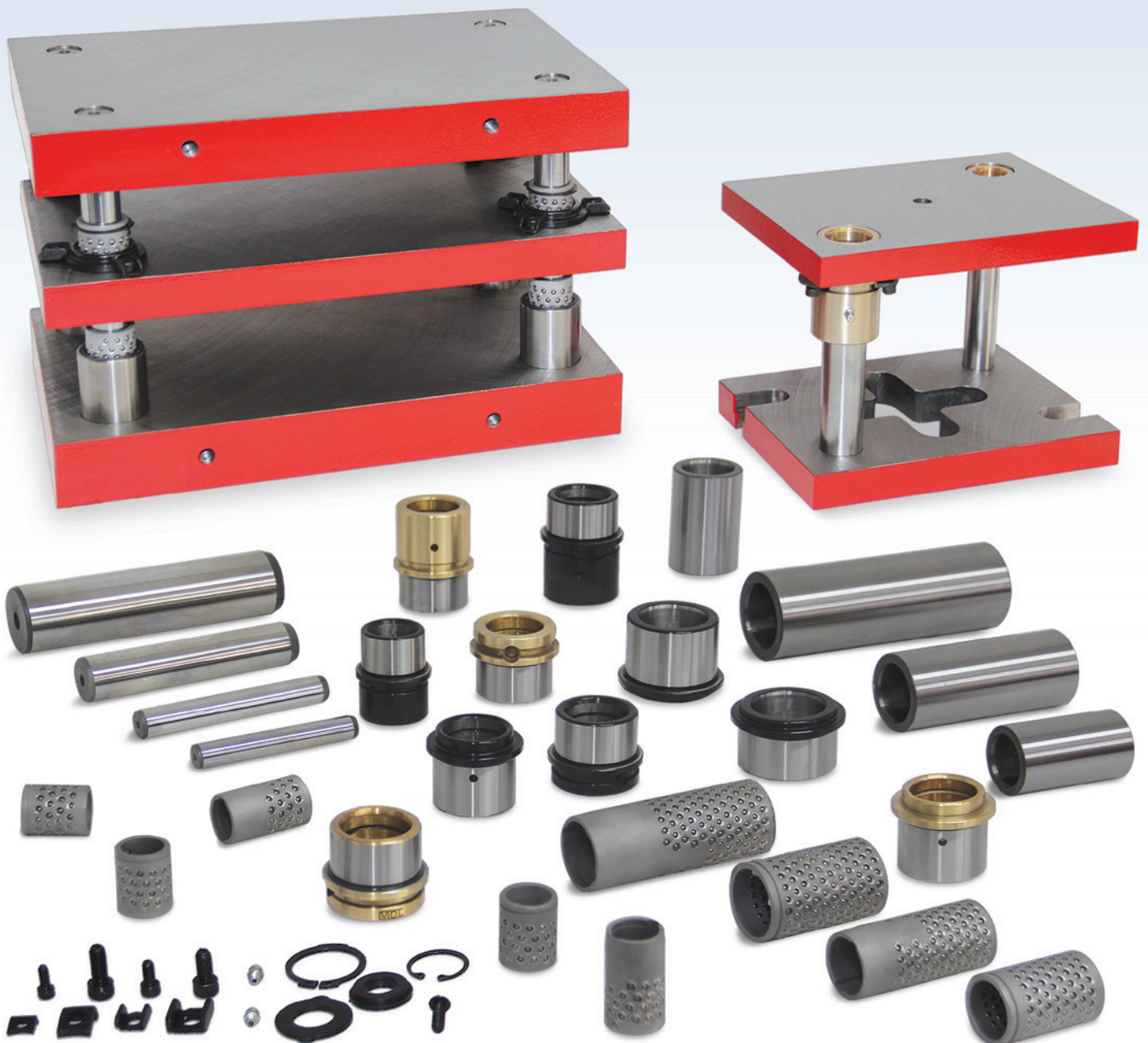


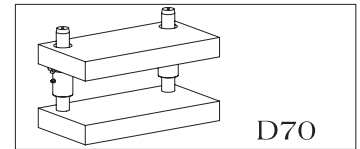


DIE SETS & TOOLING COMPONENTS



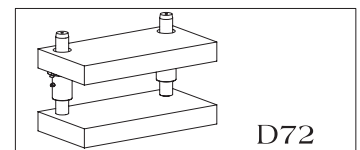
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Standard Die Sets with Rear Pillars(D70).....5



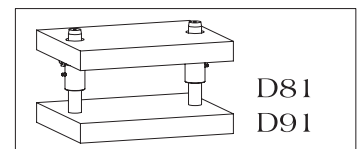
D70

Rectangular Die Sets with Rear Pillars(D72).....6



D72

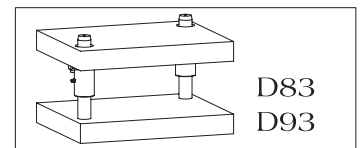
Rectangular Die Sets
with Centre Pillars(D81 & D91).....8



D81

D91

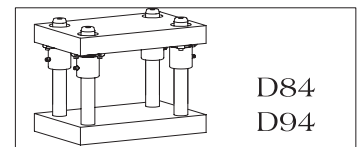
Rectangular Die Sets
with Diagonal Pillars(D83 & D93).....10



D83

D93

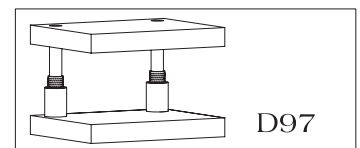
Rectangular Die Sets
with Four Pillars(D84 & D94).....12



D84

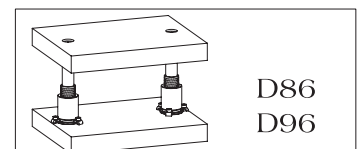
D94

Rectangular Die Sets
with Rear Pillars and Ball Cages(D97).....14



D97

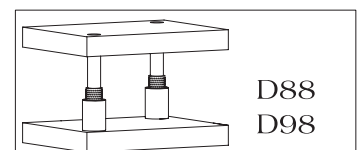
Rectangular Die Sets with Centre Pillars
and Ball Cages(D86 & D96).....16



D86

D96

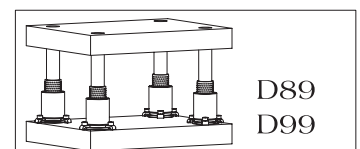
Rectangular Die Sets with Diagonal Pillars
and Ball Cages(D88 & D98).....18



D88

D98

Rectangular Die Sets with Four Pillars
and Ball Cages(D89 & D99).....20



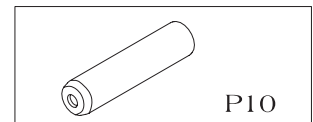
D89

D99

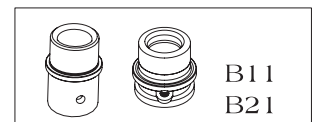
How to Order Steel Machined Plates.....22



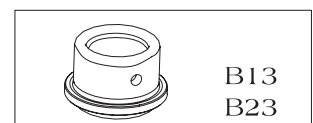
Straight Guide Pillars.....23



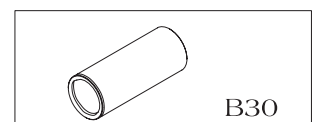
Shoulder Bushings.....24



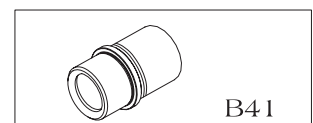
Low Profile Bushings.....25



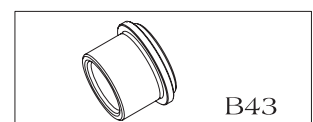
Straight Sleeve Ball Cages Bushings.....26



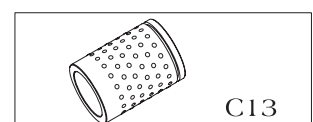
Shoulder Sleeve Ball Cages Bushings.....27



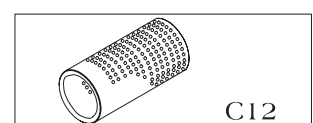
Stripper Plate Ball Cages Bushings.....28



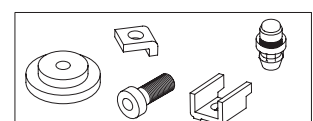
Stripper Plate Ball Cages Type 3.....29



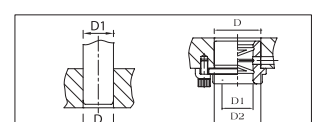
Ball Cages Type 2.....30



Component Parts.....32



Bore Sizes Recommendations.....33



Type 2 Operating Conditions.....34

Type 2 Bushing & Ball Cage Selection Chart.....35

In order to provide a better response to your urgent ordering requirements, we can offer you three new die set solutions:

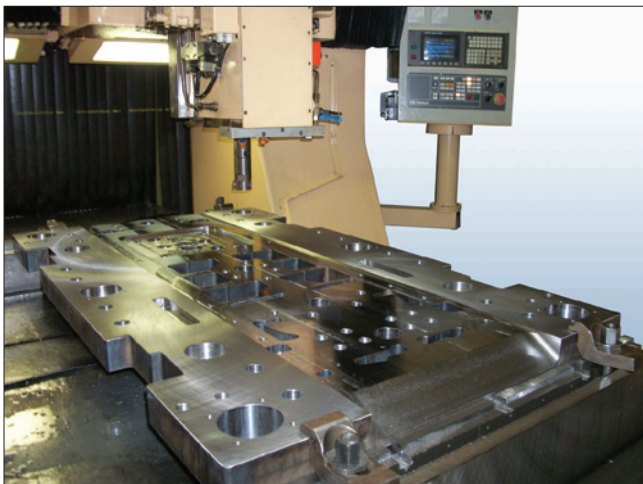
- Standard small die sets: 48 hours delivery ex works (See page 5)
- Rectangular die sets: 72 hours delivery ex works (See odd pages 7 to 21)
- Special die sets: according to your drawings and specifications (See even pages 6 to 20)

Matching bushes and pillars, we can offer you three fits:

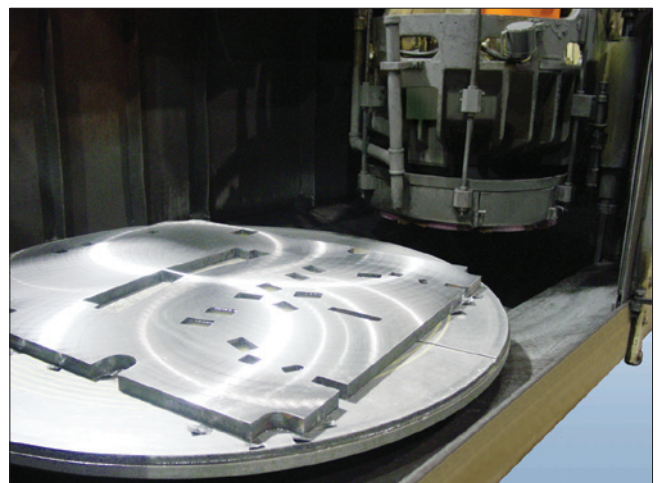
Category I: For tooling processing of very thin sheet metal.
For very fine clearance between punch and die sections. Where clearance per side is less than 0.02mm.

Category II: For tooling processing of sheet metal more than 0.4mm thick.
For clearance between punch and die sections from 0.02 to 0.06mm per side.
For most applications.

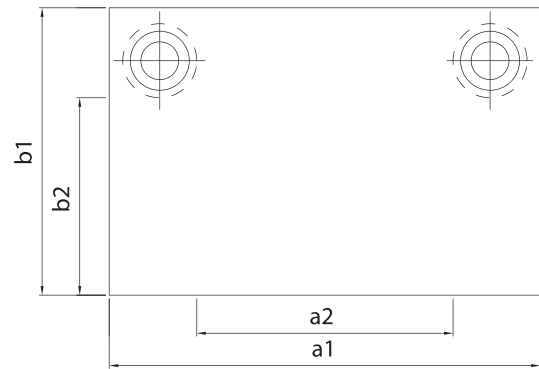
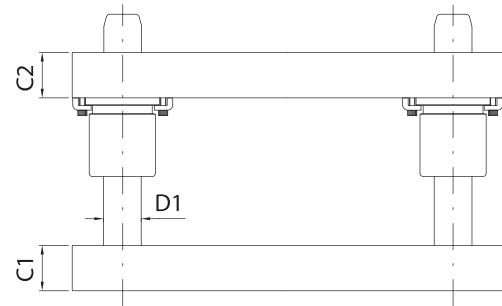
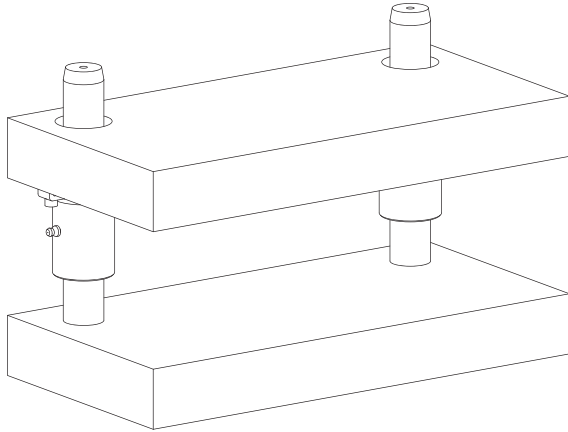
Category III: For clearance between punch and die sections of 0.08mm per side.
For automotive, forming dies.



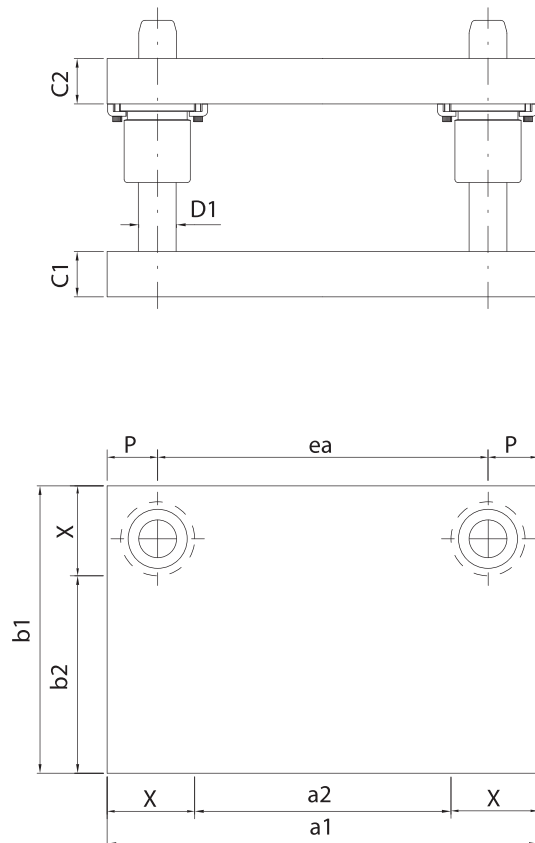
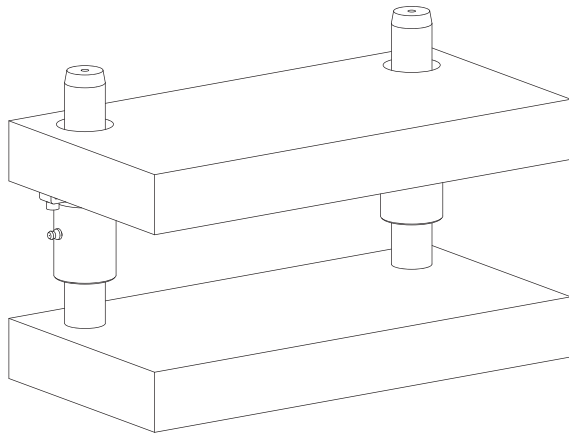
CNC Double Column Machining
Center Onsrud R48 Vertical Spindle
Table Size 3000 x 1500[mm]



42HD-84 Blanchard Grinder
Max. Diagonal 2500[mm]
Max. Height 900[mm]



a_1	b_2	b_1	a_2	C_1	C_2	D_1	CATALOG NUMBER
136 156 181	63	108	47.5 67.5 92.5	24	19	20	D70136108 D70156108 D70181108
178 203 238	80	143	53 78 113	30	24	25	D70178143 D70203143 D70238143
203 238 278	100	163	78 113 153				D70203163 D70238163 D70278163
246 286 336	125	195	106 146 196	39	30	32	D70246195 D70286195 D70336195
286 336	160	230	146 196				D70286230 D70336230
354	200	284	187	49	39	40	D70354284



DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

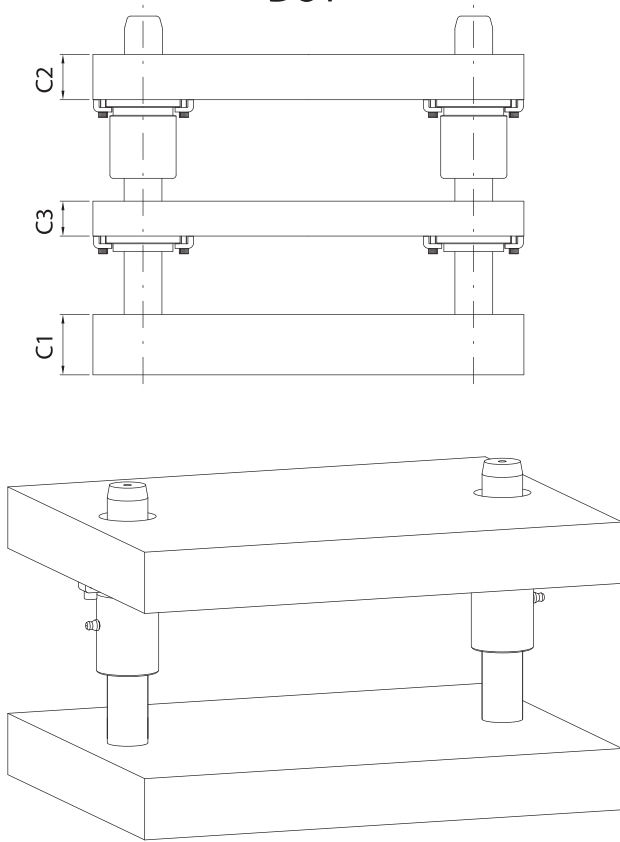
$\frac{a_1}{b_2}$	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
mm	D ₁	C ₁	C ₂	X	P			D ₁	C ₁	C ₂	X	P	
125	25	30	24	62.5	39			50	55	49	95	57.5	
160	32	39	30	70	43			63	75	62	114	67.5	
200	40	49	39	82.5	51								
250													
315													
400													
500													
630													
800													
1000													

Note: For dimensions larger than the ones shown above, we recommend D1 = 80mm

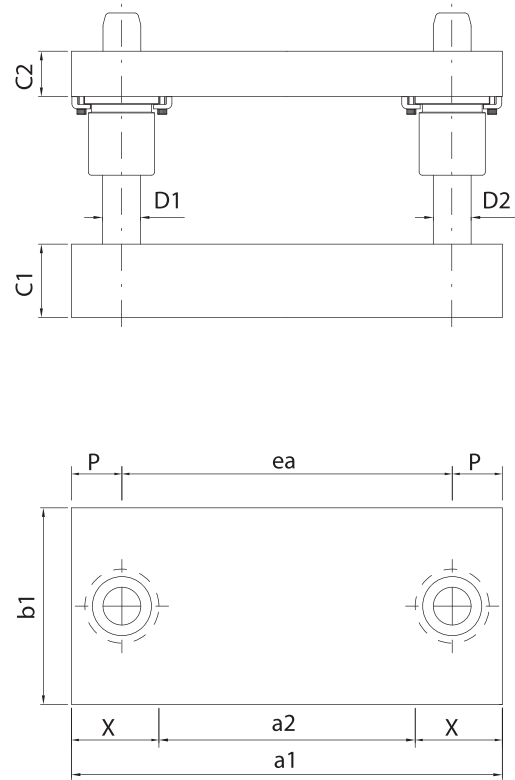
	Rectangular Die Sets with Rear Pillars(D72)	D72Xa1a1b2b2b2
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a ₁	b ₂	b ₁	a ₂	C ₁	C ₂	D ₁	e _a	CATALOG NUMBER
250	97.5	160	125	30	24	25	172	D72125097
				30	30			D72225097
				24	24			D72325097
	137.5	200	30	24	25	172	D72125137	
			30	30			D72225137	
			24	24			D72325137	
180	250	110	39	30	32	164	D72125180	
			39	39			D72225180	
			30	30			D72325180	
315	130	200	175	39	30	32	229	D72131130
				39	39			D72231130
				30	30			D72331130
	180	250	39	30	32	229	D72131180	
			39	39			D72231180	
			30	30			D72331180	
232.5	315	150	49	39	40	213	D72131232	
			49	49			D72231232	
			39	39			D72331232	
400	130	200	260	49	39	32	314	D72140130
				49	49			D72240130
				39	39			D72340130
	167.5	250	235	49	39	40	298	D72140167
				49	49			D72240167
				39	39			D72340167
232.5	315	235	49	39	40	298	D72140232	
			49	49			D72240232	
			39	39			D72340232	
317.5	400	235	49	39	40	298	D72140317	
			49	49			D72240317	
			39	39			D72340317	
500	167.5	250	335	49	39	40	398	D72150167
				49	49			D72250167
				39	39			D72350167
	232.5	315	335	49	39	40	398	D72150232
				49	49			D72250232
				39	39			D72350232
305	400	310	55	49	50	385	D72150305	
			55	55			D72250305	
			49	49			D72350305	
405	500	310	55	49	50	385	D72150405	
			55	55			D72250405	
			49	49			D72350405	
630	232.5	315	465	55	49	40	528	D72163232
				55	55			D72263232
				49	49			D72363232
	305	400	440	55	49	50	515	D72163305
				55	55			D72263305
				49	49			D72363305
405	500	440	55	49	50	515	D72163405	
			55	55			D72263405	
			49	49			D72363405	
535	630	440	55	49	50	515	D72163535	
			55	55			D72263535	
			49	49			D72363535	

D81



D91



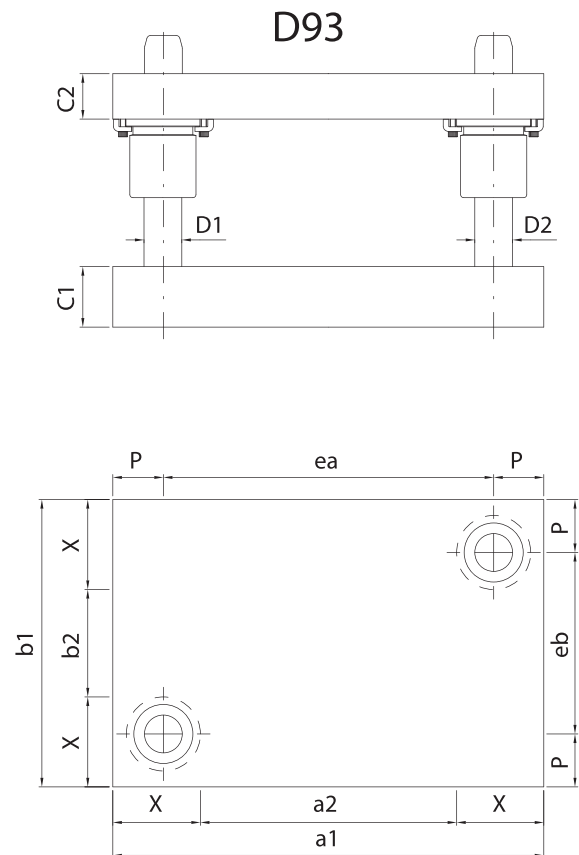
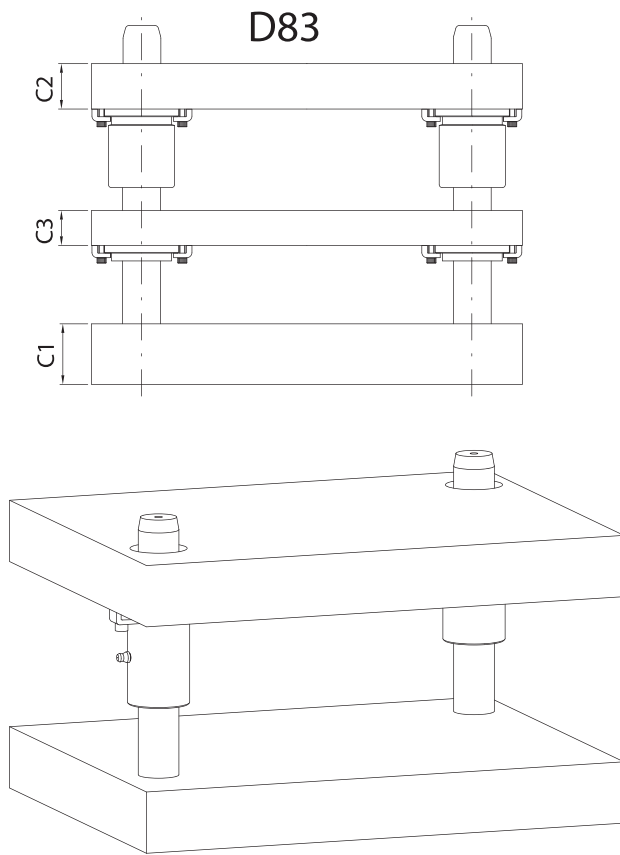
DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	mm															
$b_1 \backslash a_2$	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000		
125																
160																
200																
250																
315																
400																
500																
630																
800																
1000																
mm	D ₁	D ₂	C ₁	C ₂	C ₃	X	P		D ₁	D ₂	C ₁	C ₂	C ₃	X	P	
	20	25	30	24	24	62.5	39		40	50	55	49	39	95	57.5	
	25	32	39	30	30	70	43		50	63	75	62	49	114	67.5	
	32	40	49	39	30	82.5	51									

Note: For dimensions larger than the ones shown above, we recommend D1=63mm and D2=80mm

	Rectangular Die Sets with Centre Pillars(D81 & D91)	D81xa2a2b1b1b1 D91xa2a2b1b1b1
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a ₂	b ₁	a ₁	C ₁	C ₂	D ₁	D ₂	e _a	CATALOG NUMBER	WITH C3		
									C3	CATALOG NUMBER	
110	160	250	30	24	25	32	164	D91111160	24	D81111160	
	200		30	30				D91211160		D81211160	
			24	24				D91311160		D81311160	
			30	24				D91111200		D81111200	
			30	30				D91211200		D81211200	
			24	24				D91311200		D81311200	
			250	39				30	D91111250	D81111250	
	39			39				D91211250	D81211250		
	30			30				D91311250	D81311250		
175	200	315	39	30	25	32	229	D911117200	30	D811117200	
	250		39	39				D912117200		D812117200	
			30	30				D913117200		D813117200	
			39	30				D911117250		D811117250	
			39	39				D912117250		D812117250	
			30	30				D913117250		D813117250	
			315	49				39		D911117315	D811117315
	49			49				D912117315		D812117315	
	39			39				D913117315		D813117315	
235	200	400	49	39	32	40	298	D911123200	30	D811123200	
	250		49	49				D91223200		D81223200	
			39	39				D91323200		D81323200	
			49	39				D911123250		D811123250	
			49	49				D91223250		D81223250	
			39	39				D91323250		D81323250	
			315	49				39		D911123315	D811123315
	49			49				D91223315		D81223315	
	39			39				D91323315		D81323315	
	400			49				39		D911123400	D811123400
				49				49		D91223400	D81223400
				39				39		D91323400	D81323400
335		250	500	49	39	32	40	398	D911133250	30	D811133250
		315		49	49				D91233250		D81233250
				39	39				D91333250		D81333250
	49			39	D911133315				D811133315		
	49			49	D91233315				D81233315		
	39			39	D91333315				D81333315		
	400			55	49				D911133400	D811133400	
		55		55	D91233400				D81233400		
		49		49	D91333400				D81333400		
		500		55	49				D911133500	D811133500	
				55	55				D91233500	D81233500	
				49	49				D91333500	D81333500	
440	315		630	55	49	40	50	515	D911144315	39	D811144315
	400			55	55				D91244315		D81244315
				49	49				D91344315		D81344315
		55		49	D911144400				D811144400		
		55		55	D91244400				D81244400		
		49		49	D91344400				D81344400		
		500		55	49				D911144500		D811144500
	55			55	D91244500				D81244500		
	49			49	D91344500				D81344500		
	630			55	49				D911144630		D811144630
				55	55				D91244630		D81244630
				49	49				D91344630		D81344630



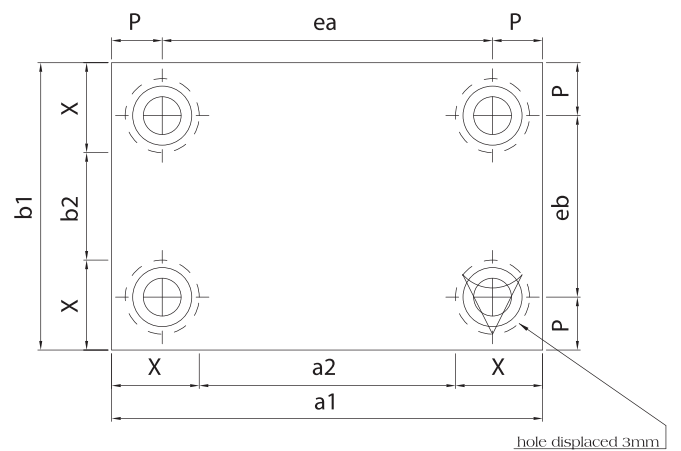
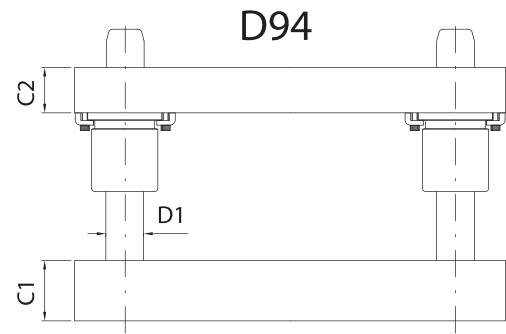
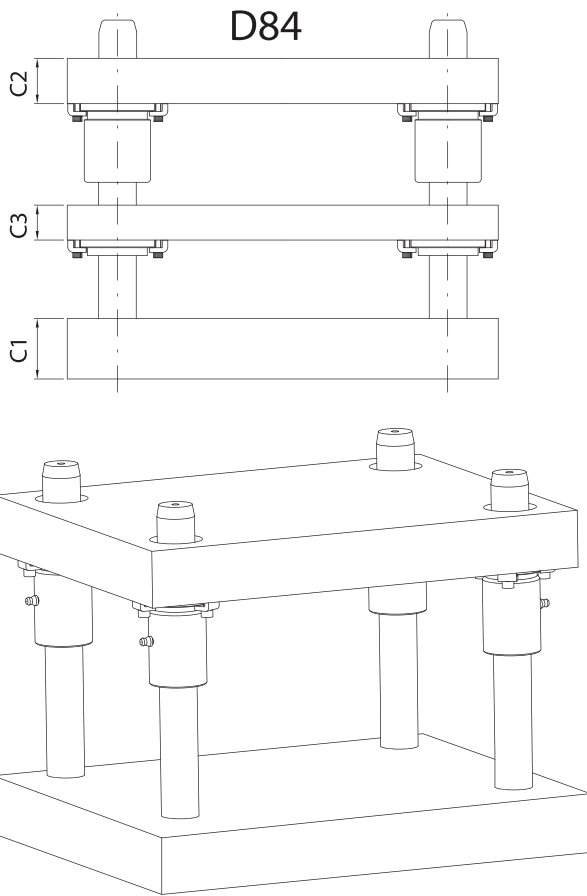
DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	mm
125															
160															
200															
250															
315															
400															
500															
630															
800															
1000															
mm	D ₁	D ₂	C ₁	C ₂	C ₃	X	P		D ₁	D ₂	C ₁	C ₂	C ₃	X	P
	20	25	30	24	24	62.5	39		40	50	55	49	39	95	57.5
	25	32	39	30	30	70	43		50	63	75	62	49	114	67.5
	32	40	49	39	30	82.5	51								

Note: For dimensions larger than the ones shown above, we recommend D1=63mm and D2=80mm

	Rectangular Die Sets with Diagonal Pillars(D83 & D93)	D83xa2a2b1b1b1 D93xa2a2b1b1b1
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a ₂	b ₁	a ₁	b ₂	C ₁	C ₂	D ₁	D ₂	e _a	e _b	CATALOG NUMBER	WITH C3	
											C3	CATALOG NUMBER
110	160	250	20	30 30 24	24 30 24	25	32	164	74	D93111160 D93211160 D93311160	24	D83111160 D83211160 D83311160
	200		60	30 30 24	24 30 24				D93111200 D93211200 D93311200	D83111200 D83211200 D83311200		
	250		110	39 39 30	30 39 30				164	D93111250 D93211250 D93311250		30
175	200	315	60	39 39 30	30 39 30	25	32	229	114	D93117200 D93217200 D93317200	30	D83117200 D83217200 D83317200
	250		110	39 39 30	30 39 30				164	D93117250 D93217250 D93317250		D83117250 D83217250 D83317250
	315		175	49 49 39	39 49 39				229	D93117315 D93217315 D93317315		D83117315 D83217315 D83317315
235	200	400	35	49 49 39	39 49 39	32	40	298	98	D93123200 D93223200 D93323200	30	D83123200 D83223200 D83323200
	250		85	49 49 39	39 49 39				148	D93123250 D93223250 D93323250		D83123250 D83223250 D83323250
	315		150	49 49 39	39 49 39				213	D93123315 D93223315 D93323315		D83123315 D83223315 D83323315
	400		235	49 49 39	39 49 39				298	D93123400 D93223400 D93323400		D83123400 D83223400 D83323400
335	250	500	85	49 49 39	39 49 39	32	40	398	148	D93133250 D93233250 D93333250	30	D83133250 D83233250 D83333250
	315		150	49 49 39	39 49 39				213	D93133315 D93233315 D93333315		D83133315 D83233315 D83333315
	400		235	55 55 49	49 55 49				298	D93133400 D93233400 D93333400		39
	500		335	55 55 49	49 55 49				398	D93133500 D93233500 D93333500	D83133500 D83233500 D83333500	
440	315	630	125	55 55 49	49 55 49	40	50	515	200	D93144315 D93244315 D93344315	39	D83144315 D83244315 D83344315
	400		210	55 55 49	49 55 49				285	D93144400 D93244400 D93344400		D83144400 D83244400 D83344400
	500		310	55 55 49	49 55 49				385	D93144500 D93244500 D93344500		D83144500 D83244500 D83344500
	630		440	55 55 49	49 55 49				515	D93144630 D93244630 D93344630		D83144630 D83244630 D83344630



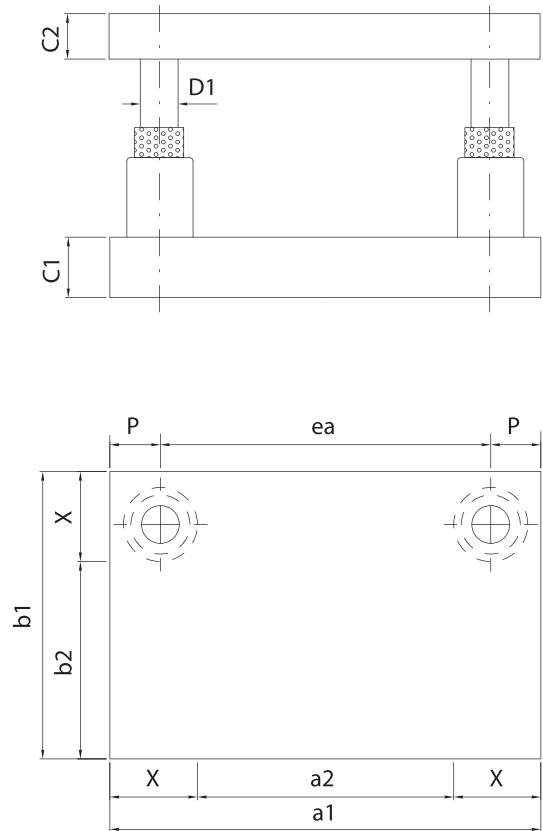
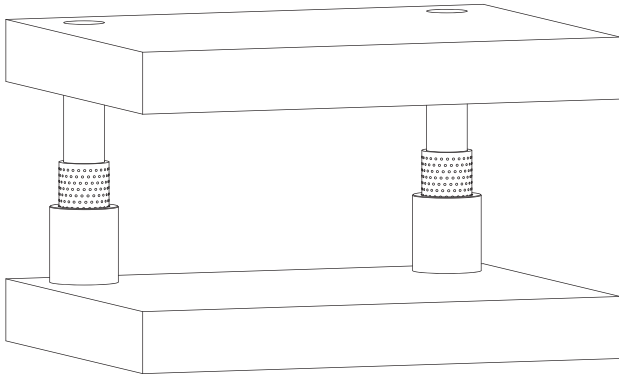
DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	160	200	250	315	400	500	630	800	1000	1250	1600	2000	mm
160													
200													
250													
315													
400													
500													
630													
800													
1000													
1250													
mm	D ₁	C ₁	C ₂	C ₃	X	P		D ₁	C ₁	C ₂	C ₃	X	P
	25	30	24	24	62.5	39		50	55	49	39	95	57.5
	32	39	30	30	70	43		63	75	62	49	114	67.5
	40	49	39	39	82.5	51							

Note: For dimensions larger than the ones shown above, we recommend D1 = 80mm

	Rectangular Die Sets with Four Pillars(D84 & D94)	D84xa1a1b1b1b1 D94xa1a1b1b1b1
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a ₁	b ₁	a ₂	b ₂	C ₁	C ₂	D ₁	e _a	e _b	CATALOG NUMBER	WITH C3					
										C3	CATALOG NUMBER				
250	160	125	35	30 30 24	24 30 24	25	172	82	D94125160 D94225160 D94325160	24	D84125160 D84225160 D84325160				
	200		75	30 30 24	24 30 24			122	D94125200 D94225200 D94325200		D84125200 D84225200 D84325200				
	250		125	39 39 30	30 39 30			172	D94125250 D94225250 D94325250		30	D84125250 D84225250 D84325250			
	200		75	39 39 30	30 39 30			122	D94131200 D94231200 D94331200	30	D84131200 D84231200 D84331200				
	250		125	39 39 30	30 39 30			172	D94131250 D94231250 D94331250		D84131250 D84231250 D84331250				
	315		190	49 49 49	39 49 39			237	D94131315 D94231315 D94331315		D84131315 D84231315 D84331315				
400	200	275	75	39 49 39	39 49 39	25	322	122	D94140200 D94240200 D94340200	30	D84140200 D84240200 D84340200				
	250		125	49 49 39	39 49 39			172	D94140250 D94240250 D94340250		D84140250 D84240250 D84340250				
	315	260	175	49 49 39	39 49 39	32	314	229	D94140315 D94240315 D94340315		D84140315 D84240315 D84340315				
	400		260	49 49 39	39 49 39			314	D94140400 D94240400 D94340400		D84140400 D84240400 D84340400				
	500	250	360	110	49 49 39	39 49 39	32	414	164		D94150250 D94250250 D94350250	30	D84150250 D84250250 D84350250		
		315		175	49 49 39	39 49 39			229		D94150315 D94250315 D94350315		D84150315 D84250315 D84350315		
400		260		49 49 49	39 49 39	314			D94150400 D94250400 D94350400	39	D84150400 D84250400 D84350400				
500		360		49 49 39	39 49 39	414			D94150500 D94250500 D94350500		D84150500 D84250500 D84350500				
630		315		465	150	49 49 39			39 49 39		40	528	213	D94163315 D94263315 D94363315	39
		400			235	49 49 39			39 49 39	298			D94163400 D94263400 D94363400	D84163400 D84263400 D84363400	
	500	440	310	55 55 49	49 55 49	50	515	385	D94163500 D94263500 D94363500	D84163500 D84263500 D84363500					
	630		440	55 55 49	49 55 49			515	D94163630 D94263630 D94363630	D84163630 D84263630 D84363630					



DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_1}{b_2}$	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000
mm	D ₁	C ₁	C ₂	*X	**X	P		D ₁	C ₁	C ₂	*X	**X	P
125	25	30	24	66.5	71	44		50	55	49	104.5	110.5	64
160		32	39	30	75	79.5	48	63	75	62	120.5	127	73
200			40	49	39	88.5	93.5	56					
250													
315													
400													
500													
630													
800													
1000													

Note: For dimensions larger than the ones shown above, we recommend D1 = 80mm

*X= With Straight Sleeve Ball Cage Bushings
**X= With Shoulder Sleeve Ball Cage Bushings

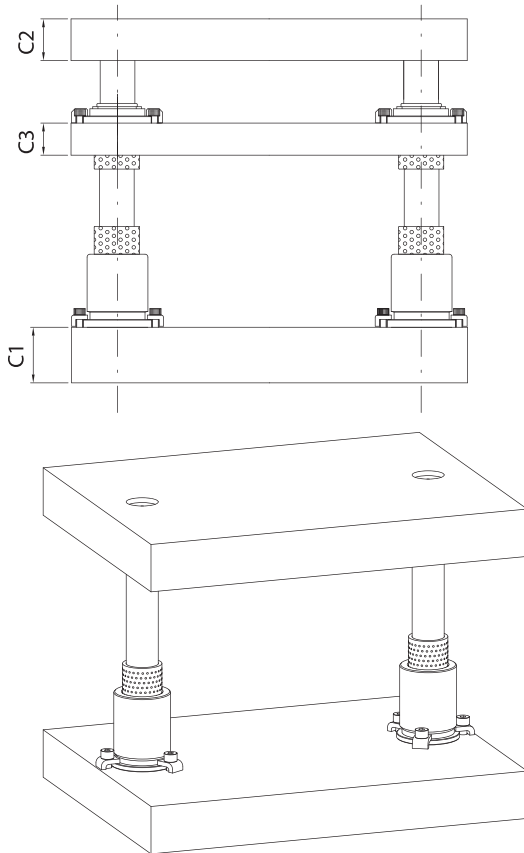
	Rectangular Die Sets with Rear Pillars and Ball Cage(D97)	D97xa1a1b2b2b2
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a ₁	b ₂	b ₁	a ₂	C ₁	C ₂	D ₁	e _a	CATALOG NUMBER
250	*93.5 **89.0	160	*117 **108	30	24	25	162	D97125093
				30	30			D97225093
				24	24			D97325093
	*133.5 **129.0	200	*100 **91	30	24	32	154	D97125133
				30	30			D97225133
				24	24			D97325133
315	*125.0 **120.5	200	*165 **156	39	30	32	219	D97131125
				39	39			D97231125
				30	30			D97331125
	*175.0 **170.5	250	*138 **128	39	30	40	203	D97131175
				39	39			D97231175
				30	30			D97331175
400	*226.5 **221.5	315	*250 **241	49	39	32	304	D97140125
				49	49			D97240125
				39	39			D97340125
	*161.5 **156.5	250	*223 **213	49	39	40	288	D97140161
				49	49			D97240161
				39	39			D97340161
500	*226.5 **221.5	315	*291 **279	49	39	40	388	D97140226
				49	49			D97240226
				39	39			D97340226
	*311.5 **306.5	400	*323 **313	49	39	50	372	D97140311
				49	49			D97240311
				39	39			D97340311
630	*161.5 **156.5	250	*453 **443	49	39	40	518	D97150161
				49	49			D97250161
				39	39			D97350161
	*226.5 **221.5	315	*291 **279	49	39	50	372	D97150226
				49	49			D97250226
				39	39			D97350226
630	*295.5 **289.5	400	*421 **409	55	49	40	502	D97150295
				55	55			D97250295
				49	49			D97350295
	*395.5 **389.5	500	*453 **443	55	49	50	502	D97150395
				55	55			D97250395
				49	49			D97350395
630	*226.5 **221.5	315	*453 **443	55	49	40	518	D97163226
				55	55			D97263226
				49	49			D97363226
	*295.5 **289.5	400	*421 **409	55	49	50	502	D97163295
				55	55			D97263295
				49	49			D97363295
630	*395.5 **389.5	500	*421 **409	55	49	50	502	D97163395
				55	55			D97263395
				49	49			D97363395
	*525.5 **519.5	630	*453 **443	55	49	50	502	D97163525
				55	55			D97263525
				49	49			D97363525

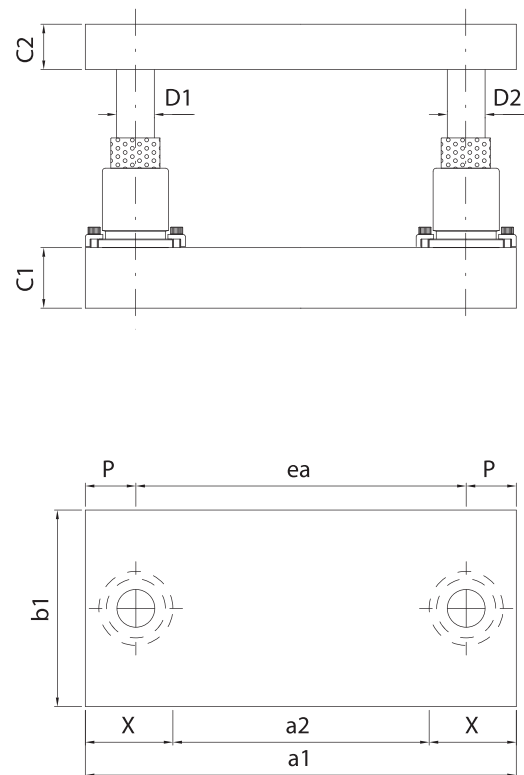
* = Using Straight Sleeve Ball Cage Bushings

** = Using Shoulder Sleeve Ball Cage Bushings

D86



D96



DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	mm		
125																	
160																	
200																	
250																	
315																	
400																	
500																	
630																	
800																	
1000																	
mm	D ₁	D ₂	C ₁	C ₂	C ₃	*X	**X	P		D ₁	D ₂	C ₁	C ₂	C ₃	*X	**X	P
	20	25	30	24	24	66.5	71	44		40	50	55	49	39	104.5	110.5	64
	25	32	39	30	30	75	79.5	48		50	63	75	62	49	120.5	127	73
	32	40	49	39	30	88.5	93.5	56									

Note: For dimensions larger than the ones shown above, we recommend D1=63mm and D2=80mm

*X= With Straight Sleeve Ball Cage Bushings
**X= With Shoulder Sleeve Ball Cage Bushings

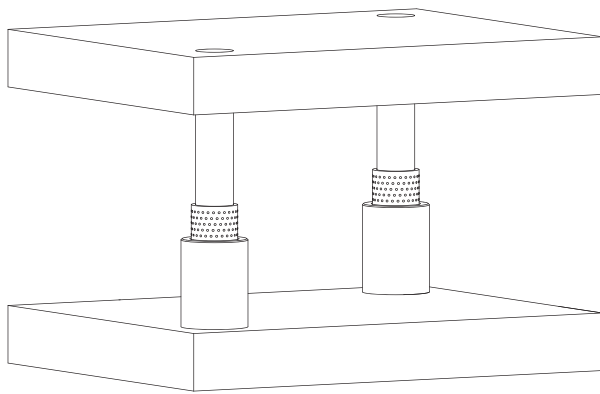
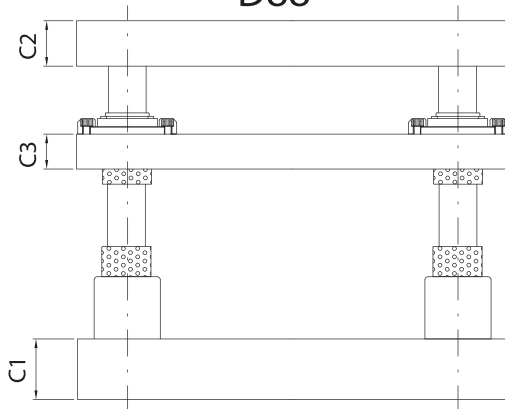
	Rectangular Die Sets with Centre Pillars and Ball Cage(D86 & D96)	D86xa2a2b1b1b1 D96xa2a2b1b1b1
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a ₂	b ₁	a ₁	C ₁	C ₂	D ₁	D ₂	e _a	CATALOG NUMBER	WITH C3	
									C3	CATALOG NUMBER
*110 **91	160	250	30 30 24	24 30 24	25	32	154	D96110160 D96210160 D96310160	24	D86110160 D86210160 D86310160
	200		30 30 24	24 30 24				D96110200 D96210200 D96310200		D86110200 D86210200 D86310200
	250		39 39 30	30 39 30				D96110250 D96210250 D96310250	30	D86110250 D86210250 D86310250
	200	315	39 39 30	30 39 30	25	32	219	D96116200 D96216200 D96316200	30	D86116200 D86216200 D86316200
	250		39 39 30	30 39 30				D96116250 D96216250 D96316250		D86116250 D86216250 D86316250
	315		49 49 39	39 49 39				D96116315 D96216315 D96316315		D86116315 D86216315 D86316315
	200	400	49 49 39	39 49 39	32	40	288	D96122200 D96222200 D96322200	30	D86122200 D86222200 D86322200
	250		49 49 39	39 49 39				D96122250 D96222250 D96322250		D86122250 D86222250 D86322250
	315		49 49 39	39 49 39				D96122315 D96222315 D96322315		D86122315 D86222315 D86322315
	400		49 49 39	39 49 39				D96122400 D96222400 D96322400		D86122400 D86222400 D86322400
	250	500	49 49 39	39 49 39	32	40	388	D96132250 D96232250 D96332250	30	D86132250 D86232250 D86332250
	315		49 49 39	39 49 39				D96132315 D96232315 D96332315		D86132315 D86232315 D86332315
	400		55 55 49	49 55 49				D96132400 D96232400 D96332400	39	D86132400 D86232400 D86332400
	500		55 55 49	49 55 49				D96132500 D96232500 D96332500		D86132500 D86232500 D86332500
	315	630	55 55 49	49 55 49	40	50	502	D96142315 D96242315 D96342315	39	D86142315 D86242315 D86342315
	400		55 55 49	49 55 49				D96142400 D96242400 D96342400		D86142400 D86242400 D86342400
	500		55 55 49	49 55 49				D96142500 D96242500 D96342500		D86142500 D86242500 D86342500
	630		55 55 49	49 55 49				D96142630 D96242630 D96342630		D86142630 D86242630 D86342630

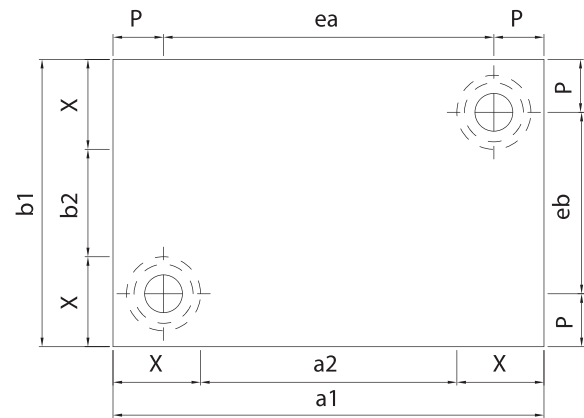
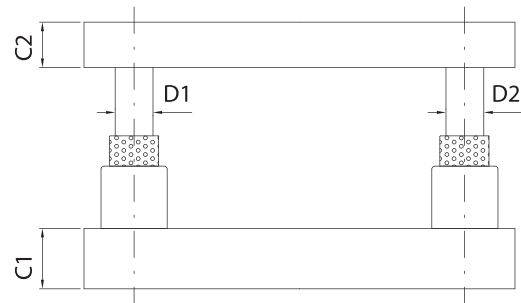
* = Using Straight Sleeve Ball Cage Bushings

** = Using Shoulder Sleeve Ball Cage Bushings

D88



D98



DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	mm		
125																	
160																	
200																	
250																	
315																	
400																	
500																	
630																	
800																	
1000																	
mm	D ₁	D ₂	C ₁	C ₂	C ₃	*X	**X	P		D ₁	D ₂	C ₁	C ₂	C ₃	*X	**X	P
	20	25	30	24	24	66.5	71	44		40	50	55	49	39	104.5	110.5	64
	25	32	39	30	30	75	79.5	48		50	63	75	62	49	120.5	127	73
	32	40	49	39	30	88.5	93.5	56									

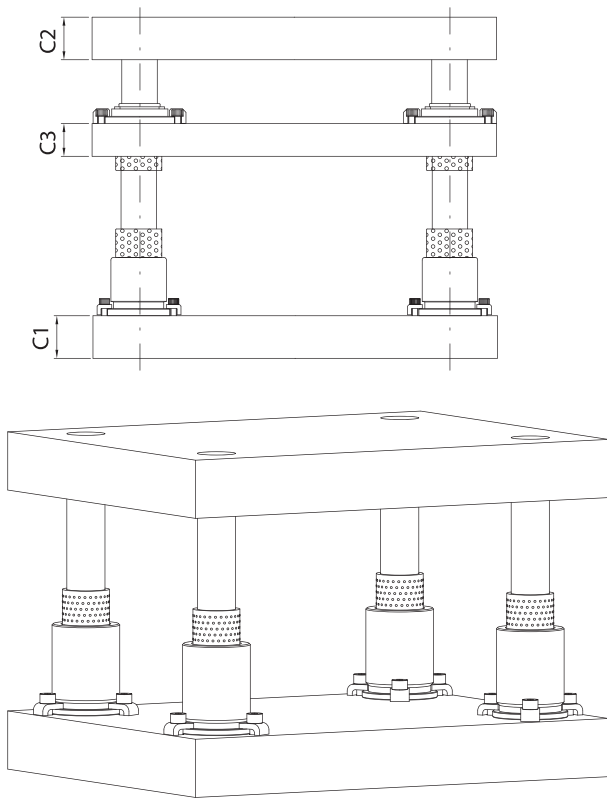
Note: For dimensions larger than the ones shown above we recommend the use of D1= 63mm and D2= 80mm

*X= With Straight Sleeve Ball Cage Bushings
**X= With Shoulder Sleeve Ball Cage Bushings

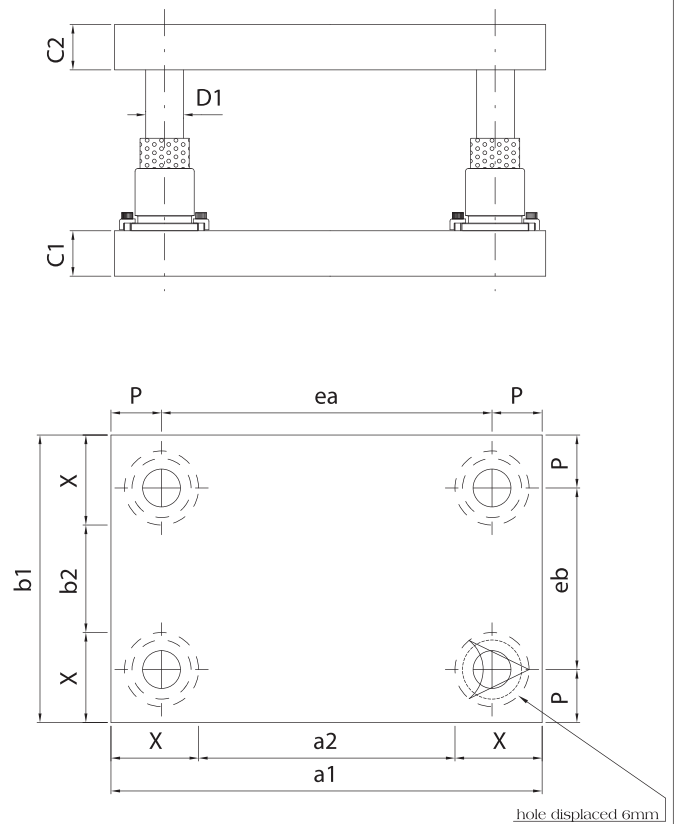
	Rectangular Die Sets with Diagonal Pillars and Ball Cage(D88 & D98)	D88xa2a2b1b1b1 D98xa2a2b1b1b1
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a ₂	b ₁	a ₁	b ₂	C ₁	C ₂	D ₁	D ₂	e _a	e _b	CATALOG NUMBER	WITH C3	
											C3	CATALOG NUMBER
*100 **91	160	250	*10 **1	30 30 24	24 30 24	25	32	154	64	D98110160 D98210160 D98310160	24	D88110160 D88210160 D88310160
	200		*50 **41	30 30 24	24 30 24				104	D98110200 D98210200 D98310200		D88110200 D88210200 D88310200
	250		*100 **91	39 39 30	30 39 30				154	D98110250 D98210250 D98310250	30	D88110250 D88210250 D88310250
*165 **156	200	315	*50 **41	39 39 30	30 39 30	25	32	219	104	D98116200 D98216200 D98316200	30	D88116200 D88216200 D88316200
	250		*100 **91	39 39 30	30 39 30				154	D98116250 D98216250 D98316250		D88116250 D88216250 D88316250
	315		*165 **156	49 49 39	39 49 39				219	D98116315 D98216315 D98316315		D88116315 D88216315 D88316315
*223 **213	200	400	*23 **13	49 49 39	39 49 39	32	40	288	88	D98122200 D98222200 D98322200	30	D88122200 D88222200 D88322200
	250		*73 **63	49 49 39	39 49 39				138	D98122250 D98222250 D98322250		D88122250 D88222250 D88322250
	315		*138 **128	49 49 39	39 49 39				203	D98122315 D98222315 D98322315		D88122315 D88222315 D88322315
	400		*223 **213	49 49 39	39 49 39				288	D98122400 D98222400 D98322400		D88122400 D88222400 D88322400
*323 **313	250	500	*73 **63	49 49 39	39 49 39	32	40	388	138	D98132250 D98232250 D98332250	30	D88132250 D88232250 D88332250
	315		*138 **128	49 49 39	39 49 39				203	D98132315 D98232315 D98332315		D88132315 D88232315 D88332315
	400		*223 **213	55 55 49	49 55 49				288	D98132400 D98232400 D98332400	39	D88132400 D88232400 D88332400
	500		*323 **313	55 55 49	49 55 49				388	D98132500 D98232500 D98332500		D88132500 D88232500 D88332500
*421 **409	315	630	*106 **94	55 55 49	49 55 49	40	50	502	187	D98142315 D98242315 D98342315	39	D88142315 D88242315 D88342315
	400		*191 **179	55 55 49	49 55 49				272	D98142400 D98242400 D98342400		D88142400 D88242400 D88342400
	500		*291 **279	55 55 49	49 55 49				372	D98142500 D98242500 D98342500		D88142500 D88242500 D88342500
	630		*421 **409	55 55 49	49 55 49				502	D98142630 D98242630 D98342630		D88142630 D88242630 D88342630

D89



D99



DIMENSIONS, MINIMUM COMPONENTES AND THICKNESS(RECOMMENDED) FOR SPECIAL DIE SETS

$\frac{a_2}{b_1}$	160	200	250	315	400	500	630	800	1000	1250	1600	2000	mm		
160															
200															
250															
315															
400															
500															
630															
800															
1000															
1250															
mm	D ₁	C ₁	C ₂	C ₃	*X	**X	P		D ₁	C ₁	C ₂	C ₃	*X	**X	P
	25	30	24	24	66.5	71	44		50	55	49	39	104.5	110.5	64
	32	39	30	30	75	79.5	48		63	75	62	49	120.5	127	73
	40	49	39	39	88.5	93.5	56								

Note: For dimensions larger than the ones shown above, we recommend D1 = 80mm

*X= With Straight Sleeve Ball Cage Bushings
**X= With Shoulder Sleeve Ball Cage Bushings

	Rectangular Die Sets with Four Pillars and Ball Cage(D89 & D99)	D89xa1a1b1b1b1 D99xa1a1b1b1b1
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a ₁	b ₁	a ₂	b ₂	C ₁	C ₂	D ₁	e _a	e _b	CATALOG NUMBER	WITH C3	
										C3	CATALOG NUMBER
250	160	*117 **108	*27 **18	30 30 24	24 30 24	25	162	72	D99125160 D99225160 D99325160	24	D89125160 D89225160 D89325160
	200		*67 **58	30 30 24	24 30 24			112	D99125200 D99225200 D99325200		D89125200 D89225200 D89325200
	250		*117 **108	39 39 30	30 39 30			162	D99125250 D99225250 D99325250	30	D89125250 D89225250 D89325250
315	200	*182 **173	*67 **58	39 39 30	30 39 30	25	227	112	D99131200 D99231200 D99331200	30	D89131200 D89231200 D89331200
	250		*117 **108	39 39 30	30 39 30			162	D99131250 D99231250 D99331250		D89131250 D89231250 D89331250
	315		*182 **173	49 49 39	39 49 39			227	D99131315 D99231315 D99331315		D89131315 D89231315 D89331315
400	200	*267 **258	*67 **58	49 49 39	39 49 39	25	312	112	D99140200 D99240200 D99340200	30	D89140200 D89240200 D89340200
	250		*117 **108	49 49 39	39 49 39			162	D99140250 D99240250 D99340250		D89140250 D89240250 D89340250
	315	*250 **241	*165 **156	49 49 39	39 49 39	32	304	219	D99140315 D99240315 D99340315		D89140315 D89240315 D89340315
	400		*250 **241	49 49 39	39 49 39			304	D99140400 D99240400 D99340400		D89140400 D89240400 D89340400
500	250	*350 **341	*100 **91	49 49 39	39 49 39	32	404	154	D99150250 D99250250 D99350250	30	D89150250 D89250250 D89350250
	315		*165 **156	49 49 39	39 49 39			219	D99150315 D99250315 D99350315		D89150315 D89250315 D89350315
	400		*250 **241	49 49 49	39 49 39			304	D99150400 D99250400 D99350400	39	D89150400 D89250400 D89350400
	500		*350 **341	49 49 39	39 49 39			404	D99150500 D99250500 D99350500		D89150500 D89250500 D89350500
630	315	*453 **443	*138 **128	49 49 39	39 49 39	40	518	203	D99163315 D99263315 D99363315	39	D89163315 D89263315 D89363315
	400		*223 **213	49 49 39	39 49 39			288	D99163400 D99263400 D99363400		D89163400 D89263400 D89363400
	500	*421 **409	*291 **279	55 55 49	49 55 49	50	502	372	D99163500 D99263500 D99363500		D89163500 D89263500 D89363500
	630		*421 **409	55 55 49	49 55 49			502	D99163630 D99263630 D99363630		D89163630 D89263630 D89363630

* = Using Straight Sleeve Ball Cage Bushings

** = Using Shoulder Sleeve Ball Cage Bushings

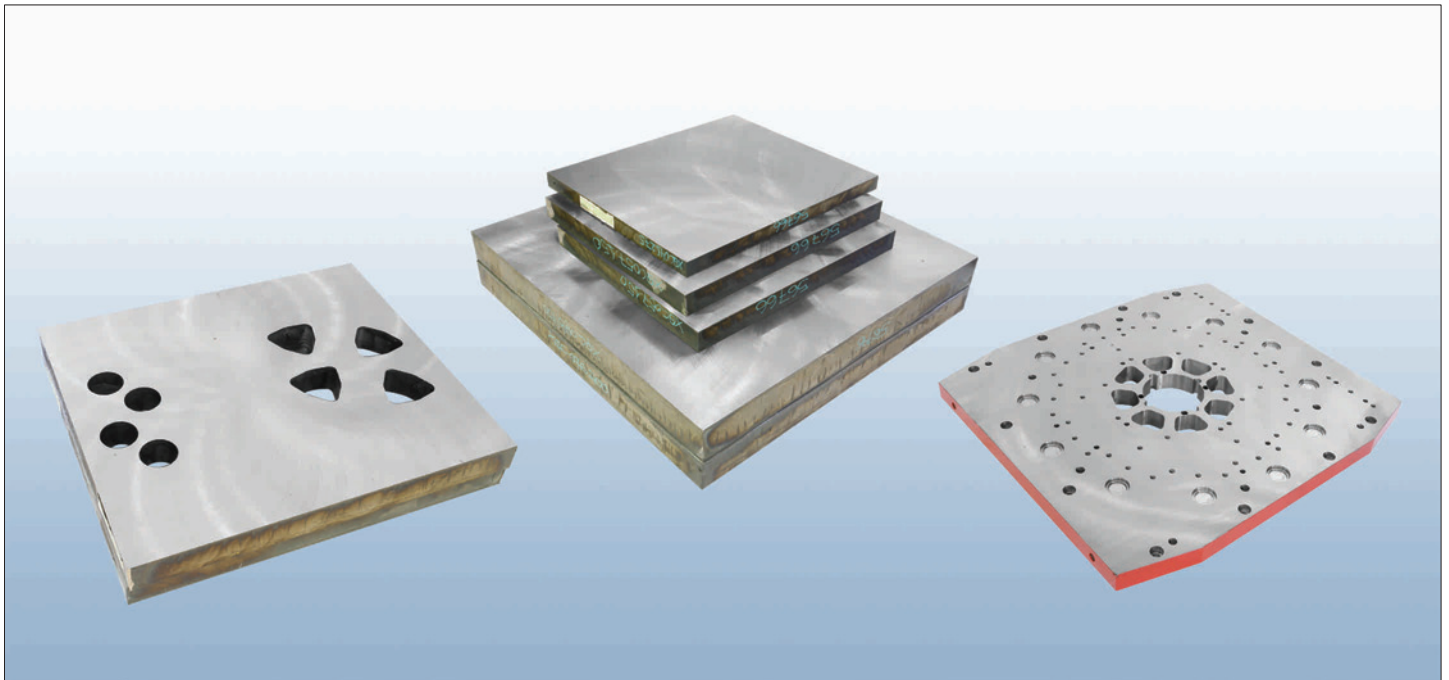


PLATE TYPES	FINISHES TYPES
P1	EDGES TORCH/GAS CUT. GROUND TOP AND BOTTOM TO CLEAN UP.
P3	EDGES MACHINED. GROUND TOP AND BOTTOM TO CLEAN UP.
P7	EDGES TORCH/GAS CUT. GROUND TOP AND BOTTOM TO SPECIFIC TOLERANCE.
P9	EDGES MACHINED. GROUND TOP AND BOTTOM TO SPECIFIC TOLERANCE.

TOLERANCES TO GROUND SURFACES [mm]
(VALID TO RATIO: DIAGONAL / THICKNESS < 30)

PARALLELISM	FLATNESS	THICKNESS (ONLY FOR P1 E P3)	THICKNESS (ONLY FOR P7 E P9)
0.008 / 100	0.010 / 100	±3	0 / +0.2

TOLERANCES FOR EDGES MACHINED [mm]

LENGTH AND WIDTH	SQUARENESS BETWEEN SURFACES AND EDGES	SQUARENESS OF EDGES
UP TO 650	0 / +0.2	
OVER 650-1000	0 / +0.4	0.025 / 100
OVER 1000	0 / +0.5	0.015 / 100

TORCH/GAS CUT TOLERANCES[mm]

PLATE THICKNESS	SLOT DIMENSION	SLOT LOCATION	MINIMUM SLOT WIDTH
UP TO 45	±1	±1	10
OVER 45-75	±2	±2	15
OVER 75	±3	±3	20

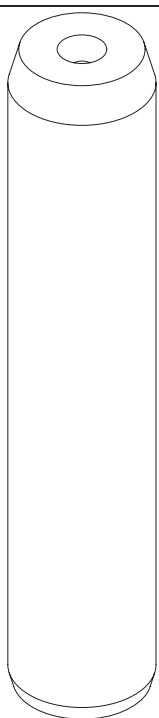
SERVICE LINE

- "BLANCHARD" GRINDER
(UP TO 2500[mm] OF DIAGONAL
X 900[mm] OF HEIGHT).
- MACHINING CENTER
(UP TO 3000[mm] X 1500[mm] X 500[mm]).

PRODUCT LINE

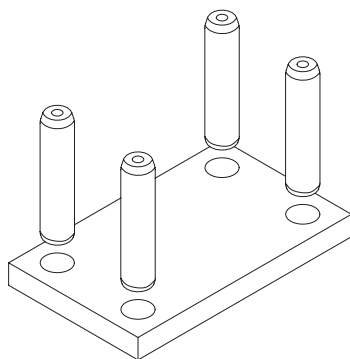
- * DIE SETS.
- * DIE SETS COMPONENTS.
- * COMPRESSION SPRINGS.
- * PROVIDE STEEL PLATES MACHINED
ACCORDING TO DRAWING.
- * STEEL PLATE MACHINING.

- WITH ONLY ONE CALL
YOU CAN ORDER YOUR STEEL PLATE
QUICKLY, THEN SEND US A DRAWING
AND WE CAN, TORCH/GAS CUT, NORMALIZE,
GRIND (BLANCHARD), DRILL, MILL, BORE
AND TAP YOUR PLATE TO SUIT YOUR
SPECIFY REQUIREMENTS.



Case Hardened 60 - 64 HRC

Assembly



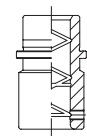
To Be Use With



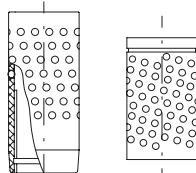
SHORT SHOULDER
BUSHINGS



LOW PROFILE
BUSHINGS



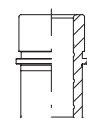
SHOULDER
BUSHINGS



BALL CAGE
TYPE 2/3

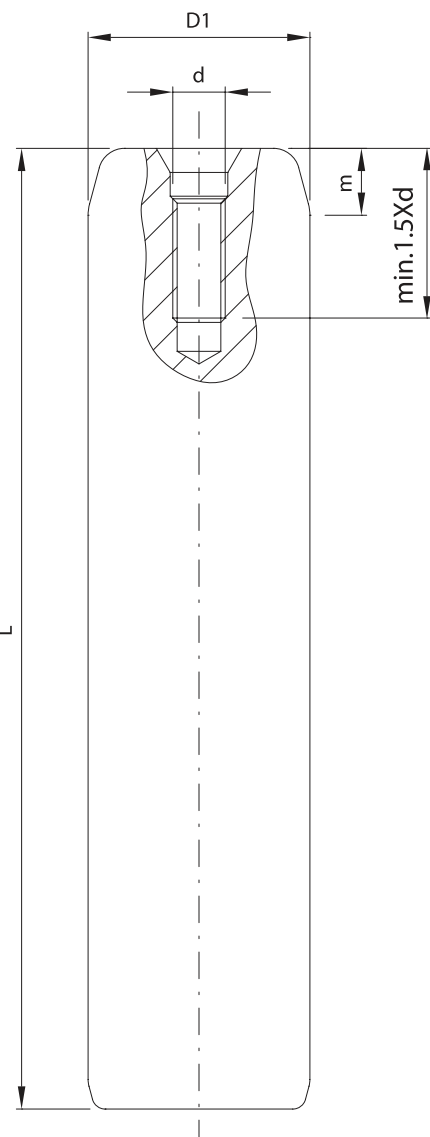
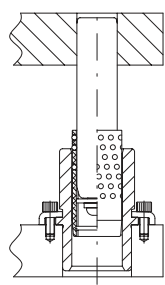
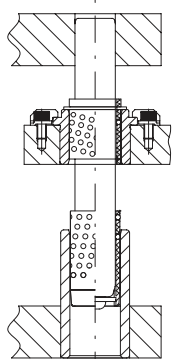
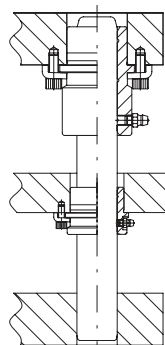


STRAIGHT SLEEVE
BALL CAGE
BUSHING



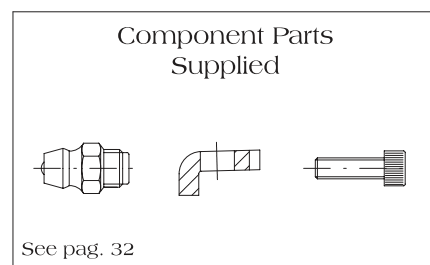
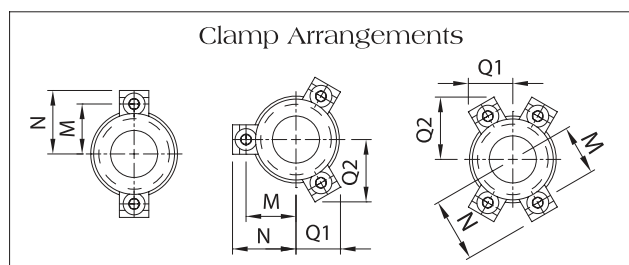
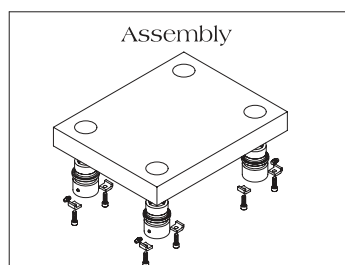
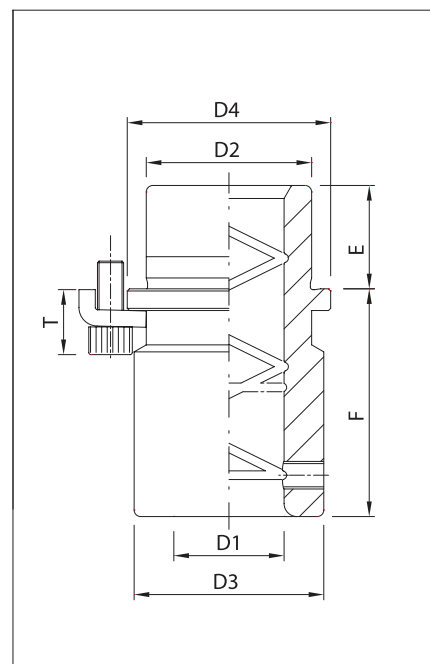
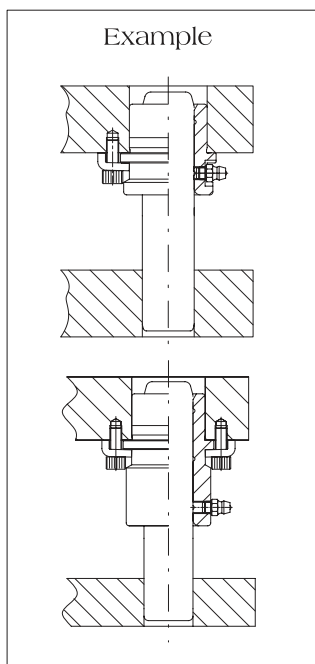
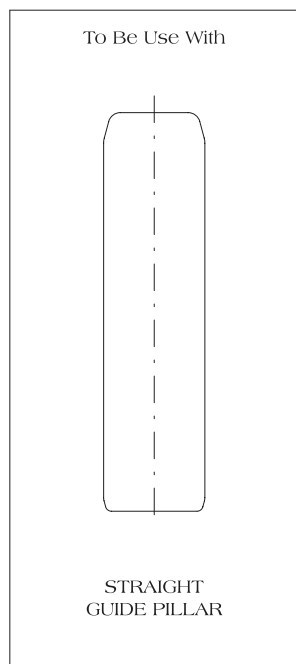
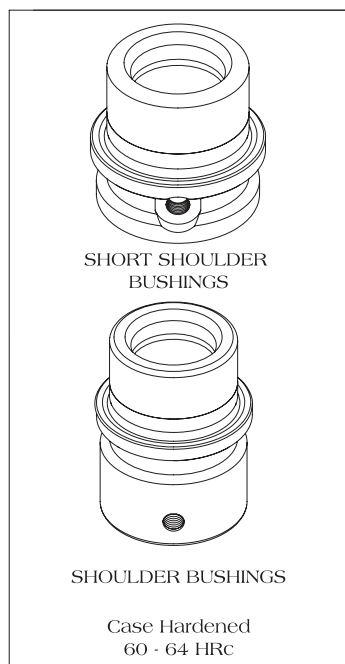
BALL CAGE
BUSHING

Example



D ₁	20	25	32	40	50	63	80*
L	CATALOG NUMBER						
100	P10020100	P10025100					
110	P10020110	P10025110	P10032110				
125	P10020125	P10025125	P10032125	P10040125			
140	P10020140	P10025140	P10032140	P10040140			
160	P10020160	P10025160	P10032160	P10040160	P10050160		
180	P10020180	P10025180	P10032180	P10040180	P10050180		
200	P10020200	P10025200	P10032200	P10040200	P10050200	P10063200	P10080200
220		P10025220	P10032220	P10040220	P10050220	P10063220	P10080220
250		P10025250	P10032250	P10040250	P10050250	P10063250	P10080250
280		P10025280	P10032280	P10040280	P10050280	P10063280	P10080280
315			P10032315	P10040315	P10050315	P10063315	P10080315
355				P10040355	P10050355	P10063355	P10080355
400					P10050400	P10063400	P10080400
450					P10050450	P10063450	P10080450
500							P10080500
d	M5	M6	M8	M10	M12	M16	M20
m	7.3	9.6	10.1	10.6	11.3	12.1	13.3

* Dia. 80[mm], Special Item.

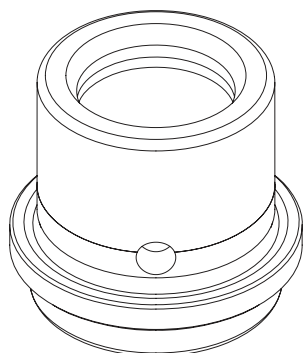


D ₁	20	25	32	40	50	63	80*
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F	SHORT SHOULDER BUSHINGS						
16	B11020016						
	B21020016						
20		B11025020	B11032020	B11040020	B11050020	B11063020	B11080020
		B21025020	B21032020	B21040020	B21050020	B21063020	B21080020

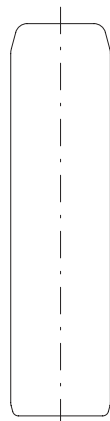
F	SHOULDER BUSHINGS						
32	B11020032						
	B21020032						
50		B11025050	B11032050	B11040050	B11050050	B11063050	B11080050
		B21025050	B21032050	B21040050	B21050050	B21063050	B21080050

DIMENSIONAL DATA							
D ₂	28	38	45	54	65	81	100
D ₃	29	42	49	58	70	88	110
D ₄	32.5	47	54	63	75	93	115
E	18	22	25	30	35	48	
M	19.5	27.5	31	37	43	52	63
N	26.3	35.7	39.1	48.0	53.9	62.8	73.7
Q ₁	-	24.3	26.0	30.5	33.5	38.0	43.5
Q ₂	-	34.1	37.1	44.9	50.1	57.9	67.5
T	11.3	15.1		18.1			
KITS	B010050M2 + B05006001	B010060M3 + B05006001		B010080M3 + B05006001	B010080M4 + B05006001		



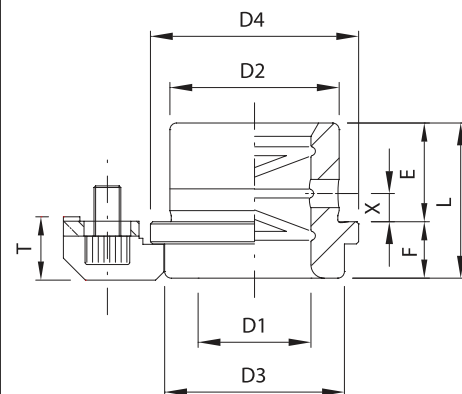
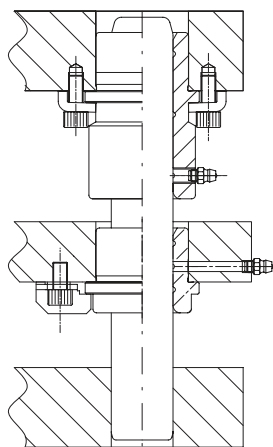
Case Hardened
60 - 64 HRC

To Be Use With

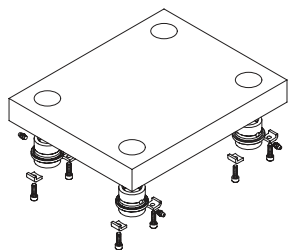


STRAIGHT
GUIDE PILLAR

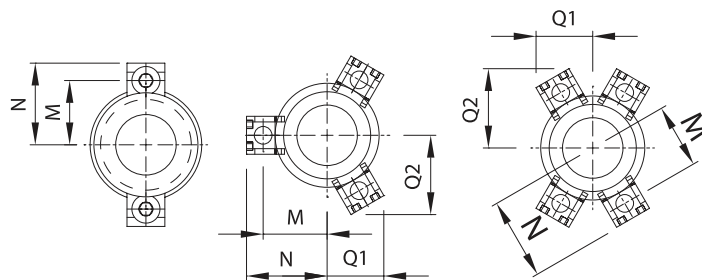
Example



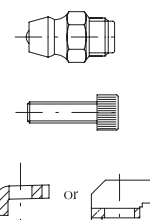
Assembly



Clamp Arrangements



Component Parts
Supplied

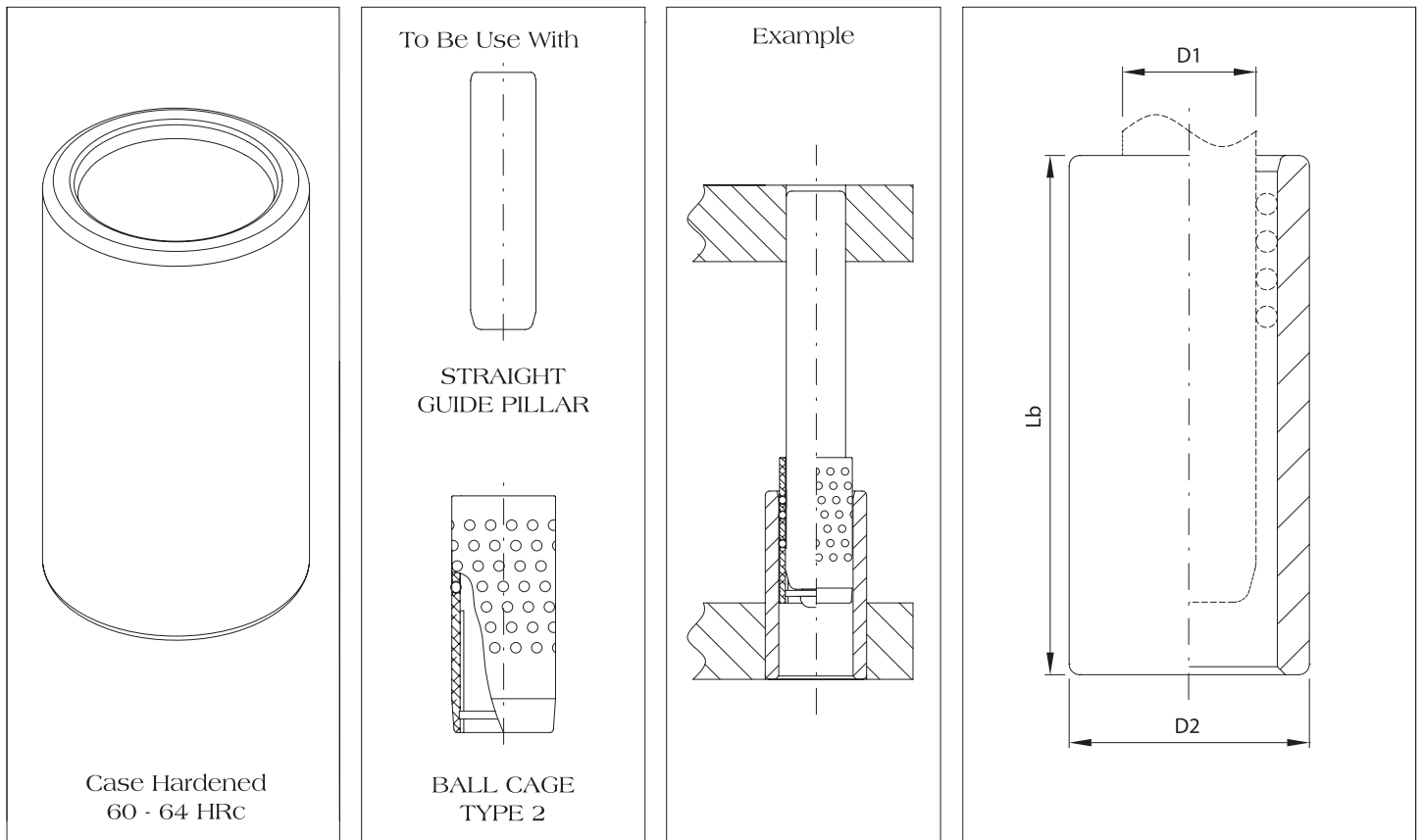


See pag. 32

D ₁	20	25	32	40	50	63	80*
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F	CATALOG NUMBER						
10	B13020010	B13025010	B13032010				
	B23020010	B23025010	B23032010				
14				B13040014	B13050014	B13063014	B13080014
				B23040014	B23050014	B23063014	B23080014

	DIMENSIONAL DATA						
E	18	23	30	38	48	61	78
L	28	33	40	52	62	75	92
D ₂		38	45	54	65	81	100
D ₃	29	36	43	50	64	79	99
D ₄	32.5	47	54	63	75	93	115
M	19.5	30	33.5	40	46	55	66
N	26.3	38.6	42	52	57.9	66.8	77.7
Q ₁	-	25.2	27	33.7	36.7	41.2	46.7
Q ₂		36.4	39.5	49	54.2	61.9	71.5
T	11.3	10.2		13.2			
X	6		10		20		32
KITS	B010050M2 + B05006001	B020060M3 + B05006001		B020080M3 + B05006001		B020080M4 + B05006001	



D ₁	25	32	40	50	63	80*
Lb	CATALOG NUMBER					
65	B30025065					
80	B30025080	B30032080	B30040080			
95	B30025095	B30032095	B30040095			
110	B30025110	B30032110	B30040110	B30050110		
130	B30025130	B30032130	B30040130	B30050130		
150		B30032150	B30040150	B30050150	B30063150	B30080150
170		B30032170	B30040170	B30050170	B30063170	B30080170
190			B30040190	B30050190	B30063190	B30080190
215			B30040215	B30050215	B30063215	B30080215
240				B30050240	B30063240	B30080240
265				B30050265	B30063265	B30080265
D ₂	45	54	65	81	95	112

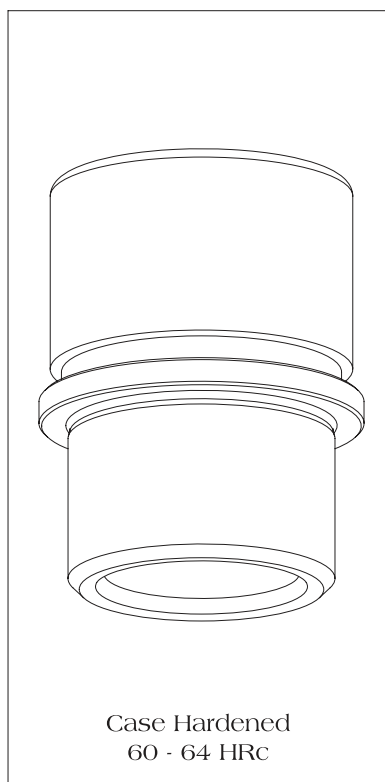
MDL Straight Sleeve Ball Cage Bushings should not be press-fit since close-in may occur. If properly installed, no honing is necessary.

MDL recommends that Straight Sleeve Ball Cage Bushings should be installed using Loctite 603.

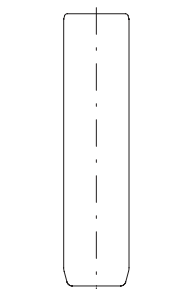
For selection of appropriate Sleeve Ball Cage Bushings length, see page 34/35.

Assembly Instructions:

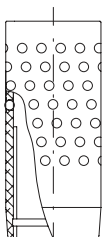
1. Press Guide Posts into Punch Holder Plate, End of Guide Posts with drill and tapped hole should not be pressed in.
2. Be sure Guide Posts are perpendicular to the surface of the Punch Holder (0.025 in 150 mm).
3. Mount Ball Cages on the Guide Pillar using Retainer Assembly supplied.
4. Place Die Shoe on a flat surface. For Big Die Sets we recommend using two horses to keep the bores accessible on both ends.
5. Place on Die Shoe two parallels having height as close as possible Minimum Shut Height.
6. Degrease Sleeve and Die Shoe Bore using appropriate solvent and wipe carefully.
7. Apply a thin layer of Loctite 603 on the Bores and Sleeves.
8. Position the Sleeve into Bore.
9. Bring the Punch Holder into position until it rests on the two parallels.
10. Check that the Sleeves are in the right position.
11. Allow the required time to harden: 4 hours at 22°C. Do not use Die Set during hardening process.



To Be Use With

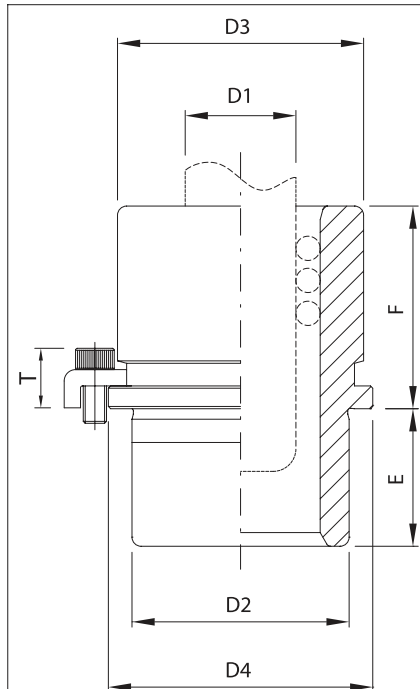
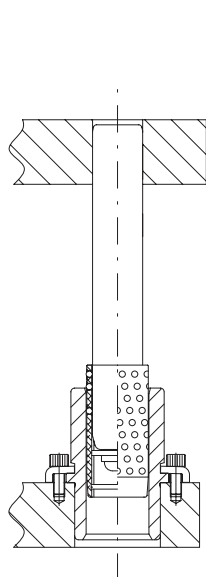


STRAIGHT
GUIDE PILLAR

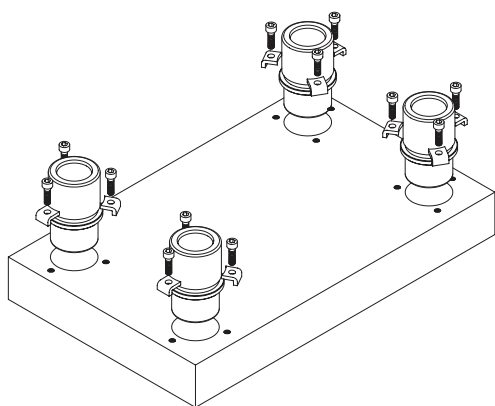


BALL CAGE
TYPE 2

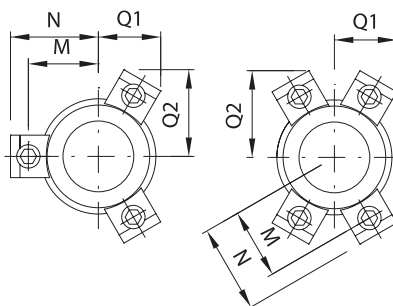
Example



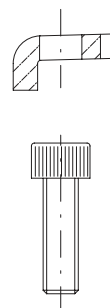
Assembly



Clamp Arrangements



Component Parts
Supplied

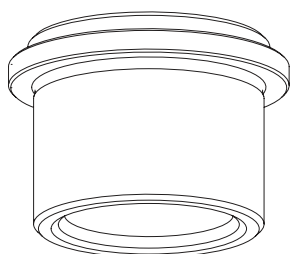


See pag. 32

D ₁	25	32	40	50	63	80*
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F	CATALOG NUMBER					
35	B41025035					
50	B41025050	B41032050	B41040050			
65	B41025065	B41032065	B41040065	B41050065		
80		B41032080	B41040080	B41050080		
100			B41040100	B41050100	B41063100	B41080100
120				B41050120	B41063120	B41080120
140					B41063140	B41080140
D ₂	45	54	65	81	95	112
D ₃	49	58	70	88	103	120
D ₄	54	63	75	93	108	125
E		30			50	
M	31	37	43	52	60	68
N	39.1	48.0	53.9	62.8	70.8	78.7
Q ₁	26.0	30.5	33.5	38.0	42.0	46.0
Q ₂	37.1	44.9	50.1	57.9	64.9	71.8
T	15.1			18.1		
KITS	B010060M3	B010080M3		B010080M4		

* Dia. 80[mm], Special Item.

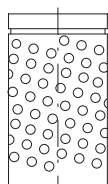


Case Hardened
60 - 64 HRC

To Be Use With

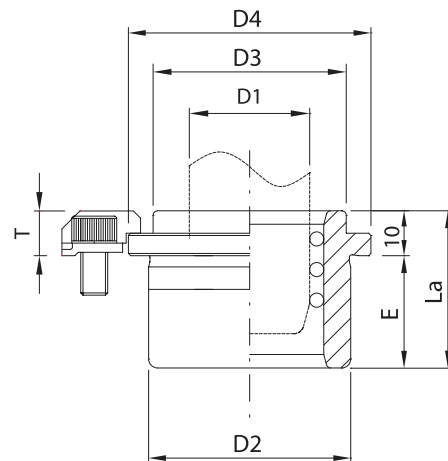
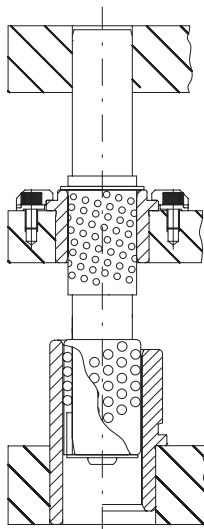


STRAIGHT
GUIDE PILLAR

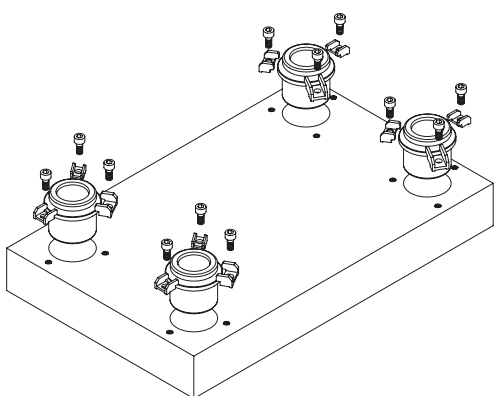


BALL CAGE
TYPE 3

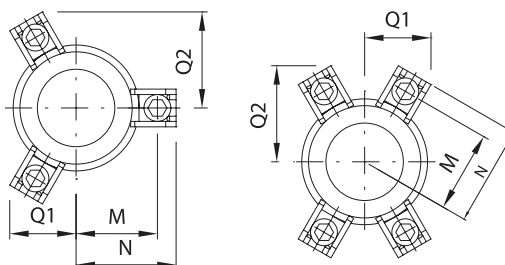
Examples



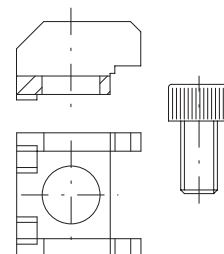
Assembly



Clamp Arrangements

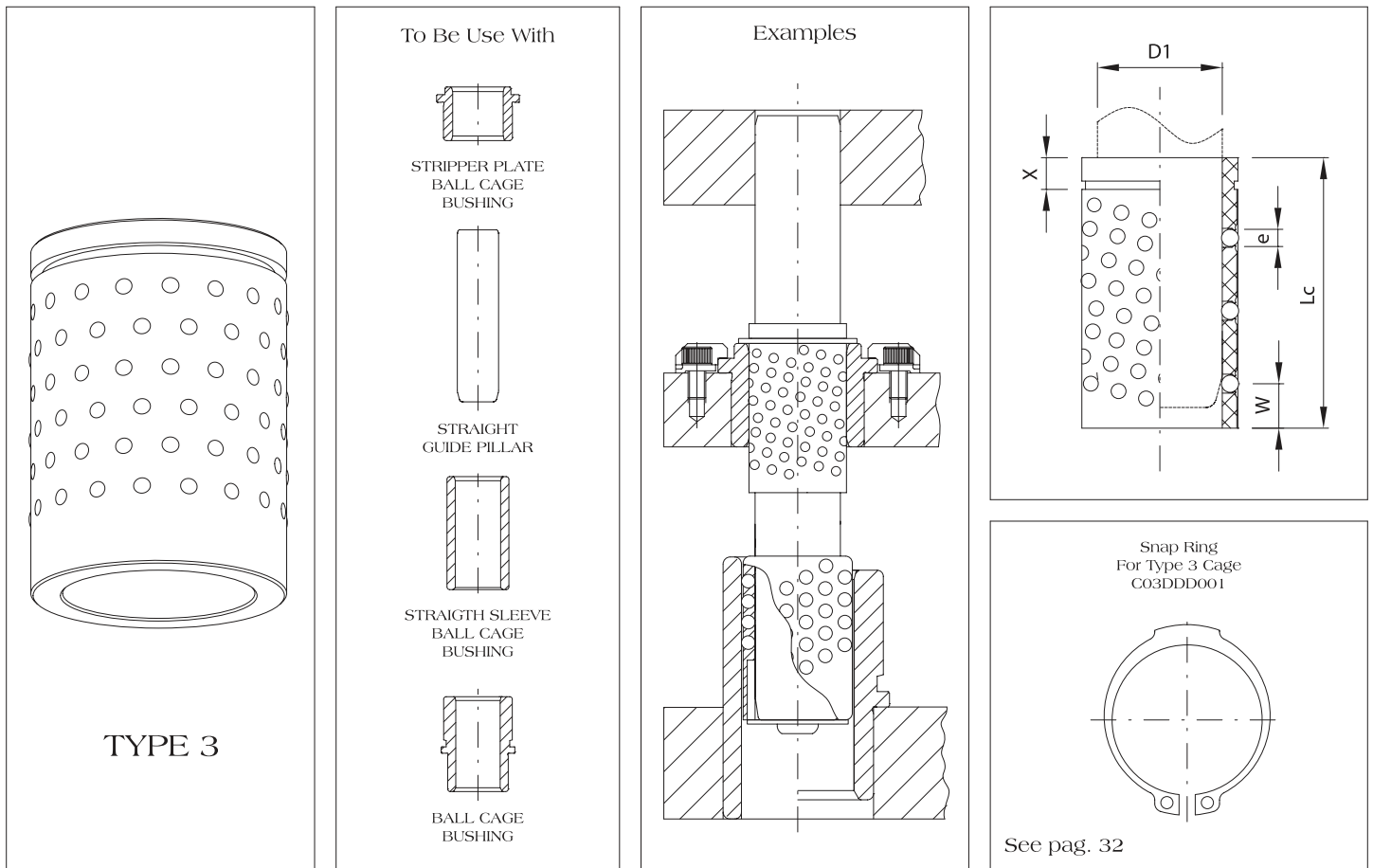


Component Parts
Supplied



See pag. 32

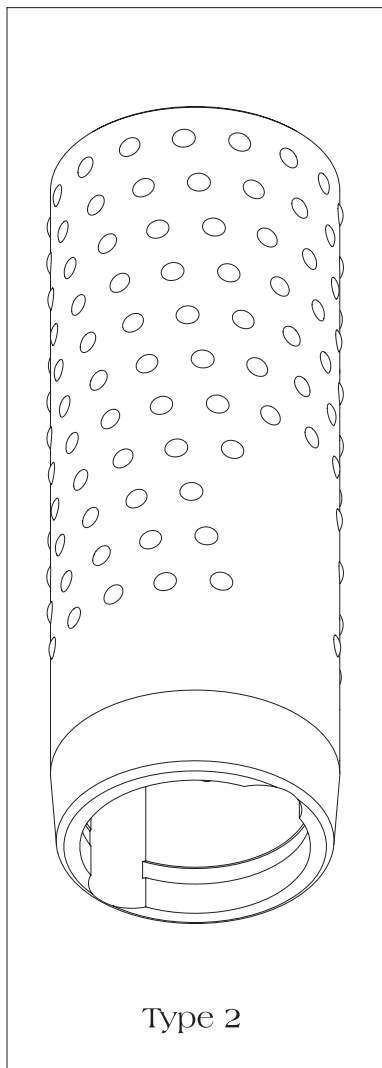
D_1	25	32	40	50
E	CATALOG NUMBER			
20	B43025030	B43032030		
25	B43025035	B43032035		
29		B43032039	B43040039	
32		B43032042	B43040042	
36			B43040046	B43050046
44			B43040054	B43050054
D_2	45	54	65	81
D_3	43	50	64	79
D_4	54	63	75	93
M	33.5	38.0	44.0	53.0
N	42.1	46.5	52.4	61.4
Q_1	27.0	29.3	32.3	36.8
Q_2	39.6	43.4	48.6	56.4
T	10,2		13,2	
KITS	B020060M3		B020060M4	



D _i	25	32	40	50
Lc	CATALOG NUMBER			
40	C13025040	C13032040		
52	C13025052	C13032052	C13040052	
63	C13025063	C13032063	C13040063	C13050063
80	C13025080	C13032080	C13040080	C13050080
100		C13032100	C130400100	
125			C13040125	
140				
X	4.2	4.9	5.7	6.7
e	4			6
W	5.0	5.3	4.8	5.6

Selection of Stripper Plate Ball Bearing Cage is based on Guide Post diameter, stroke of Stripper Plate (C) in relation to Plate where Guide Post is attached and lenght of Stripper Plate Ball Bearing Bushing used, according to the following formula:

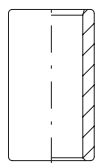
$$Lc \geq \frac{C}{2} + E + 10 + X$$



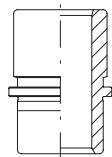
To Be Use With



STRAIGHT
GUIDE PILLAR

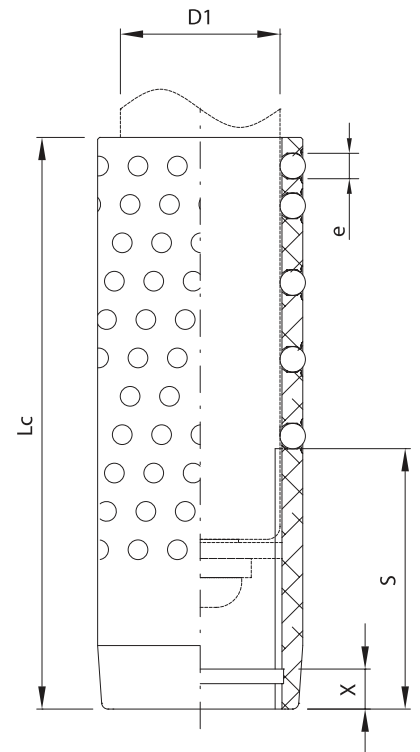
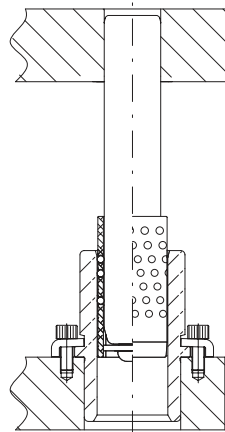
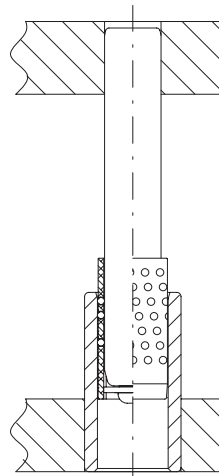


STRAIGHT SLEEVE
BALL CAGE
BUSHING

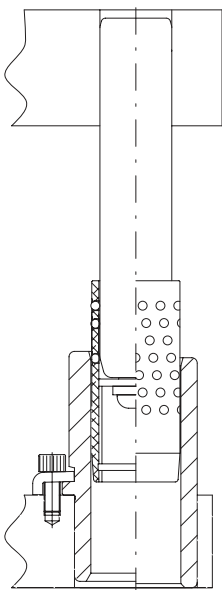


BALL CAGE
BUSHING

Examples

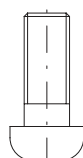
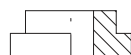
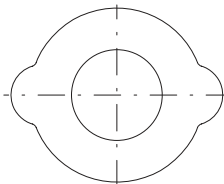
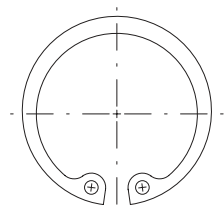


Assembly Type 2



To select Ball Cages
length, see page 34/35.

Type 2
Retainer Assembly
C02DDD000



MDL Ball Cages are manufactured from aluminum alloy heat treated tubing with tough and wear-resistant properties. Balls are made of bearing quality alloy steel through hardened and thoroughly inspected.

Operating Conditions:

Type 2:

In this condition at the upper end of the stroke, the Guide Pillar may leave the top end of the Bushing. When this happens the Cage starts to travel with the Guide Pillar. At the bottom end of stroke, the Guide Pillar and the Retainer Assembly cannot leave the lower end of the Cage due to a Snap Ring.

On type 2 condition, the Cage remains under pre-load with the Guide Pillar and the Bushing only when the lower end of the Guide Post goes below the top end of the Bushing.

To select Ball Cages length, see page 34/35.



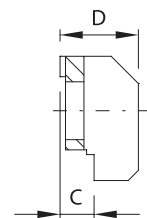
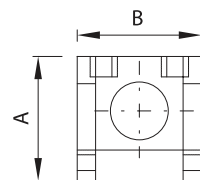
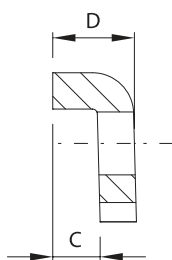
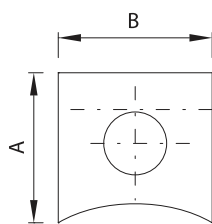
Ball Cages Type 2(Internal Circlip)

C12DDDLcLcLc

D ₁		25	32	40	50	63	80*
Lc	S	CATALOG NUMBER					
55	27	C12025055					
70	35	C12025070	C12032070				
	36			C12040070			
85	43			C12040085			
90	42	C12025090					
	43		C12032090				
100	50	C12025100					
			C12032105				
105	51			C12040105	C12050105		
110	60	C12025110					
			C12032115				
115	61			C12040115			
120					C12050120		
125	70		C12032125				
	71			C12040125			
135	80		C12032135				
	81			C12040135			
140	71				C12050140		
145	72					C12063145	C12080145
	91			C12040145			
150	81				C12050150		
155	103			C12040155			
160	91				C12050160		
165	82					C12063165	C12080165
170	103				C12050170		
180	92					C12063180	C12080180
185	116				C12050185		
190	105					C12063190	C12080190
195	128				C12050195		
205	117					C12063205	C12080205
215	130					C12063215	C12080215
X		4.2		5.8	7.0		8.5
e		4.0			6.0		

* Dia. 80[mm], Special Item.

CLAMPS



Clamps	B01005000	B01006000	B01008000		B02006000		B02008000	
A	12.3	15.5	19.8		18.3		24.6	
B	12.7	15.9	15.9		14.5		18.8	
C	3.2	4.9	4.9		5.0		5.0	
D	5.6	8.7	9.5		10.0		13.0	
Screws	A05005012 (M5x12)	A05006016 (M6x16)	A05008020 (M8x20)		A05006012 (M6x12)		A05008016 (M8x16)	
Quant.	2	3	3	4	3	4	3	4
KITS	B010050M2	B010060M3	B010080M3	B010080M4	B020060M3	B020060M3	B020080M3	B020080M4

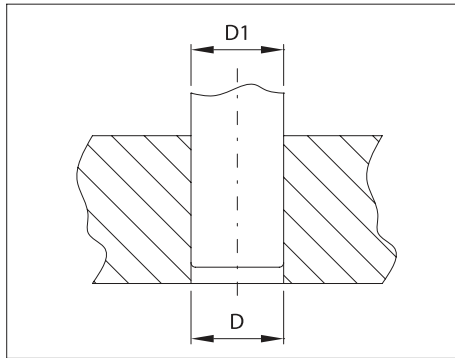
LUBRIFICATION FITTING	B05006001
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Used With Assembly Parts Type 2

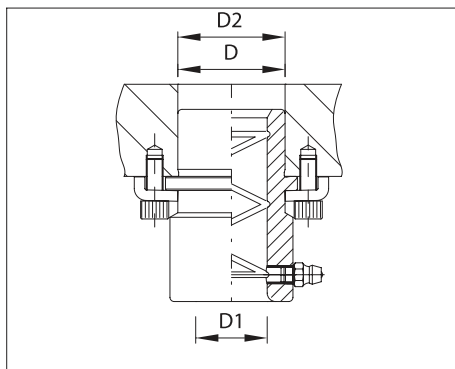
Ø Post	 A06 DIN 7380 A07 DIN 7984 Screws	 Retaining Washes Type 2	 Bushing Type 2	 Snap Ring Type 2	Type 2 Retainer Assembly (Screw, washer, Bushing and Snap Ring).	 Snap Ring Type 3
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Used With Assembly Type

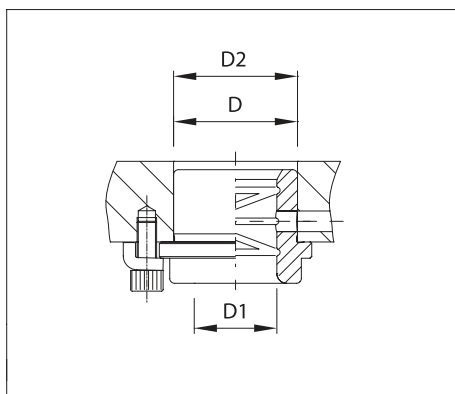
Type D ₁	2	2	2	2	Kit Type 2	Kit Type 3
25	A06006020 (M6x20)	C02025001	C02025002	C02025003	C02025000	C03025001
32	A06008020 (M8x20)	C02032001	C02032002	C02032003	C02032000	C03032001
40	A06010025 (M10x25)	C02040001	C02040002	C02040003	C02040000	C03040001
50	A06012030 (M12x30)	C02050001	C02050002	C02050003	C02050000	C03050001
63	A07016035 (M16x35)	C02063001	C02063002	C02063003	C02063000	C03063001
80	A07020040 (M20x40)	C02080001	C02080002	C02080003	C02080000	C03080001



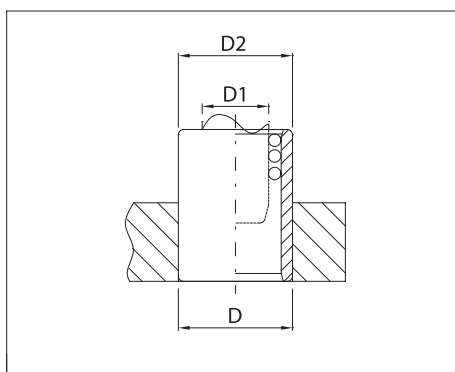
STRAIGHT GUIDE POSTS P10							
D_1	20	25	32	40	50	63	80
D	$\frac{19.976}{19.963}$	$\frac{24.976}{24.963}$	$\frac{31.971}{31.955}$	$\frac{39.971}{39.955}$	$\frac{49.971}{49.955}$	$\frac{62.965}{62.946}$	$\frac{79.963}{79.944}$



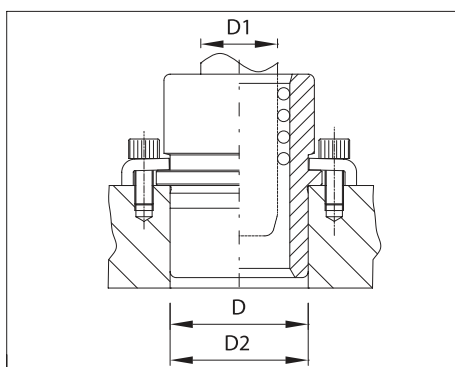
SHOULDER BUSHINGS B11/B21							
D_1	20	25	32	40	50	63	80
D_2	28	38	45	54	65	81	100
D	$\frac{28.013}{28.000}$	$\frac{38.016}{38.000}$	$\frac{45.016}{45.000}$	$\frac{54.019}{54.000}$	$\frac{65.019}{65.000}$	$\frac{81.022}{81.000}$	$\frac{100.022}{100.000}$



LOW PROFILE BUSHINGS B13/B23							
D_1	20	25	32	40	50	63	80
D_2	28	38	45	54	65	81	100
D	$\frac{28.013}{28.000}$	$\frac{38.016}{38.000}$	$\frac{45.016}{45.000}$	$\frac{54.019}{54.000}$	$\frac{65.019}{65.000}$	$\frac{81.022}{81.000}$	$\frac{100.022}{100.000}$



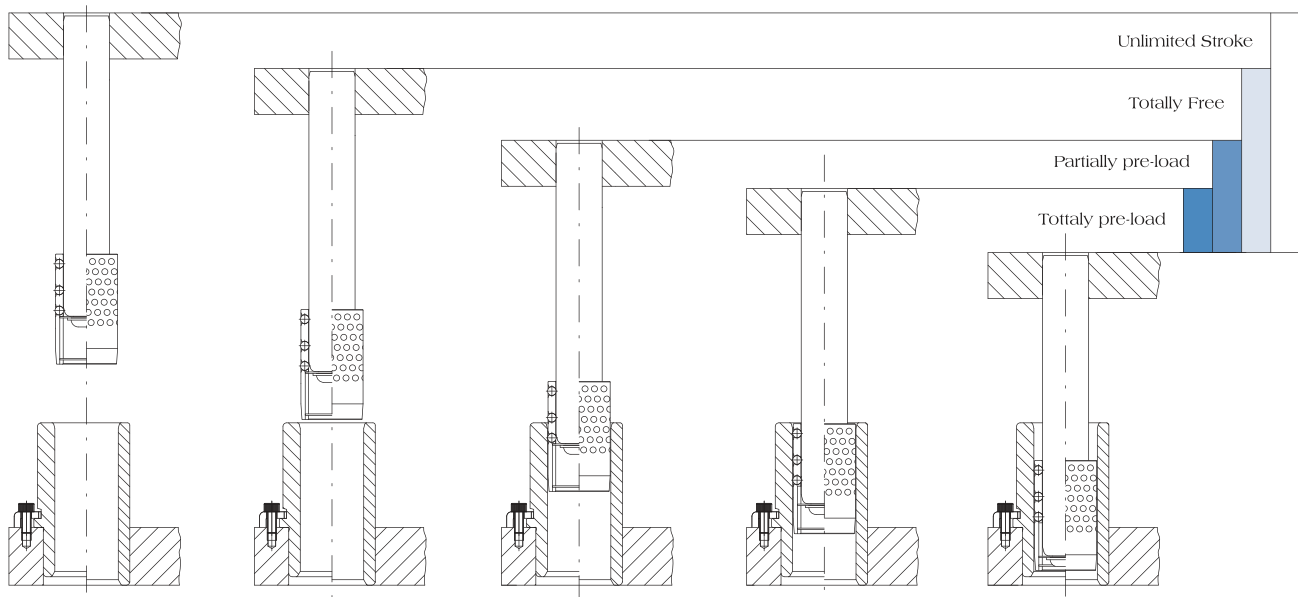
STRAIGHT SLEEVE BALL BEARING BUSHING B30						
D_1	25	32	40	50	63	80
D_2	45	54	65	81	95	112
D	$\frac{45.016}{45.000}$	$\frac{54.019}{54.000}$	$\frac{65.019}{65.000}$	$\frac{81.022}{81.000}$	$\frac{95.022}{95.000}$	$\frac{112.022}{112.000}$



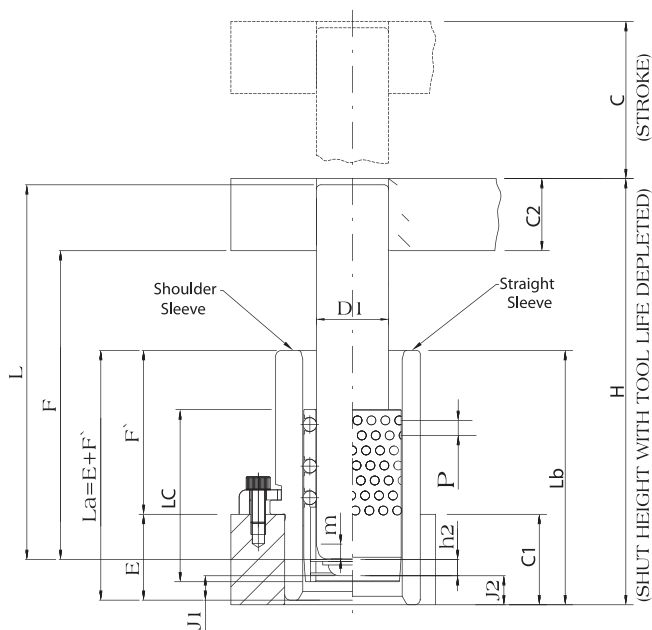
BALL BEARING BUSHING B41 / B43						
D_1	25	32	40	50	63	80
D_2	45	54	65	81	95	112
D	$\frac{45.016}{45.000}$	$\frac{54.019}{54.000}$	$\frac{65.019}{65.000}$	$\frac{81.022}{81.000}$	$\frac{95.022}{95.000}$	$\frac{112.022}{112.000}$

Type 2: The cage pre-load can vary from partial pre-load up to totally free, according to selected conditions.

Operating
Conditions



Guide Post Length Calculation See Below.



Selection of Ball Cage Bushings and Cages for Type 2 is based on Guide Pillar diameter and stroke of tool using chart of page 35.

1. Select desired Guide Pillar diameter "D1".
2. Select required stroke of tool "C"(don't forget to add grinding allowance of tool to press stroke).
3. Move down the stroke column until you reach the color of desired operating condition.
4. Move horizontally to the left to select the length of one Ball Cage Bushing and Cage

On Type 2, each Ball Cage length corresponds to one Ball Cage Bushing and length.

Caution: Length of Ball Cage Bushing is limited by space available between the plates of the Die Set. To check interference, use formula on page down label as "CAUTION".

Calculations for Guide Pillar Length

Calculations for Guide Pillar Length							
Straight Sleeve				Shoulder Sleeve			
L=H - h - J2				L= H - J1 - h - C1 + E			
CAUTION: H>C2+Lb				CAUTION: H>C1+C2+F'			
NB: h=h2 (for type 2); for E see page 27; J1=J2=4							
For Straight Guide Pillar, if calculated length (L) is not available: Select the immediately longer Guide Pillar and cut it or select the immediately shorter Guide Pillar and press it on the Punch Holder of Die Set until exact length is obtained.	D1	25	32	40	50	63	80
	a	14.5	14.0	14.5	15.5		
	h1	5.8	6.9	8.0	9.1	12.5	15.0
	h2	9.3	10.4	11.5	12.6	16.0	18.5



Type 2 Bushing & Ball Cage Selection Chart



PILLAR Dia.	Ball Cage Bushing		Ball Cage (pag. 30)	Stroke "C" Including Die Grinding Allowance															
	Shoulder Sleeve (pag. 27)	Straight Sleeve (pag. 26)		10				50				100				150			
				F	Lb	Lc													
D1	F	Lb	Lc																
25	35	65	55																
	50	80	70																
	65	95	90																
		110	100																
		130	110																
32	50	80	70																
	65	95	90																
	80	110	105																
		130	115																
		150	125																
		170	135																
40	50	80	70																
	65	95	85																
	80	110	105																
	100	130	115																
		150	125																
		170	135																
		190	145																
		215	155																
50	65	110	105																
	80	130	120																
	100	150	140																
	120	170	150																
		190	160																
		215	170																
		240	185																
		265	195																
63	100	150	145																
	120	170	165																
	140	190	180																
		215	190																
		240	205																
		265	215																
80	100	150	145																
	120	170	165																
	140	190	180																
		215	190																
		240	205																
		265	215																

PRODUCT LINE

- Compression Springs
- Die Sets
- Die Sets Components

SERVICE LINE

- "Blanchard" Grinder
(Up to 2500[mm] of Diagonal x 900[mm] of Height)
- Machining Center
(Up to 3000[mm] x 1500[mm] x 500[mm])
- Provide Steel Plates Machined According to Drawing
- Steel Plate Machining



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