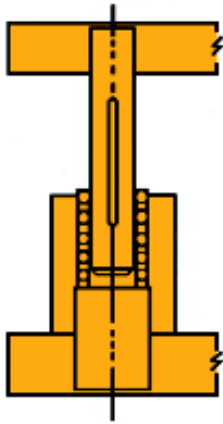




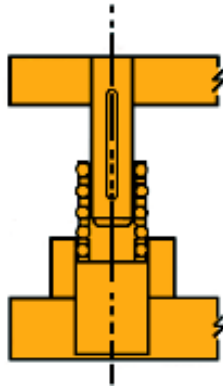
BALL BEARING COMPONENTS

In component selection varied characteristics must be taken into consideration when selecting length of guide post, bushing and ball bearing retainer, such as stroke, shut height and type of operation. To help in your selection we have supplied engineering data and instructions that should be used as a guide when making your component selection. The following conditions should be considered for the most effective performance in a specific application.



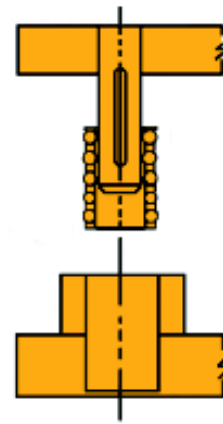
FULL CONTACT PRE-LOAD

In this condition the guide post, bushing and ball bearing retainer remain in full contact throughout the stroke cycle. This selection is beneficial and recommended for high speed, high production, short stroke dies.



PRE-LOAD RELIEVED AT TOP OF STROKE

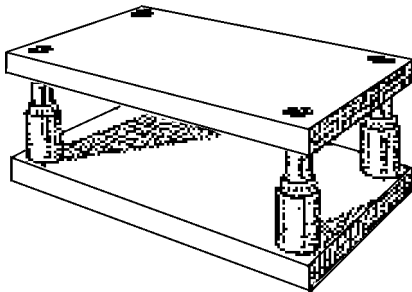
This may be accomplished by selecting the guide post bushing length that allows the guide post to disengage the bushing at the beginning of the stroke or cycle. This will result in the loss of pre-load while the ball retainer is still within the bushing. This condition may be utilized with long stroke dies. It also provides safe operation by eliminating pinch points and prevents foreign materials from entering the bushing. A further benefit is it allows for re-registration of the ball retainer on each stroke. Removal of the punch holder or die holder from press is possible without total removal of dies.



FULL DISENGAGEMENT

This condition is permissible when the ball retainer must totally disengage the bushing on applications requiring long strokes. Safety precautions (as outlined on page 5) should always be taken when employing this method.

It should also be noted the the above illustration depicts the proper way to assemble (insert) the guide post and ball bearing retainer into the bushing.



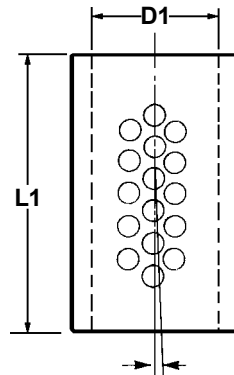
We are committed to satisfying our customers by finding new and better ways to design, manufacture and distribute quality products.

When in a pre-loaded (rolling press fit) condition, the ball retainer will travel half the distance of movement. In a die set application it would be half the distance of the press stroke.

**BALL BEARING ASSEMBLY
LUBRICATION RECOMMENDATION**

In operation of ball assembly, add lubricant once each 8-hour shift by spray or brush application. Use a lightweight spindle oil like Lamina Ball Lube.

NEVER USE GREASE



Radial Placement
reduces wear and
tracking

Lamina ball retainers (AR1) are made of a heat treated aluminum alloy that combines lightness and strength.

Each retainer is quality inspected for dimensional tolerance and all burrs are removed prior to ball insertion.

Ball bearings are of the highest quality AAA1 Grade (25 millionth class), continually inspected to meet our exacting tolerance.

After the ball bearings have been inserted into the retainer, they are then staked using Lamina's unique method that allows free movement with maximum security.

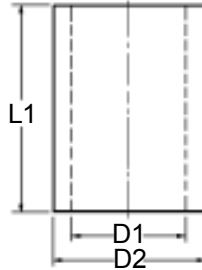
After staking, the retainers are then scrubbed to remove all metal particles that could cause accelerated tracking and grooving in the post and bushing.

Ball bearings are placed in retainers in an off-line radial pattern that offers optimum life in high or low speed presses.

Ball retainers are fastened to the guide post by means of a set screw and slot in guide post and are interchangeable with all other manufacturers using this method.

PART NUMBER	D1	L1
AR1-0606	3/4"	1.50
AR1-0607		1.75
AR1-0608		2.00
AR1-0609		2.25
AR1-0610		*2.50
AR1-0806	1"	1.50
AR1-0807		1.75
AR1-0808		2.00
AR1-0809		2.25
AR1-0810		*2.50
AR1-1008	1-1/4"	2.00
AR1-1009		2.25
AR1-1010		2.50
AR1-1011		2.75
AR1-1012		3.00
AR1-1013		*3.25
AR1-1210	1-1/2"	2.50
AR1-1211		2.75
AR1-1212		3.00
AR1-1213		3.25
AR1-1214		3.50
AR1-1215		*3.75
AR1-1411	1-3/4"	2.75
AR1-1412		3.00
AR1-1413		3.25
AR1-1414		3.50
AR1-1415		3.75
AR1-1416		4.00
AR1-1417		*4.25
AR1-1613	2	3.25
AR1-1614		3.50
AR1-1615		3.75
AR1-1616		4.00
AR1-1617		4.25
AR1-1618		*4.50
AR1-2020	2-1/2	5.00
AR1-2022		5.50
AR1-2024		6.00
AR1-2026		6.50
AR1-2028		*7.00
AR1-2420	3	5.00
AR1-2424		6.00
AR1-2428		*7.00

An asterisk (*) designates that the retainer length is recommended for general die set applications. Lengths not marked with an asterisk are for limited space use and special applications.



Lamina's Ball Bearing Guide Assembly Bushings (AB1) are made from vacuum degassed chrome alloy steel, hardened to precise Rockwell limits to give minimum tracking, grooving and downtime.

Lamina's ball bushings are ground and honed to exacting tolerance limits. Using high tech electronic and air checking instruments on I.D. and O.D. make them interchangeable and do not require select fitting.

The top is chamfered on I.D. to minimize wear and aid alignment when disengagement is required.

To minimize bushing close-in which is a result of press fit and to eliminate any additional grinding or honing, boring instructions are provided in this catalog.

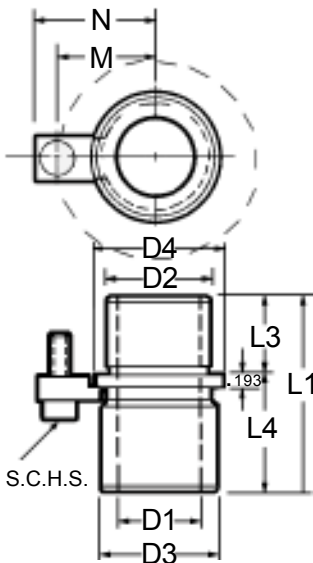
Note: Straight sleeve bushings are 1/8" shorter than nominal.

PART NUMBER	NOM PIN DIA	D1	D2	L1	PART NUMBER	NOM PIN DIA	D1	D2	L1	PART NUMBER	NOM PIN DIA	D1	D2	L1
AB1-0607	3/4"	1.1258	1.387	1.75	AB1-1212	1-1/2"	1.8765	2.437	3.00	AB1-1612	2"	2.5015	3.162	3.00
AB1-0608				2.00	AB1-1213				3.25	AB1-1614				3.50
AB1-0609				2.25	AB1-1214				3.50	AB1-1615				3.75
AB1-0610				2.50	AB1-1215				3.75	AB1-1616				4.00
AB1-0611				2.75	AB1-1216				4.00	AB1-1617				4.25
AB1-0612				3.00	AB1-1217				4.25	AB1-1618				4.50
AB1-0613				3.25	AB1-1218				4.50	AB1-1619				4.75
AB1-0614				3.50	AB1-1219				4.75	AB1-1620				5.00
AB1-0615				3.75	AB1-1220				5.00	AB1-1621				5.25
AB1-0616				4.00	AB1-1221				5.25	AB1-1622				5.50
AB1-0618				4.50	AB1-1222				5.50	AB1-1624				6.00
AB1-0620				5.00	AB1-1224				6.00	AB1-1626				6.50
AB1-0624				6.00	AB1-1226				6.50	AB1-1628				7.00
					AB1-1228					AB1-1630				7.50
					AB1-1230					AB1-1632				8.00
					AB1-1232					AB1-1634				8.50
AB1-0808	1"	1.3768	1.717	2.00	AB1-1234				8.50	AB1-1636				9.00
AB1-0809				2.25	AB1-1236	9.00	AB1-1638	9.50						
AB1-0810				2.50	AB1-1240	10.00	AB1-1640	10.00						
AB1-0811				2.75	AB1-1242	10.50	AB1-1642	10.50						
AB1-0812				3.00	AB1-1244	11.00	AB1-1644	11.00						
AB1-0813				3.25	AB1-1248	12.00	AB1-1648	12.00						
AB1-0814				3.50			AB1-1652	13.00						
AB1-0815				3.75			AB1-1656	14.00						
AB1-0816				4.00										
AB1-0817				4.25			AB1-2024	6.00						
AB1-0818				4.50			AB1-2026	6.50						
AB1-0819				4.75			AB1-2028	7.00						
AB1-0820				5.00			AB1-2030	7.50						
AB1-0822	5.50			AB1-2032	8.00									
AB1-0824	6.00			AB1-2034	8.50									
AB1-0826	6.50			AB1-2036	9.00									
AB1-0828	7.00			AB1-2038	9.50									
				AB1-2040	10.00									
				AB1-2042	10.50									
				AB1-2044	11.00									
				AB1-2048	12.00									
				AB1-2052	13.00									
				AB1-2056	14.00									
				AB1-2424	6.00									
				AB1-2426	6.50									
				AB1-2428	7.00									
				AB1-2430	7.50									
				AB1-2432	8.00									
				AB1-2434	8.50									
				AB1-2436	9.00									
				AB1-2438	9.50									
				AB1-2440	10.00									
				AB1-2442	10.50									
				AB1-2444	11.00									
				AB1-2448	12.00									
				AB1-2452	13.00									
				AB1-2456	14.00									
AB1-1010	1-1/4"	1.6265	2.107	2.50	AB1-1412	1-3/4"	2.1265	2.747	3.00					6.00
AB1-1011				2.75	AB1-1414				3.50					6.50
AB1-1012				3.00	AB1-1415				3.75					7.00
AB1-1013				3.25	AB1-1416				4.00					7.50
AB1-1014				3.50	AB1-1417				4.25					8.00
AB1-1015				3.75	AB1-1418				4.50					8.50
AB1-1016				4.00	AB1-1419				4.75					9.00
AB1-1017				4.25	AB1-1420				5.00					9.50
AB1-1018				4.50	AB1-1421				5.25					10.00
AB1-1019				4.75	AB1-1422				5.50					10.50
AB1-1020				5.00	AB1-1424				6.00					11.00
AB1-1022				5.50	AB1-1426				6.50					12.00
AB1-1024				6.00	AB1-1428				7.00					13.00
AB1-1026	6.50	AB1-1430	7.50					14.00						
AB1-1028	7.00	AB1-1432	8.00											
AB1-1032	8.00	AB1-1434	8.50											
AB1-1036	9.00	AB1-1436	9.00											
		AB1-1438	9.50											
		AB1-1440	10.00											
		AB1-1442	10.50											
		AB1-1444	11.00											
		AB1-1448	12.00											
		AB1-1452	13.00											



* When ordering unground Demountable Ball Bearing Bushings please use the prefix ABD. The flange must be ground flat when grinding the D2 dimension to assure a square surface when seating the bushing.

Note: Shoulder bushings are 1/8" shorter than nominal



REPLACEMENT KITS CLAMPS & SCREWS			
PART NUMBER	Nom Pin Diameters	# Clamps & Screws per Kit	No of Kits Needed
CSK200003	1"	3	1
CSK200003	1 1/4" - 1 1/2"	3	1
CSK200002	1 3/4" - 3"	2	2

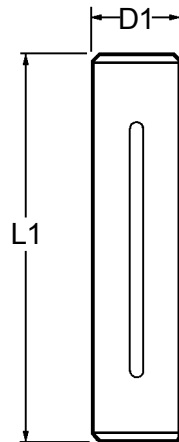
Toe clamps and socket head screws are provided to hold the bushings in place.

Demountable shoulder bushings offer all the advantages of straight sleeve bushings and combine them with the convenience of easy assembly and disassembly.

These clamp type bushings are meant to be wring fit into the die shoe and should never be forced or inserted by hammering.

ABD unground demountable bushings are available with .015 grind stock on the "D2" dimension. Specify when ordering.

PART NUMBER	Nom Pin Dia	Inside Dia D1	D2	D3	D4	L1	L3	L4	M	N								
ABG0808	1	1.3768	1.716	1.920	1.995	2.00	1.125	0.875	1.218	1.594								
ABG0809						2.25		1.125										
ABG0811						2.75		1.625										
ABG0812						3.00		1.875										
ABG0813						3.25		2.125										
ABG0814						3.50		2.375										
ABG0815	3.75	2.625																
ABG1010	1-1/4	1.6265	2.106	2.280	2.355	2.50	1.125	1.375	1.406	1.781								
ABG1011						2.75		1.625										
ABG1012						3.00		1.875										
ABG1013						3.25		2.125										
ABG1014						3.50		2.375										
ABG1015						3.75		2.625										
ABG1016						4.00		2.875										
ABG1017						4.25		3.125										
ABG1018						4.50		3.375										
ABG1020						5.00		3.875										
ABG1022	5.50	4.375																
ABG1024	6.00	4.875																
ABG1212	1-1/2	1.8765	2.436	2.600	2.675	3.00	1.375	1.625	1.562	1.937								
ABG1213						3.25		1.875										
ABG1214						3.50		2.125										
ABG1215						3.75		2.375										
ABG1216						4.00		2.625										
ABG1217						4.25		2.875										
ABG1218						4.50		3.125										
ABG1219						4.75		3.375										
ABG1220						5.00		3.625										
ABG1222						5.50		4.125										
ABG1224						6.00		4.625										
ABG1412						1-3/4		2.1265			2.746	2.920	2.995	3.00	1.375	1.625	1.718	2.094
ABG1414	3.50	2.125																
ABG1416	4.00	2.625																
ABG1417	4.25	2.875																
ABG1418	4.50	3.125																
ABG1419	4.75	3.375																
ABG1420	5.00	3.625																
ABG1421	5.25	3.875																
ABG1422	5.50	4.125																
ABG1424	6.00	4.625																
ABG1426	6.50	5.125																
ABG1428	7.00	5.625																
ABG1430	7.50	6.125																
ABG1612	2	2.5015	3.161	3.500	3.565	3.00	1.375	1.625	2.000	2.375								
ABG1614						3.50		2.125										
ABG1615						3.75		2.375										
ABG1616						4.00		2.625										
ABG1617						4.25		2.875										
ABG1618						4.50		3.125										
ABG1619						4.75		3.375										
ABG1620						5.00		3.625										
ABG1621						5.25		3.875										
ABG1622						5.50		4.125										
ABG1624						6.00		4.625										
ABG1626						6.50		5.125										
ABG1628						7.00		5.625										
ABG1630						7.50		6.125										
ABG2020	2-1/2	3.0015	3.681	4.000	4.075	5.00	1.375	3.625	2.250	2.625								
ABG2022						5.50		4.125										
ABG2024						6.00		4.625										
ABG2026						6.50		5.125										
ABG2028						7.00		5.625										
ABG2030						7.50		6.125										
ABG2420	3	3.5015	4.181	4.500	4.575	5.00	1.375	3.625	2.500	2.875								
ABG2422						5.50		4.125										
ABG2424						6.00		4.625										
ABG2426						6.50		5.125										
ABG2428						7.00		5.625										
ABG2430						7.50		6.125										



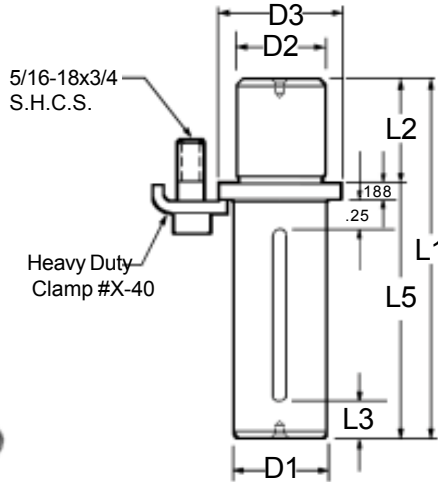
Lamina's Precision Guide Posts (AP1) for ball bearing assemblies are made from chrome alloy steel, hardened to provide maximum protection against tracking and accelerated wear.

Ground to a high degree of tolerance accuracy that also provides a smooth hard wearing surface to assure free rolling of balls to maintain constant, predictable preload and complete interchangeability, not only with our own but other manufacturers' also.

Boring instructions for press fit are provided in this catalog.

Note: Guide posts are 1/8" shorter than nominal.

PART NUMBER	D1	L1	PART NUMBER	D1	L1	PART NUMBER	D1	L1
AP1-0612	3/4" (.753)	3.00	AP1-1218	1-1/2" (1.503)	4.50	AP1-1622	2" (2.003)	5.50
AP1-0613		3.25	AP1-1219		4.75	AP1-1623		5.75
AP1-0614		3.50	AP1-1220		5.00	AP1-1624		6.00
AP1-0615		3.75	AP1-1221		5.25	AP1-1625		6.25
AP1-0616		4.00	AP1-1222		5.50	AP1-1626		6.50
AP1-0617		4.25	AP1-1223		5.75	AP1-1627		6.75
AP1-0618		4.50	AP1-1224		6.00	AP1-1628		7.00
AP1-0619		4.75	AP1-1226		6.50	AP1-1629		7.25
AP1-0620		5.00	AP1-1228		7.00	AP1-1630		7.50
AP1-0622		5.50	AP1-1230		7.50	AP1-1631		7.75
AP1-0624	6.00	AP1-1232	8.00	AP1-1632	8.00			
			AP1-1234		8.50	AP1-1634		8.50
			AP1-1236		9.00	AP1-1636		9.00
AP1-0815	1" (1.003)	3.75	AP1-1238		9.50	AP1-1638		9.50
AP1-0816		4.00	AP1-1240		10.00	AP1-1640		10.00
AP1-0817		4.25	AP1-1242		10.50	AP1-1642		10.50
AP1-0818		4.50	AP1-1244		11.00	AP1-1644		11.00
AP1-0819		4.75	AP1-1246		11.50	AP1-1646		11.50
AP1-0820		5.00	AP1-1248		12.00	AP1-1648		12.00
AP1-0821		5.25	AP1-1250		12.50	AP1-1650		12.50
AP1-0822		5.50	AP1-1251		13.00	AP1-1652		13.00
AP1-0823		5.75	AP1-1256		14.00	AP1-1656		14.00
AP1-0824		6.00				AP1-1660		15.00
AP1-0826		6.50				AP1-1664		16.00
AP1-0828		7.00				AP1-1668		17.00
AP1-0830		7.50	AP1-1420		5.00	AP1-1672		18.00
AP1-0832		8.00	AP1-1421		5.25			
AP1-0834		8.50	AP1-1422		5.50	AP1-2032	2-1/2" (2.503)	8.00
AP1-0836		9.00	AP1-1423		5.75	AP1-2034		8.50
		AP1-1424		6.00	AP1-2036	9.00		
		AP1-1425		6.25	AP1-2040	10.00		
		AP1-1426		6.50	AP1-2044	11.00		
		AP1-1428		7.00	AP1-2048	12.00		
AP1-1018	1-1/4" (1.253)	4.50	AP1-1430		7.50	AP1-2052		13.00
AP1-1019		4.75	AP1-1432		8.00	AP1-2056		14.00
AP1-1020		5.00	AP1-1434		8.50	AP1-2068		17.00
AP1-1021		5.25	AP1-1436		9.00	AP1-2080		20.00
AP1-1022		5.50	AP1-1438		9.50			
AP1-1023		5.75	AP1-1440		10.00	AP1-2432	3" (3.003)	8.00
AP1-1024		6.00	AP1-1442		10.50	AP1-2434		8.50
AP1-1026		6.50	AP1-1444		11.00	AP1-2436		9.00
AP1-1028		7.00	AP1-1446		11.50	AP1-2440		10.00
AP1-1030		7.50	AP1-1448		12.00	AP1-2444		11.00
AP1-1032		8.00	AP1-1450		12.50	AP1-2448		12.00
AP1-1034		8.50	AP1-1452		13.00	AP1-2452		13.00
AP1-1036		9.00	AP1-1456		14.00	AP1-2456		14.00
AP1-1040		10.00	AP1-1460		15.00	AP1-2468		17.00
AP1-1044		11.00	AP1-1468		17.00	AP1-2480		20.00
AP1-1048		12.00						



Designed to expedite die repair, these Ball Bearing flanged guide posts offer:

- Large savings in maintenance, repair costs and downtime
- Wide variety of sizes
- Long, trouble free production runs
- Highest quality workmanship and materials
- "D2" dimension is finished ground.*

*When ordering unground Demountable Ball Bearing Pins, please use the prefix APD. The flange must be ground flat when grinding the D2 dimension to assure a square surface when seating the pin.

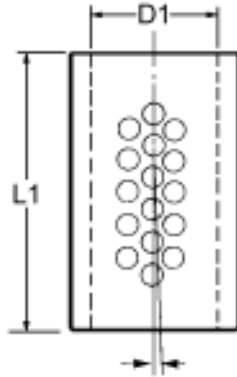
REPLACEMENT KITS CLAMPS & SCREWS			
PART NUMBER	Nom Pin Diameters	# Clamps & Screws per Kit	No of Kits Needed
CSK200003	1"	3	1
CSK200003	1¼" - 1½"	3	1
CSK200002	1¾" - 3"	2	2

PART NUMBER	D1	D2	D3	L1	L2	L3	L5	PART NUMBER	D1	D2	D3	L1	L2	L3	L5
APG0815				3.625			2.437	APG1626				6.375		1.375	4.437
APG0819				4.625			3.437	APG1627				6.625		1.375	4.687
APG0820				4.875			3.687	APG1628				6.875		1.625	4.937
APG0821				5.125			3.937	APG1629				7.125		1.625	5.187
APG0824	1.0030	1.0011	1.312	5.875	1.188	.875	4.687	APG1630				7.375		1.625	5.437
APG0826	1.0027	1.0006		6.375			5.187	APG1632				7.875		1.625	5.937
APG0828				6.875			5.687	APG1634				8.375		1.625	6.437
APG0830				7.375			6.187	APG1636				8.875		1.625	6.937
APG0836				8.875			7.687	APG1638				9.375		1.875	7.437
APG1021				5.125			3.937	APG1640	2.0031	2.0011	2.500	9.875	1.938	1.875	7.937
APG1022				5.375		.875	4.187	APG1642	2.0028	2.0006		10.375		1.875	8.437
APG1023				5.625		.875	4.437	APG1644				10.875		1.875	8.937
APG1026	1.2530	1.2511	1.562	6.375	1.188	.875	5.187	APG1648				11.875		1.875	9.937
APG1028	1.2527	1.2506		6.875		.875	5.687	APG1650				12.375		1.875	10.437
APG1030				7.375		.875	6.187	APG1652				12.875		1.875	10.937
APG1032				7.875		1.125	6.687	APG1656				13.875		1.875	11.937
APG1034				8.375		1.125	7.187	APG1660				14.875		1.875	12.937
APG1036				8.875		1.125	7.687	APG1664				15.875		1.875	13.937
APG1218				4.375		1.125	2.937	APG1668				16.875		1.875	14.937
APG1222				5.375		1.125	3.937	APG1672				17.875		1.875	15.937
APG1223				5.625		1.125	4.187	APG2032				7.875		2.375	5.937
APG1224				5.875		1.125	4.437	APG2034				8.375		2.375	6.437
APG1226				6.375		1.125	4.937	APG2036				8.875		2.375	6.937
APG1228	1.5030	1.5011	1.875	6.875	1.438	1.125	5.437	APG2040				9.875		2.375	7.937
APG1230	1.5027	1.5006		7.375		1.375	5.937	APG2044	2.5031	2.5011	3.000	10.875	1.938	2.375	8.937
APG1234				8.375		1.375	6.937	APG2048	2.5028	2.5006		11.875		2.375	9.937
APG1236				8.875		1.375	7.437	APG2052				12.875		2.375	10.937
APG1238				9.375		1.375	7.937	APG2056				13.875		2.375	11.937
APG1242				10.375		1.375	8.937	APG2068				16.875		2.375	14.937
APG1424				5.875		1.375	4.187	APG2080				19.875		2.375	17.937
APG1428				6.875		1.375	5.187	APG2432				7.875		1.875	5.437
APG1430				7.375		1.375	5.687	APG2434				8.375		1.875	5.937
APG1432				7.875		1.375	6.187	APG2436				8.875		1.875	6.437
APG1434	1.7530	1.7511	2.250	8.375	1.688	1.375	6.687	APG2440				9.875		2.375	7.437
APG1436	1.7527	1.7506		8.875		1.375	7.187	APG2444	3.0031	3.0011	3.500	10.875	2.438	2.375	8.437
APG1438				9.375		1.625	7.687	APG2448	3.0028	3.0006		11.875		2.375	9.437
APG1440				9.875		1.625	8.187	APG2452				12.875		2.875	10.437
APG1442				10.375		1.625	8.687	APG2456				13.875		2.875	11.437
APG1448				11.875		1.625	10.187	APG2468				16.875		2.875	14.437
								APG2480				19.875		2.875	17.437

METRIC



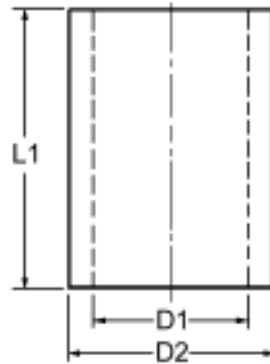
- Aluminum
- AAA1 Grade Ball Bearings
- Off-line radial pattern
- Set-screw and slot fastening



BALL BEARING RETAINERS – METRIC			
PART NUMBER	Nom Pin Diameter D1	LENGTH L1	# of Set Screws
ARM040065 ARM040077 ARM040096	40	65 77 96	1
ARM050083 ARM050102 ARM050114	50	83 102 114	2
ARM063178	63	178	2
ARM080178	80	178	2



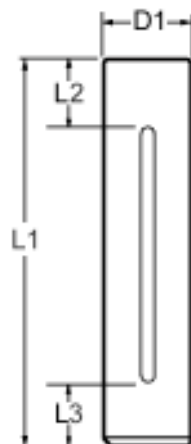
- Vacuum degassed chrome alloy steel
- Ground & honed to exact tolerance limits
- Top chamfered on I.D. to aid in alignment



BALL BEARING BUSHINGS – METRIC				
PART NUMBER	Nom Pin Diameter	D1	D2	L1
ABM040100 ABM040140 ABM040150 ABM040200	40	49.977	65	100.0 140.0 150.0 200.0
ABM050150 ABM050175 ABM050190 ABM050200	50	63.975	81	150.0 175.0 190.0 200.0
ABM063150 ABM063175 ABM063215 ABM063250	63	76.975	95	150.0 175.0 215.0 250.0
ABM080200 ABM080230 ABM080250	80	93.975	112	200.0 230.0 250.0



- Hardened chrome alloy steel
- Precision ground



40mm – centerless ground
50mm - 80mm – ground on centers

BALL BEARING PINS – METRIC					
PART NUMBER	Nom Pin Diameter D1	L1	L2	L3	# of Slots
APM040190 APM040200 APM040240 APM040300	40	190 200 240 300	50.80 50.80 63.50 63.50	34.93 34.93 41.28 41.28	1
APM050230 APM050250 APM050280 APM050300	50	230 250 280 300	57.15 57.15 76.20 76.20	47.63 47.63 47.63 47.63	2
APM063280 APM063300 APM063360	63	280 300 360	76.20 76.20 76.20	60.33 60.33 60.33	2
APM080280 APM080300 APM080360 APM080430	80	280 300 360 430	76.20 76.20 76.20 101.60	73.03 73.03 73.03 73.03	2


BALL LUBE® & BALL SCRUBB®

PART NUMBER	DESCRIPTION	PART NUMBER	DESCRIPTION
ARS016	1 Pint BALL-SCRUB® Spray	ARL016	1 Pint BALL-LUBE® spray
ARS384	1 Case (24) 1 Pint BALL-SCRUBB®	ARL384	1 Case (24) 1 Pint BALL-LUBE®
ARS128	1 Gallon BALL-SCRUBB®	ARL128	1 Gallon BALL-LUBE®
ARS640	5 Gallons BALL-SCRUBB®	ARL640	5 Gallons BALL-LUBE®

BALL-SCRUBB® removes heavy soils, dirt or grease from ball-bearing guide pin assemblies.

Just spray it on...wait 3 minutes... and spray again. Then blow off excess with compressed air.

BALL-LUBE® lubricates assemblies and gives them longtime protection against wear, oxidation and heat.

Spray liberally on ball bearing assemblies.

Lamina **BALL-SCRUBB®** is an industrial strength cleaner with rust inhibitors, specially formulated to clean debris and grease from all types of ball bearing assemblies.

Lamina **BALL-LUBE®**, when applied after **BALL-SCRUBB®**, locks out wear by chemically bonding to precision surfaces. It provides a tough, long-lasting shield that protects against oxidation and rust.

*Available in pints, gallons and 5 gallons.

*Pints are available by the case (24)

Figure 1

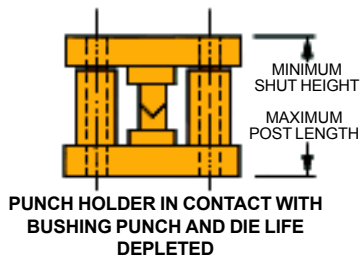


Figure 1 (Minimum Shut Height) determines maximum guide post length and maximum bushing height. Lamina Guide Posts are 1/8" shorter than nominal lengths shown, e.g. 6" post is 5-7/8". This will prevent post bottoming on bolster at minimum shut height if nominal post length is same as minimum shut height.

Figure 2

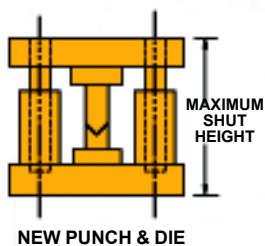


Figure 3

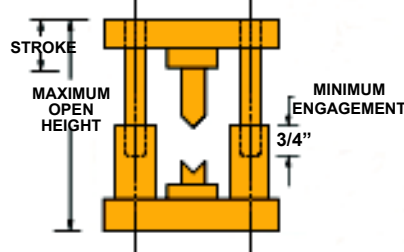
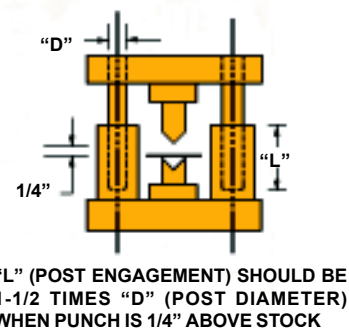


Figure 4



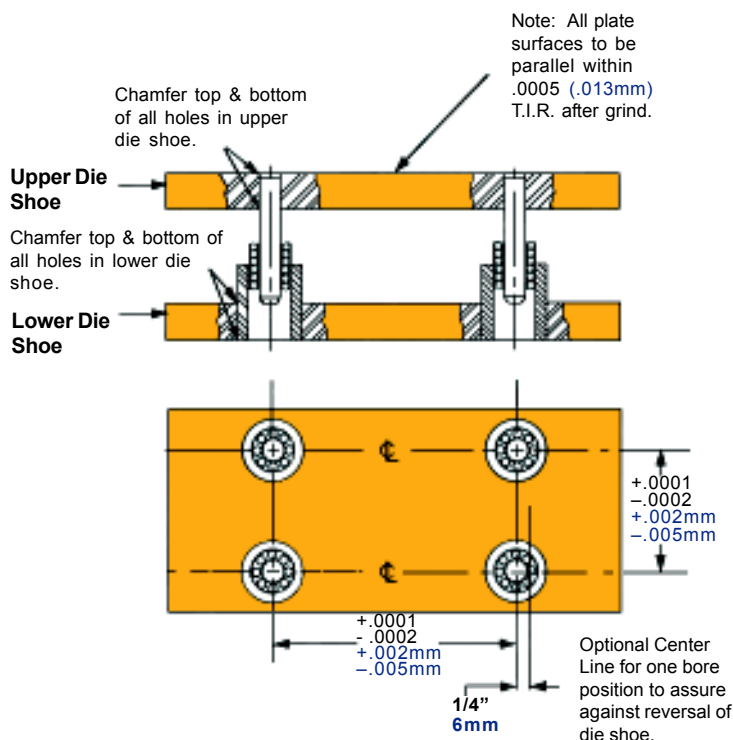
The maximum shut height added to the stroke equals the maximum open height (Figure 3) indicating the minimum engagement for the guide post in the required bushing. It is considered ideal for the minimum engagement to be at least 3/4". If it is less than 3/4", however, the arrangement shown in Figure 4 is recommended. Keeping in mind that only a small part of the stroke on most dies actually does the work, when conditions shown in Figure 4 are acceptable, together with conditions shown in Figures 1 and 2, there is no need to be concerned with the full length of the stroke and maximum open height.

When required strokes are longer than normal, guide post and retainer, if necessary, may be totally disengaged from bushing on the upward travel, provided (A) operation is vertical, (B) operation is limited to no more than 150 strokes per minute, (C) top of bushing's inside diameter is chamfered at least 1/4" x 30°, (D) the ram and gib alignment of the press are accurate.

The bushing must always be engaged by the guide post minimum of 3/4" if the operation is inclined or if speed surpasses 150 strokes per minute. The guide post bushing must engage the retainer during the entire operation, or what is known as full contact pre-load operation.

GENERAL INFORMATION SPECIFICATIONS

1. The Ball Retainer travels half the distance the pin travels or one-half the stroke length.
2. Maximum post length equals (=) minimum shut height minus (-) 1/4" Figure 1. If post length should be greater than minimum shut height it will be necessary to provide clearance for projecting post when press is at bottom of stroke.
3. Maximum straight sleeve length Figure 1 equals (=) minimum shut height minus (-) punch holder thickness minus (-) 1/4". Select nearest standard length.
4. Maximum retainer length equals (=) bushing length minus (-) 1/2".
5. Post slot lengths available upon request.



1. Grind die shoe plates parallel within .0005 (.013mm), then deburr and thoroughly clean plates.
2. Clamp upper and lower shoes together and mount in boring machine.
3. Sweep and strip top surface of plate in boring machine. Shim as required to achieve "0" indicator reading of ($\begin{matrix} +.0001 & +.002mm \\ -.0002 & -.005mm \end{matrix}$) T.I.R. All bores to the square to plate surfaces within ($\begin{matrix} +.0001 & +.002mm \\ -.0002 & -.005mm \end{matrix}$) T.I.R.
4. Step bore in line with hole patterns to dimensions shown on chart. All bores to be square to plate surfaces within ($\begin{matrix} +.0001 & +.002mm \\ -.0002 & -.005mm \end{matrix}$) T.I.R.
5. Chamfer both ends of bore.

Complete interchangeability of Lamina ball bearing guide pins, bushings and retainers makes select fitting unnecessary. No modifications, such as grinding, honing or lapping will be required if mounting and boring instructions which are shown on this page are carefully followed.

Nominal Guide Pin Diameter	BORE SIZE for PRESS FIT of Press Fit Steel Sleeve Bushings and for WRING FIT of Demountable Steel Guide Pin Bushings	BORE SIZE for PRESS FIT of Straight Guide Pins and for REMOVABLE FIT of Demountable Flanged Guide Pins	GRIND SIZE over Bore Size for PRESS FIT of Shoulder Guide Pins	GRIND SIZE from Bore Size for WRING FIT of Steel Shoulder Guide Pin Bushings	GRIND SIZE over Bore Size for PRESS FIT of Steel Shoulder Guide Pin Bushings
3/4	1.3862 1.3864	.7515 .7510	N/A	N/A	N/A
1	1.7162 1.7164	1.0015 1.0010	.0012 .0005	Bore +.0003 -.0003	.0012 .0005
1-1/4	2.1062 2.1064	1.2515 1.2510	.0012 .0005	Bore +.0003 -.0003	.0012 .0005
1-1/2	2.4362 2.4364	1.5015 1.5010	.0012 .0005	Bore +.0003 -.0003	.0012 .0005
1-3/4	2.7462 2.7464	1.7515 1.7510	.0012 .0005	Bore +.0003 -.0004	.0012 .0005
2	3.0612 3.1614	2.0015 2.0010	.0012 .0005	Bore +.0003 -.0004	.0012 .0005
2-1/2	3.6812 3.6814	2.5015 2.5010	.0012 .0005	Bore +.0003 -.0004	.0012 .0005
3	4.1812 4.1814	3.0015 3.0010	.0012 .0005	Bore +.0003 -.0004	.0012 .0005
40mm	39.970 39.965	40 -.030 -.042	N/A	N/A	N/A
50mm	49.970 49.965	50 -.030 -.042	N/A	N/A	N/A
63mm	62.970 62.965	63 -.030 -.042	N/A	N/A	N/A
80mm	79.970 79.965	80 -.030 -.042	N/A	N/A	N/A



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