006-84
			82	6-4008-84
			105	6-4010-84
			117	6-4012-84
			139	6-4014-84
50	62	4	58	6-5006-84
			106	6-5011-84
			122	6-5012-84
			130	6-5013-84
			146	6-5015-84
			170	6-5017-84
63	75	5	147	6-6315-84
			171	6-6317-84
			187	6-6319-84

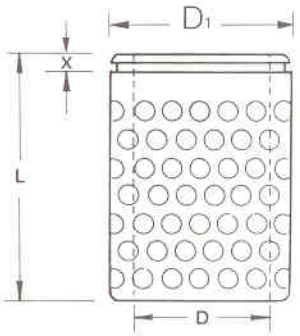
DANLY

DEMOUNTABLE BALL BEARING GUIDING FOR STRIPPER PLATES



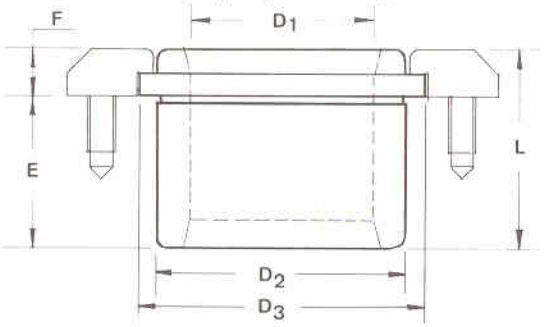
ASSEMBLY OF BUSH AND CAGE

A circlip is furnished with each ball cage

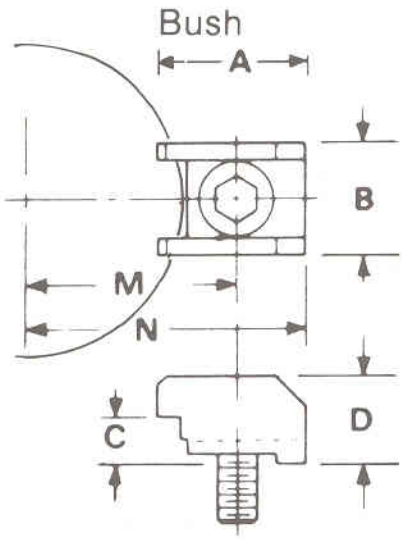


D mm	D_1 mm	X mm	L mm	CATALOGUE NUMBER
25	33	4	40 52	6-2504-83 6-2505-83
32	40	4	40 52	6-3204-83 6-3205-83
40	48	4	52 64	6-4005-83 6-4006-83
50	62	4	74 88	6-5007-83 6-5008-83
63	75	5	98	6-6309-83

Stripper plate bushing



D mm	D_1 mm	D_2 mm	D_3 mm	E mm	F mm	L mm	CATALOGUE NUMBER
25	33	45	51	20 25	10	30 35	6-2520-87 6-2525-87
32	40	54	60	20 25 32	10	30 35 42	6-3220-87 6-3225-87 6-3232-87
40	48	65	75	29 36 44	10	39 46 54	6-4029-87 6-4036-87 6-4044-87
50	62	81	91	36 44	10	46 54	6-5036-87 6-5044-87
63	75	95	105	50	10	60	6-6350-87

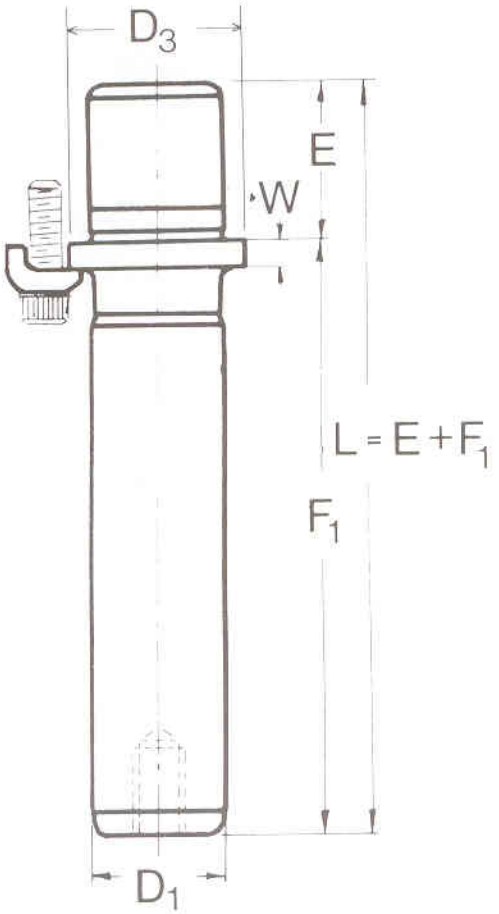


BUSH CLAMP DATA

Pillar Dia	Clamps per Bush	Screw	Clamp number	A mm	B mm	C mm	D mm	M mm	N mm
25	3	M6	6-96-1	17,5	14,5	5	10	32,5	39,5
32	3	M6	6-96-1	17,5	14,5	5	10	37	44
40	4	M6	6-96-1	17,5	14,5	5	10	44,5	51,5
50	4	M6	6-96-1	17,5	14,5	5	10	52,5	59,5
63	4	M6	6-96-1	17,5	14,5	5	10	59,5	66,5

NOTE: Necessary clamps and screws are included in the price of bushes.

BALL BEARING DEMOUNTABLE GUIDE PILLARS



D1	18	19	24	25	30	32
D3	25.6	25.6	32.6	32.6	40.6	40.6
W	5	5	5	5	6.5	6.5
E	20	20	24	24	30	30
F1	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
70	5-1807-83	5-1907-83	5-2407-83	5-2507-83		
80	5-1808-83	5-1908-83	5-2408-83	5-2508-83		
90	5-1809-83	5-1909-83	5-2409-83	5-2509-83	5-3009-83	5-3209-83
100	5-1810-83	5-1910-83	5-2410-83	5-2510-83	5-3010-83	5-3210-83
110	5-1811-83	5-1911-83	5-2411-83	5-2511-83	5-3011-83	5-3211-83
120	5-1812-83	5-1912-83	5-2412-83	5-2512-83	5-3012-83	5-3212-83
130	5-1813-83	5-1913-83	5-2413-83	5-2513-83	5-3013-83	5-3213-83
140	5-1814-83	5-1914-83	5-2414-83	5-2514-83	5-3014-83	5-3214-83
150	5-1815-83	5-1915-83	5-2415-83	5-2515-83	5-3015-83	5-3215-83
160	5-1816-83	5-1916-83	5-2416-83	5-2516-83	5-3016-83	5-3216-83
170			5-2417-83	5-2517-83	5-3017-83	5-3217-83
180			5-2418-83	5-2518-83	5-3018-83	5-3218-83
200			5-2420-83	5-2520-83	5-3020-83	5-3220-83
220					5-3022-83	5-3222-83
240					5-3024-83	5-3224-83
280					5-3028-83	5-3228-83

D1	40	42	50	52	63	80
D3	50.8	50.8	63.8	63.8	76	93
W	6.5	6.5	6.5	6.5	6.5	6.5
E	37	37	45	45	49	60
F1	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
100	5-4010-83	5-4210-83				
110	5-4011-83	5-4211-83	5-5011-83	5-5211-83		
120	5-4012-83	5-4212-83	5-5012-83	5-5212-83	5-6312-83	
130	5-4013-83	5-4213-83	5-5013-83	5-5213-83		
140	5-4014-83	5-4214-83	5-5014-83	5-5214-83	5-6314-83	
150	5-4015-83	5-4215-83	5-5015-83	5-5215-83		
160	5-4016-83	5-4216-83	5-5016-83	5-5216-83	5-6316-83	
170	5-4017-83	5-4217-83	5-5017-83	5-5217-83		
180	5-4018-83	5-4218-83	5-5018-83	5-5218-83	5-6318-83	5-8018-83
200	5-4020-83	5-4220-83	5-5020-83	5-5220-83	5-6320-83	5-8020-83
220	5-4022-83	5-4222-83	5-5022-83	5-5222-83	5-6322-83	5-8022-83
240	5-4024-83	5-4224-83	5-5024-83	5-5224-83	5-6324-83	5-8024-83
260			5-5026-83	5-5226-83		
280	5-4028-83	5-4228-83	5-5028-83	5-5228-83	5-6328-83	5-8028-83
320			5-5032-83	5-5232-83	5-6332-83	5-8032-83
360			5-5036-83	5-5236-83	5-6336-83	5-8036-83
400			5-5040-83	5-5240-83	5-6340-83	5-8040-83

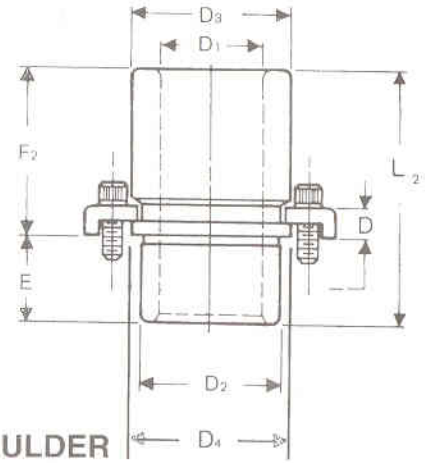
GUIDE PILLAR THREAD SIZES	
NOM DIA "D"	THREAD SIZE
24-32	M6
40-80	M10

Quickly and easily removed for die regrind. No distortion of guide pillar hole. Interchangeable. Clamps and screws supplied with each pillar. Guide pillars are drilled and tapped at bottom for mounting of ball cage by washer/assembly. Refer to page 4/12 for clamp data.
Pillar supplied with screw, bush and washer, see page 4/16

ORDERING
State catalogue number from chart above

DANLY

BALL BEARING DEMOUNTABLE GUIDE BUSHES



LONG SHOULDER

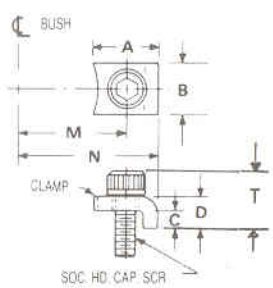
NOM POST DIA D	D_1 mm	D_2 mm	D_3 mm	D_4 mm	E mm	F_2 mm	L_2 mm	CATALOGUE NUMBER
25	33	45	50	54	30	35	65	6-2503-85
						50	80	6-2505-85
						65	95	6-2506-85
32	40	54	60	63	30	50	80	6-3205-85
						65	95	6-3206-85
						80	110	6-3208-85
40	48	65	73	75	30	50	80	6-4005-85
						65	95	6-4006-85
						80	110	6-4008-85
						100	130	6-4010-85
50	62	81	91	91	50	60	110	6-5006-85
						80	130	6-5008-85
						100	150	6-5010-85
						120	170	6-5012-85
63	75	95	105	105	50	100	150	6-6310-85
						120	170	6-6312-85
						140	190	6-6314-85

SHORT SHOULDER

32	40	54	60	63	50	15	65	6-3201-85
40	48	65	73	75	60	15	75	6-4001-85
50	62	81	85	91	80	20	100	6-5002-85
63	75	95	99	105	90	20	110	6-6302-85

CLAMP DATA

NOMINAL DIAM.	RADIUS		SIZE				CLAMP No.	PER UNIT	SCREW SIZE	T
	M	N	A	B	C	D				
25	32,5	43	19.8	15.9	6.5	11.4	6-93-1	3	M8 X 20	19.4
32	37	47								
40	43,5	54						4		
50	52,5	63								
63	59,5	70								



For recommended hole sizes, see boring chart on page 4/10

ORDERING

State catalogue number from chart above

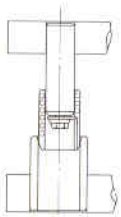
SELECTION CHARTS DATA — BALL CAGES

To meet the varied performance characteristics required for different applications and stroke requirements of ball bearing die sets, Danly has designed and manufactured three types of Ball Bearing Bush Assemblies. Selection of the proper type is important to assure the most effective and economical performance in a specific application.

TYPE I PRE-LOADED — Type I is recommended for use with high production, long-life dies. With this type of Ball Bearing Bush Assembly, all of the balls remain in contact with the pillar and bush in pre-loaded conditions throughout the press stroke. Dimensional data for this type is shown on pages 4/20 and 4/21.

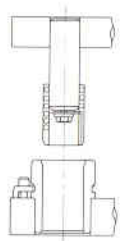
TYPE I

TYPE II RELIEVING — Type II Ball Bearing Bush Assembly is recommended when it is desirable that the ball cage does not leave the bush at any time. This design provides safe operation, eliminates the pinch point, prevents foreign materials from falling into the bush and repositions ball cage with each stroke. Dimensional data for this type of assembly begins on page 4/22



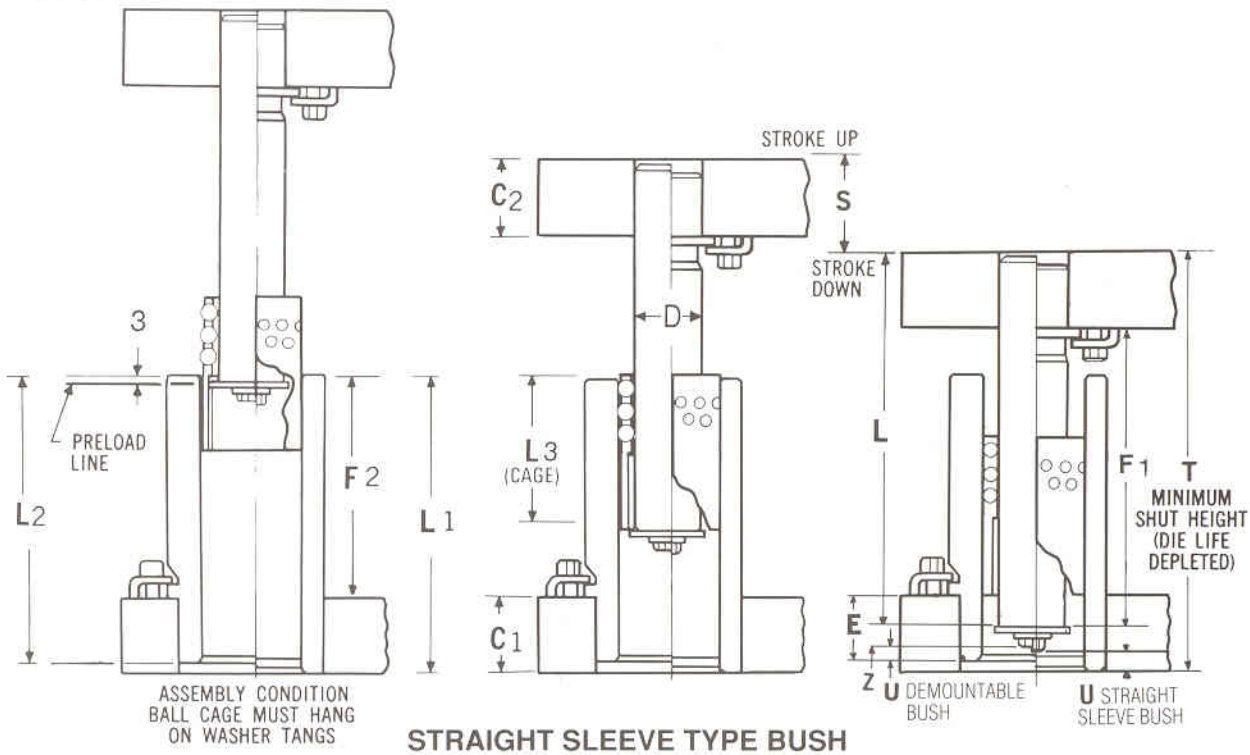
TYPE II

TYPE III DISENGAGING — Type III can be used in applications where the ball cage can be permitted to leave the bush with each stroke. This type offers the most economy, since it uses the shortest bushes and ball cages possible for general applications which require long strokes. Dimensional data for this type of assembly begins on page 4/22.



TYPE III

TYPE I



STRAIGHT SLEEVE TYPE BUSH

NOTE: If calculated guide pillar length is not listed on page 4/14 or 4/18

1. Select next longer length and cut off to required length (straight pillar only) or:
2. Select shorter length and recess pillar in punch holder to obtain correct **L** or F_1 dimension.

Press fit length should always be equal to or greater than the diameter of the guide pillar, if possible.

NOTE: On Type I Assemblies, a die set designed for a particular stroke may be used in any press of lesser stroke, but never in any press where the stroke is greater than originally chosen.

***Caution:** Be sure bush does not strike punch holder (or in the case of demountable pillars, the clamps retaining the pillars) at minimum shutheight. If this condition exists, use shorter bush and corresponding ball cage.

DANLY

SELECTION CHART TYPE 1

NOM PILLAR	DEMOUNTABLE BUSH			STRAIGHT SLEEVE BUSH	BALL CAGE LENGTH	STROKE "S" AT MAXIMUM SHUTHEIGHT (NEW DIES)	MAXIMUM DIE WEAR ALLOWANCE		
D	F_2	E	L_2	L_1 mm	L_3 mm	20 40 60 80 100 120 140 160	X mm	U mm	Z mm
25	35	30	65	65	36	If your selection falls in a White Square, use Type II or Type III (Pages 4/22 & 4/23)	10	3	7
	50	30	80	80					
	65	30	95	95					
				110	48				
				130					
32	50	30	80	80	36		10	3	7
	65	30	95	95					
	80	30	110	110					
				130					
				150	48				
				170					
40	50	30	80	80	48		10	3	9,5
	65	30	95	95					
	80	30	110	110					
	100	30	130	130					
				150					
				170					
				190	60				
				215					
50	60	50	110	110	70		10	3	9,5
	80	50	130	130					
	100	50	150	150					
	120	50	170	170					
				190					
				215					
				240	84				
				265					
63	100	50	150	150	98		15	3	9,5
	120	50	170	170					
	140	50	190	190					
				215					
				240					
				265					
80				150	98		15	3	9,5
				170					
				190					
				215					
				240					
				265					

INSTRUCTIONS FOR USING CHART: Selection of a Type I Ball Bearing Bush Assembly is based on the required stroke and the guide pillar diameter. With these two factors established, refer to the Selection Chart:

1. Under the heading Stroke 'S', find the column for the desired stroke.
2. Move down this column to coloured square on horizontal line opposite required pillar diameter.
3. For required bush length, move to left from coloured square on horizontal line to Bush Length column. (See "Caution" Note and formula on Page 4/20 regarding minimum shutheight.)
4. Select cage length from ball cage column. Select length shown within coloured area matching the coloured square in which stroke and bush length selections intersect. Increased life is provided when longest cage length is selected, shutheight permitting.

Data for finding guide pillar length shown on Page 4/20. For ordering information see Page 4/14 through 4/19.

SELECTION CHART DATA — TYPES II & III

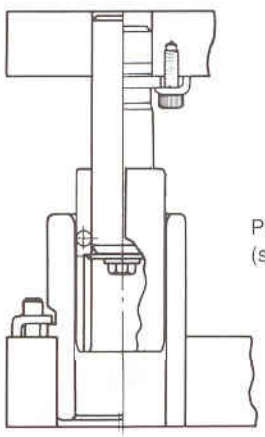
TYPE II — Fig. A — for applications where ball cage remains under partial pre-load.

Fig. B — for applications where ball cage relieves pre-load, but does not disengage from bush.

TYPE III — Fig. C — for applications where ball cage can leave bush with each stroke.

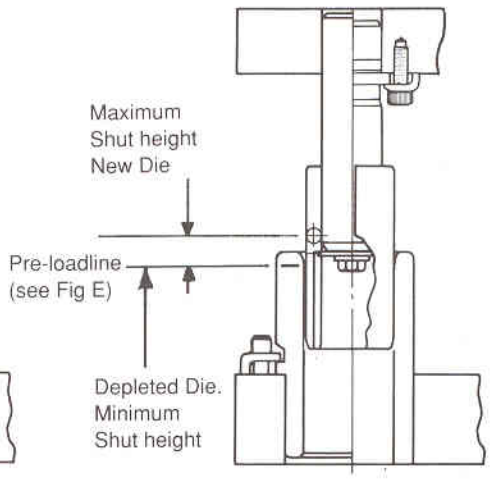
Type II and III components provide Type I operating condition

FIG. A.



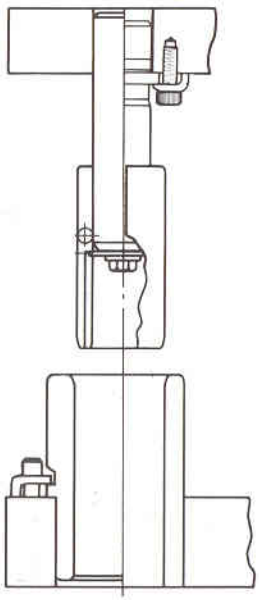
Partial Pre-load

FIG. B.



Pre-load relieved

FIG. C.



Unlimited stroke – cage leaves bush.

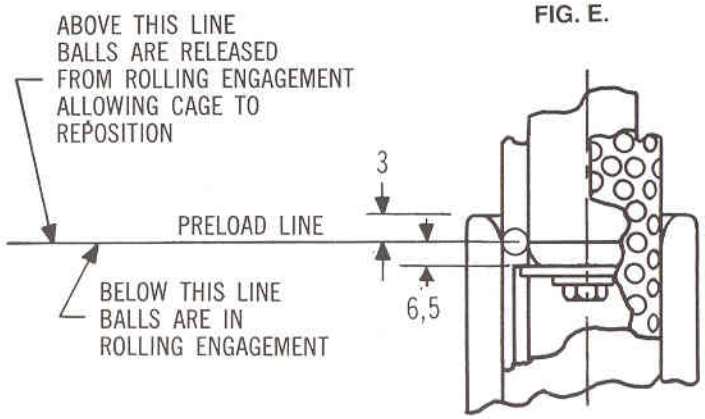
PILLAR DIA. D	U	Z
25	3,5	10,5
32	3,5	10,5
40	4	13
50	4	13
63	4	13
80	4	13

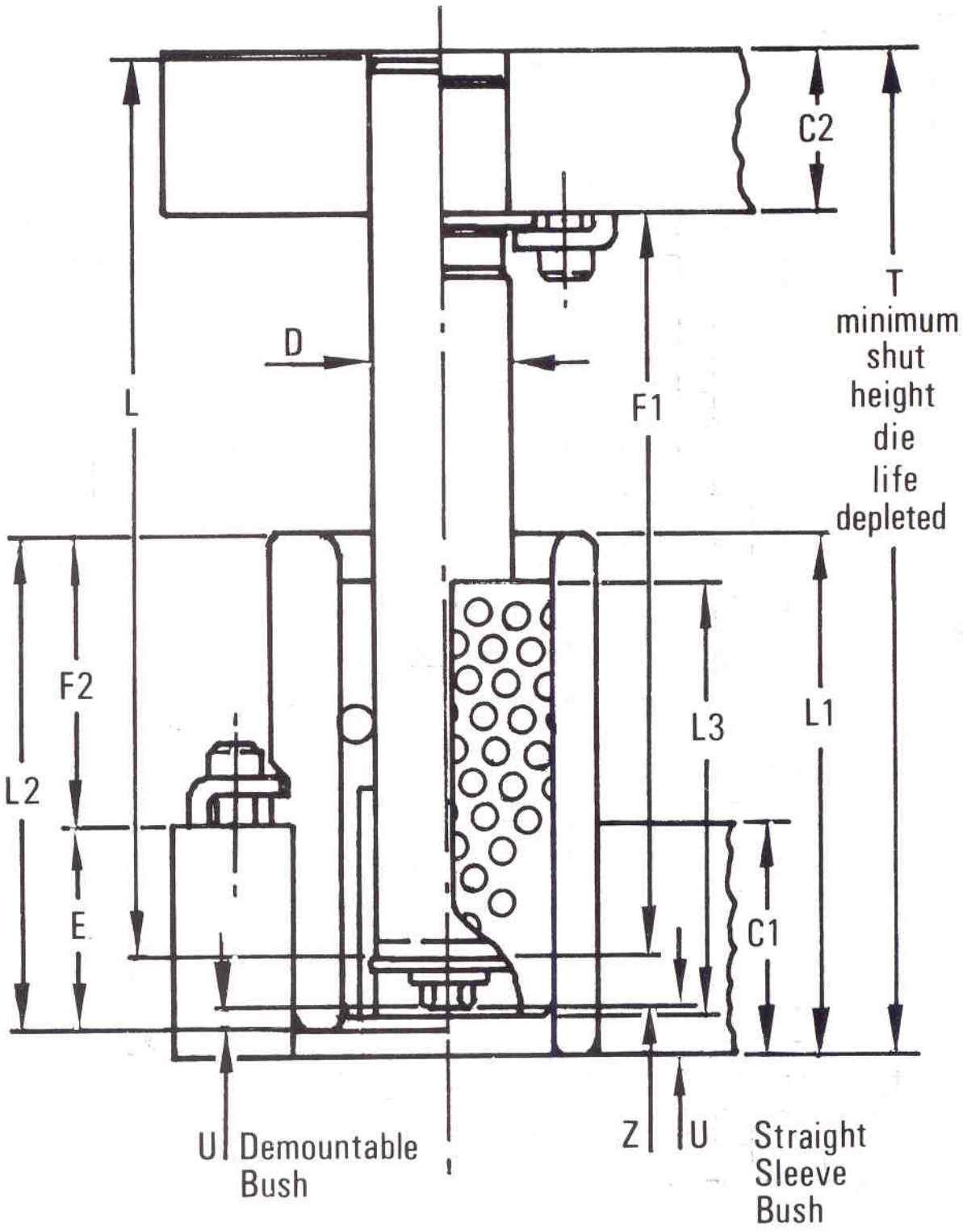
NOTE: If calculated guide pillar length is not listed on page 4/14

1. Select next longer length and specify "guide pillar to be cut off to required length," or:
2. Select shorter length and specify "pillar to be recessed in punch holder to obtain correct **L** dimension."

Press fit length should always be equal to or greater than the diameter of the guide pillar, if possible.

FIG. E.




C2
T
minimum
shut
height
die
life
depleted
D
L
F1
F2
L2
E
L3
L1
C1
U
Demountable
Bush
Z
U
Straight
Sleeve
Bush

SELECTION CHART TYPES II & III

INSTRUCTIONS FOR USING TYPE II AND TYPE III SELECTION CHART

To select a Type II or a Type III Ball Bearing Bush Assembly, first determine the desired stroke and the required guide pillar diameter. Then the desired operating condition, or the extent to which the cage leaves the bush, must be selected.

Once these three factors — stroke, guide pillar and operating condition are established, refer to the Selection Chart on this page. First find the column headed by the desired stroke "S". Moving down this column, opposite the required guide pillar diameter, find the colour square of the desired operating condition (Light Red for the condition shown in Figure A; Dark Red for the condition shown in Figure B; White for the condition shown in Figure C).

Selection of the longest bush-cage combination shutheight permitting, will provide increased life.

Once the square has been determined, follow the horizontal line to the left for selection of the bush and ball cage lengths.

Pillar Selection

Straight pillar with straight sleeve bush:
Overall length (L) = T-U-Z

Straight pillar with demountable bush:
Overall length (L) = $T-C_1+E-U-Z$

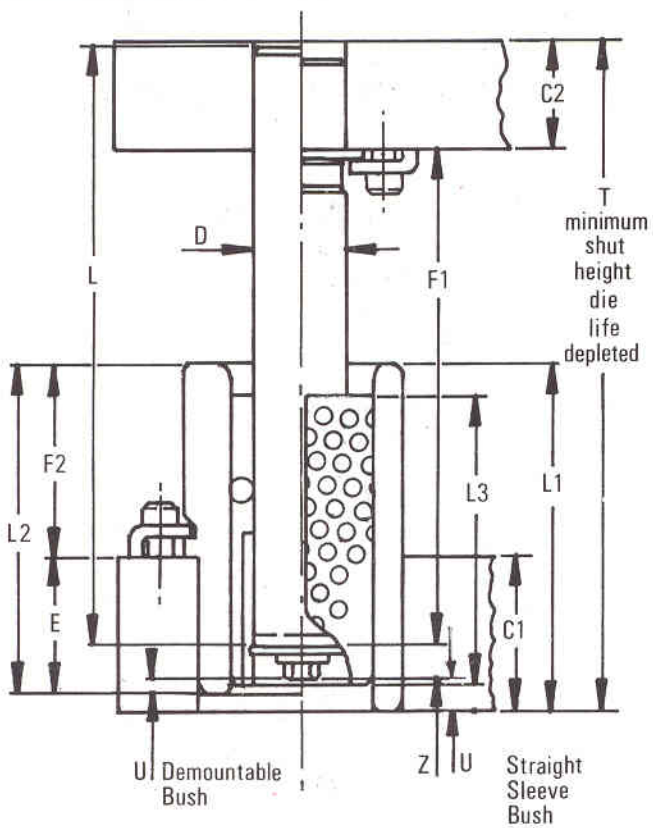
Demountable pillar with straight sleeve bush:
Protruding length (F_1) = $T-C_2-U-Z$

Demountable pillar with demountable bush:
Protruding length = $T-C_1-C_2+E-U-Z$

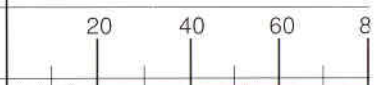
When all elements have been selected, refer back to pages giving full dimensions and catalogue numbers of these assembly components.

Caution

When choosing demountable pillars, care should be taken to ensure the retaining clamp/screws do not strike the top of the bushes at minimum daylight.



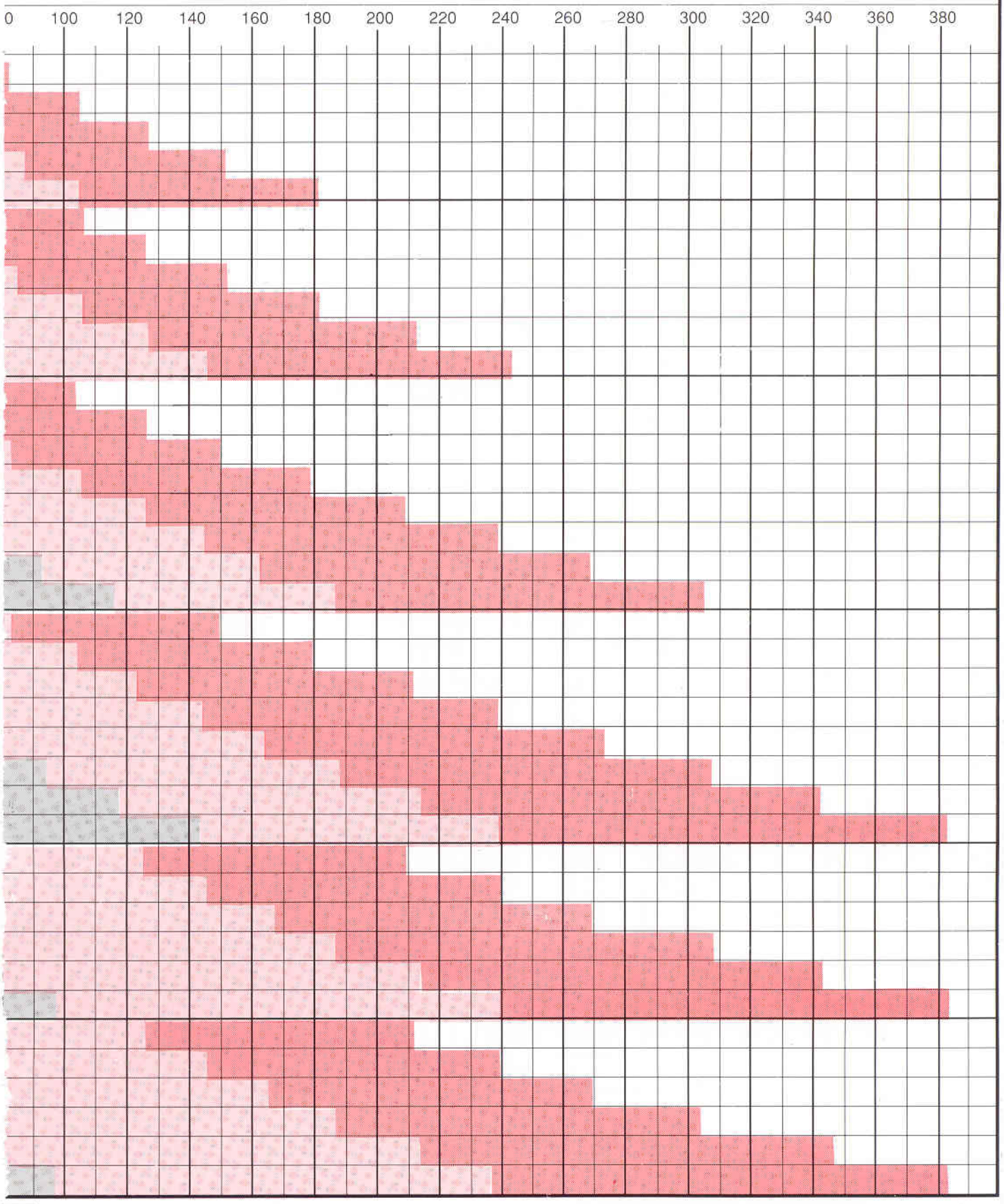
NOM PILLAR DIA.	DEMOUNTABLE BUSH			STRAIGHT SLEEVE BUSH	BALL CAGE LENGTH
D	F_2	E	L_2	L_1	L_3
25	35	30	65	65	55
	50	30	80	80	70
	65	30	95	95	90
				110	100
				130	110
32	50	30	80	80	70
	65	30	95	95	90
	80	30	110	110	105
				130	115
				150	125
				170	135
40	50	30	80	80	70
	65	30	95	95	85
	80	30	110	110	105
	100	30	130	130	115
				150	125
				170	135
				190	145
				215	155
50	60	50	110	110	105
	80	50	130	130	120
	100	50	150	150	140
	120	50	170	170	150
				190	160
				215	170
				240	185
				265	195
63	100	50	150	150	145
	120	50	170	170	165
	140	50	190	190	180
				215	190
				240	205
				265	215
80				150	145
				170	165
				190	180
				215	190
				240	205
				265	215



Caution: Be sure bush does not strike punch holder (or in the ca of demountable pillars, the clamps retaining the pillars) at minimu shutheight and if this condition exists, use shorter bush a corresponding ball cage.

STROKE "S" AT MINIMUM SHUTHEIGHT (DIE LIFE DEPLETED)

mm



se
ım
nd

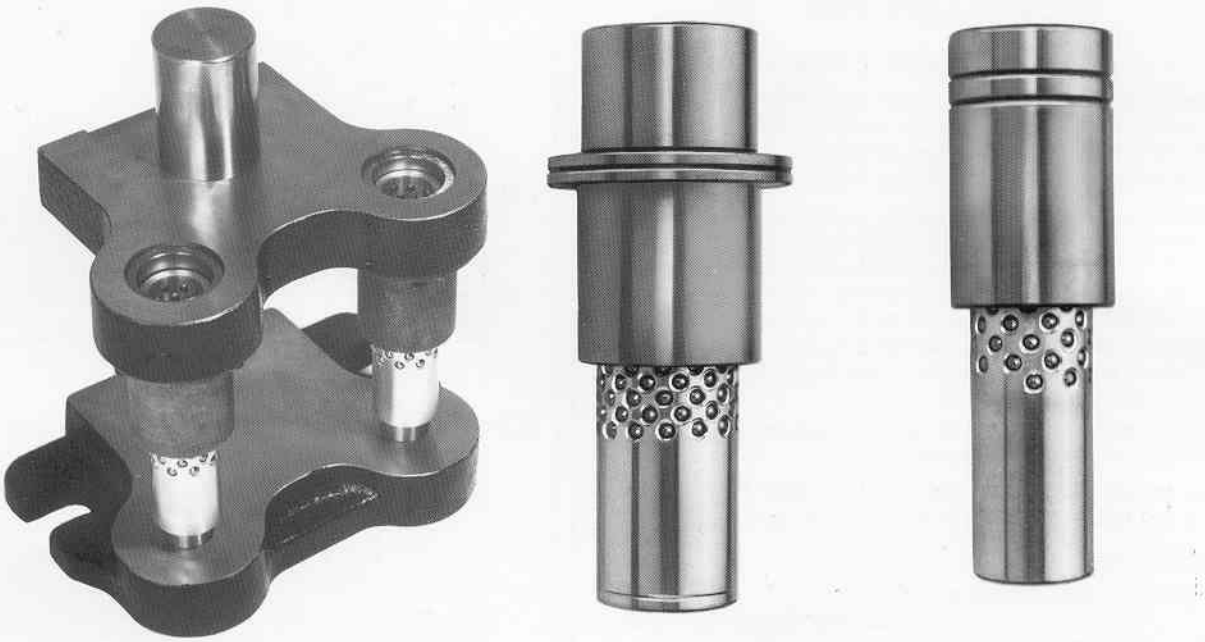
TYPE I CONDITION

TYPE II FIG. B

TYPE II FIG. A

TYPE III FIG. C

BALL BEARING BUSHES



Precision tooling frequently requires that the clearance between pillars and bushes is reduced to the minimum, but this creates the problem of adequate lubrication if plain bushes are used.

This problem can be overcome by the use of Danly ball bearing bushes which were developed principally for use in precision die sets. The very close pattern of heavy duty balls, pre-loaded on assembly, permits almost frictionless action coupled with stablilty. The freedom of movement also simplifies the accurate setting of punches and dies.

Two types of bushes are available. The flanged bush is intended to be a push fit into a bored hole in the plate and is retained by three screws. The plain bush is being retained in position with a sealing compound.

Light alloy ball cages are used to carry the balls which are retained in their housing by a patented spinning process which prevents distortion of the housings. The close helical pattern of the balls gives a very smooth axial movement and as the balls are in contact between the pillar and the full length of the bush at the bottom of the stroke, maximum stability is obtained.

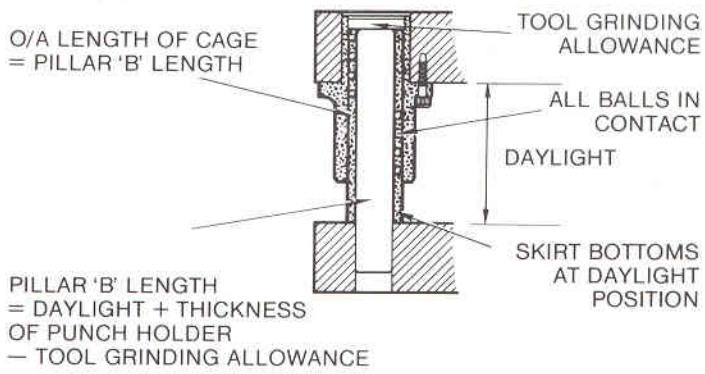
The ball cage type BC has an extended skirt which must be machined as necessary to make the overall length of the ball cage the same as that of the projecting length of the pillar. This ensures that at the bottom of the stroke the cage is prevented from creeping. In the event of the projecting length of the pillar exceeding that of the longest standard ball cage, short lengths of tubing can be supplied to increase the effective length of the ball cage. PM length on cage should equal overall bush length.

The maximum permissible stroke is limited by the amount of overlap between the bottom of the bush and the top of the pillar. This must not be less than 20mm or three rows of balls, to ensure that the ball is trapped between the pillar and bush at the top of the stroke. A longer stroke can be obtained by fitting longer pillars and ball cages, but care must be taken to ensure that these do not foul the ram of the press at the bottom of the stroke.

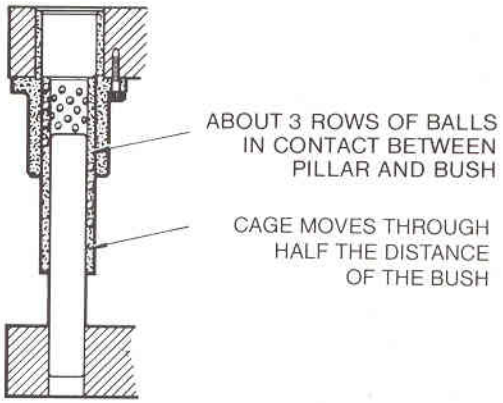
The ball cages fitted to bearings type HBA are permanently retained in the bushes. In the vertical plane the cage is suspended from the bush in the correct position for engagement with the guide pillar.

There are many applications for which Danly ball bearing bushes have proved invaluable, involving moving loads freely over a distance, or movements involving both linear and rotary motion. For these, the bushes are fully supported by balls at all positions of the load.

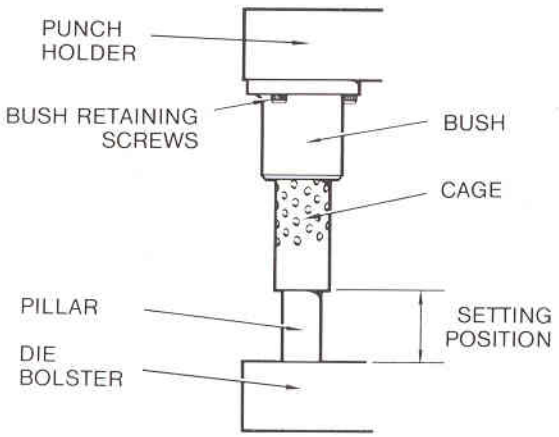
ASSEMBLY AT BOTTOM OF STROKE



ASSEMBLY AT TOP OF STROKE



PLACING TOP IN POSITION



In operation, the ball cage moves through half the distance that the bush moves relative to the pillar and the bush is fully supported at one position only, normally at the bottom of the stroke. To move a load, fully supported, through a distance, the ball cage must project from the bush by half the distance to be moved.

There is no advantage to be gained from varying the pre-loading of the balls. Increasing this pre-load will cause harshness in movement and possibly cause tracking. Decreasing the pre-load may cause the cage to skid.

Ball bearing bushes require the minimum of maintenance and, provided that the balls are lubricated initially, with a coating of refined mineral oil (of viscosity 290/340 SSU @ 100°F containing "EP" additives and rust inhibitors), after periodic cleaning will maintain accuracy and life.

The setting position of the ball cages when assembling a die set can be calculated by using the following formula:—

$$\text{S. m.m.} = \frac{(P + L) - (G + 3)}{2}$$

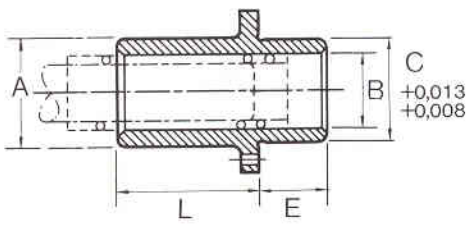
where P = the thickness of the punch holder
L = the projecting length of the bush
G = the grinding allowance

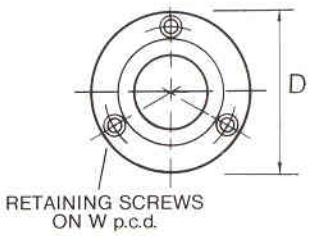
WARNING: **ALWAYS ENSURE THAT THE TOP IS FIXED BEFORE HANDLING A DIE SET FITTED WITH BALL BEARING BUSHES.**

DO NOT EXCEED THE MAXIMUM STROKE AS STATED ON PAGES 5/14, 5/15 AND 5/16 UNLESS PILLARS ARE PROJECTING

BA BALL BEARING BUSHES

DANLY





FLANGED TYPES

USED WITH PILLAR DIA.	Part No. OF BUSH AND BALL CAGE ASSY.	A	B	C	D	E	L1	L2	L3	L4	L5	RE-TAINING SCREWS	W P.C.D.	BALL DIA.	MAX. STROKE SHORT BUSH	MAX. STROKE LONG BUSH	BUSH PART No.	BALL CAGE PART No.
16	BA 16	35.5	24	32	53	21	32	45	60			M4	44	4	34	62	BB 16	BC 16
19	BA 19	38.5	27	36	57	24	32	45	60			M4	48	4	37	65	BB 19	BC 19
25	BA 25	45.0	33	42	60	27	32	45	60	70		M4	53	4	43	81	BB 25	BC 25
32	BA 32	54.0	42	52	73	37		45	60	70		M5	64	5	63	88	BB 32	BC 32
40	BA 40	63.5	50	63	85	37		45	60	70		M5	76	5	69	94	BB 40	BC 40
50	BA 50	82.0	60	73	106	43				70	90	M6	94	5	94	114	BB 50	BC 50

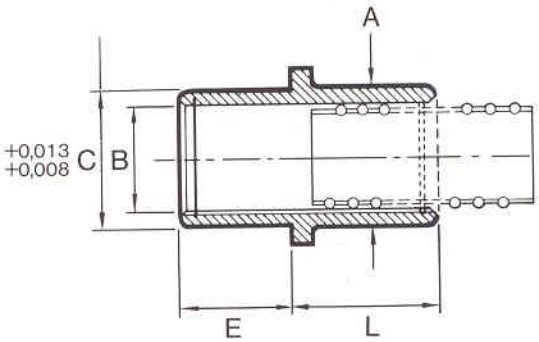
The maximum permissible stroke has been calculated for a condition where the plate thickness is 1,5mm thicker than dimension 'E'. When thicker plates are used longer guide pins can be fitted and the stroke increased by the amount of the increased thickness over dimension 'E'.

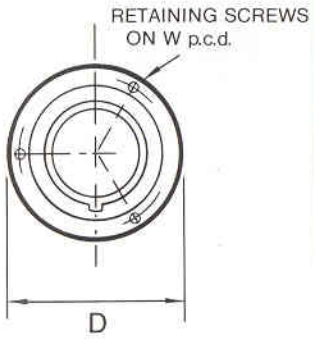
ORDERING:

State part number and length, e.g. BA16/L2. Note that BA denotes an assembly including Bush and Cage, these are available separately, BB = Bush, BC = Cage.
See righthand columns above.

DANLY

BALL BEARING BUSHES WITH RETAINED CAGES HBA





FLANGED TYPES (BUSH AND CAGE ASSEMBLIES)

USED WITH PILLAR DIA.	PART No. OF BUSH AND BALL CAGE ASSEMBLY	A	B	C	D	E	L2	L4	RETAINING SCREWS	W PCD	BALL DIA.	MAX. STROKE
16	HBA 16	35.5	24	32	53	21	45		M4	44	4	52
19	HBA 19	38.5	27	36	57	24	45		M4	48	4	54
25	HBA 25	45.0	33	42	60	27	45		M4	53	4	60
32	HBA 32	54.0	42	52	73	37	45		M5	64	5	67
40	HBA 40	63.5	50	63	85	43	45	70	M5	76	5	73
50	HBA 50	82.0	60	73	106	43		70	M6	94	5	100
52	HBA 52	82.0	62	73	106	43		70	M6	94	5	100

HBA Ball Bearing Bushes with retained cages are suited to precision presswork where the punch holder may occasionally lift off the base in operation. Danly accuracy in die set manufacture ensures the repeated safe re-alignment of the die set in the down stroke. Applications in this area include the latest generation of high speed presses.

ORDERING:

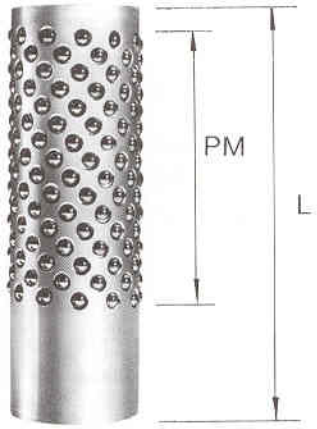
State part number and length, e.g. HBA16/L2.
Spares are available — consult Danly Sales Office.

Cages and circlips available as spares.

BAC BALL BEARING BUSHES

DANLY

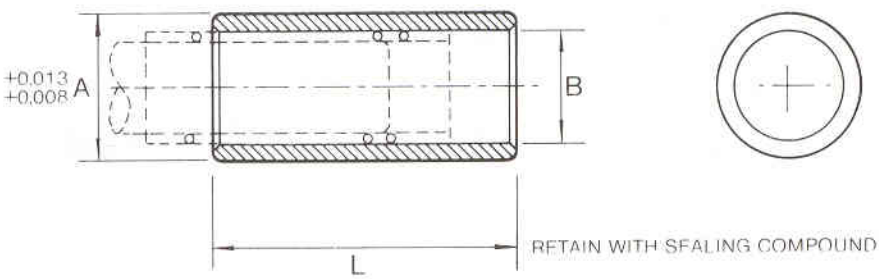
STANDARD BALL CAGES



L	80		100	140		175		
PART No.	PM1	PM2	PM3	PM4	PM6	PM7	PM8	PM9
BC 16	50	60	70	75				
BC 18	50	60	70	75				
BC 19	50	60	70	75				
BC 24	50	60	70	75	90			
BC 25	50	60	70	75	90	100		
BC 30				75	90	100		
BC 32				75	90	100		
BC 40				75	90	100	110	
BC 42				75	90	100	110	
BC 50					90	100	110	130
BC 52					90	100	110	130

It is not necessary to specify ball cage details when ordering die sets, but orders for spare parts must quote the Part No. and 'PM' length, e.g. BC25/PM4.

These sizes are no longer fitted to our shaped die sets.



PLAIN TYPES

USED WITH PILLAR DIA.	PART No. OF BUSH AND BALL ASSY.	A	B	L1	L2	L3	L4	L5	L6	L7	BALL DIA.	MAXIMUM STROKE		BUSH PART No.	BALL CAGE PART No.
												SHORT BUSH	LONG BUSH		
16	BAC 16	32	24	50	60	70	75				4	30	55	BBC 16	BC 16
18	BAC 18	36	26	50	60	70	75				4	30	55	BBC 18	BC 18
19	BAC 19	36	27	50	60	70	75				4	30	55	BBC 19	BC 19
24	BAC 24	42	32	50		70	75	80	90		4	30	70	BBC 24	BC 24
25	BAC 25	42	33	50		70	75	80	90		4	30	70	BBC 25	BC 25
30	BAC 30	52	40				75		90		5	55	70	BBC 30	BC 30
32	BAC 32	52	42				75		90		5	55	70	BBC 32	BC 32
40	BAC 40	63	50				75		90	100	5	55	80	BBC 40	BC 40
42	BAC 42	63	52				75		90	100	5	55	80	BBC 42	BC 42
50	BAC 50	73	60						90	100	5	70	80	BBC 50	BC 50
52	BAC 52	73	62						90	100	5	70	80	BBC 52	BC 52

ORDERING: State part number and length, e.g. BAC16/L2. Note that BAC denotes an assembly including Bush and Cage, these are available separately, BBC = Bush, BC = Cage. See righthand columns above.

These sizes are no longer fitted to our shaped die sets.