



Locates

The Ball Lock™ System accurately positions your workpiece...to within ± 0.0005 repeatability, minimizing the need to indicate your fixture.

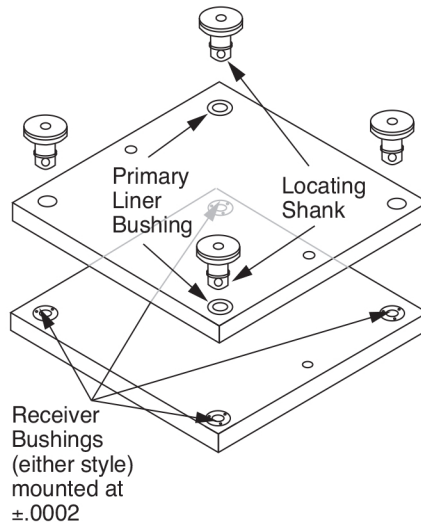


Locks

The Ball Lock™ System securely holds fixture plates to subplates with up to 20,000 lbs. of hold-down force per shank.

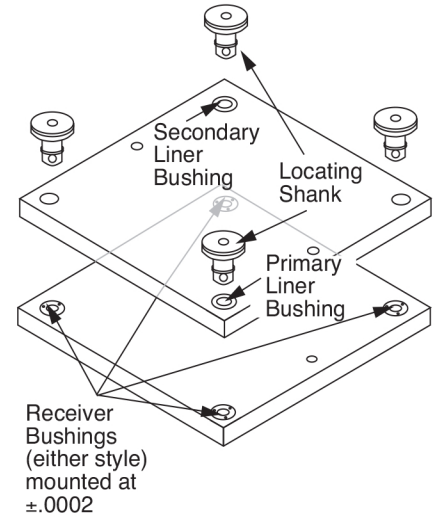
The Ball Lock Mounting System is designed to speed accurate locating and locking of fixture plates and subplates. The system consists of three parts: a Locating Shank, a Liner bushing, and a Receiver bushing. Using the Ball Lock Mounting System is a simple three step process. Install receiver bushings in your machine table or

Mounting Configuration For ± 0.0005 Accuracy



subplate, and liner bushings in your fixture plate; then insert the locating shanks through the liners and into the receivers to provide accurate location. A couple of turns of the set screw in each of the locating shanks provides positive holding force. Eighteen locating shanks, two types of receiver bushings, and two types of liner bushings are available

Mounting Configuration For ± 0.0015 Accuracy



to suit your individual requirements. It is recommended that the use of the Ball Lock Mounting System for locating and clamping of fixture plates be incorporated in a systematic process. All fixture plates should have two locating points positioned as far apart as possible. There is no advantage to having more than two locating

Most Commonly Asked Questions

Q. What is the Ball Lock System?

A. A means of locating and locking two flat surfaces together. These are usually a fixture plate and a subplate.

Q. How does it locate the plate?

A. It locates in the same manner as locating pins. In other words, there are two precision bores (receiver bushings) located on two precision pins (shanks).

Q. How many shanks (pins) do I need to locate the plate or part?

A. Two shanks are the maximum needed to locate. Anything more is a hindrance rather than a help. (This also applies to locating pins.)

Q. How does it lock?

A. The Ball Lock system achieves its holding force by a combination of force generators. A threaded screw exerts force onto a center ball which, in turn, directs this force onto threeballs that register on a taper seat.

Q. How many do I need to lock the part?

A. This would depend on the particular application, but in most cases, we would recommend that at least four shanks be used (two shanks to locate and lock, and two shanks to lock only).

Q. If I should only locate on two shanks, how do I install the other two shanks without causing interference?

A. This is accomplished by only using liner bushings for the locating shanks and drilling a clearance hole

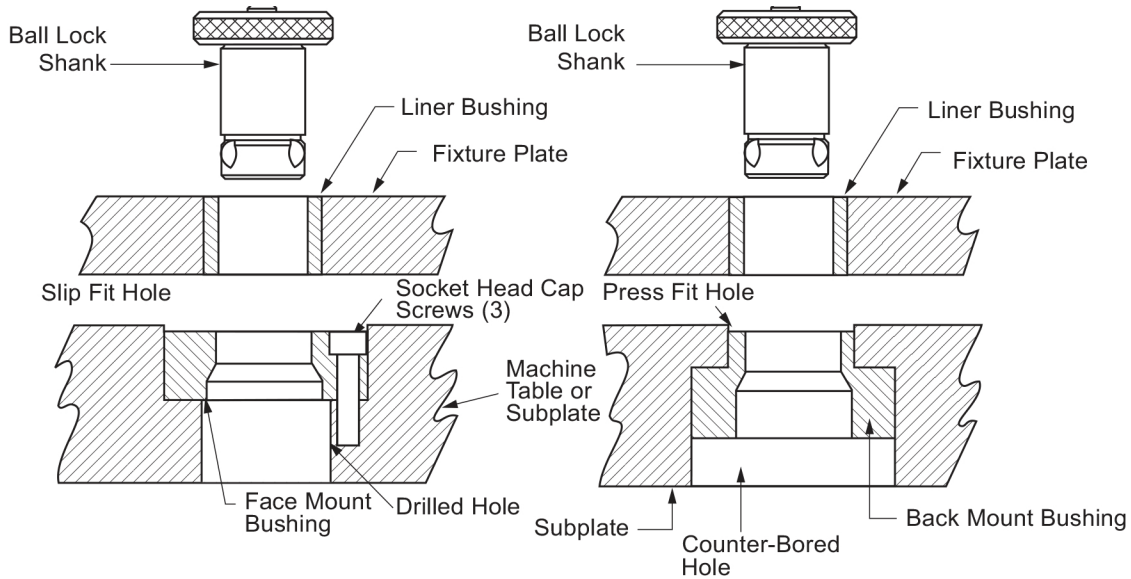
(shank diameter plus approximately .030") for the remaining shanks.

Q. How close a repeatability can I expect?

A. If the center distance between the two locating holes (receiver bushings) is held to ± 0.0002 " tolerance, and two primary liner bushings are used, then repeatability of ± 0.0005 " can be maintained.

Q. What is the difference between the primary and the secondary liner bushings?

A. The only difference between the primary and the secondary liner bushings is that the secondary liner bushing has an oversized I.D. to accommodate the wider center distance tolerance on your fixture.



Mounting Method With Face Mount Bushing

Mounting Method With Back Mount Bushing

points. If more than two flanged shanks are required to provide additional hold-down force, omit liner bushings in the additional holes in the fixture plate and allow .030 over the nominal size. The additional clearance will insure that these holes have no influence on the locating holes.

How Accurate Does Your Positioning Have to Be?

The center distance of the receiver bushings in the machine table, tombstone, or subplate should be as accurate as possible (± 0.002 recommended). Accurate location will insure a sound base for interchangeability of numerous fixture plates. For accurate

repeatability within .0005 of true position, both of the liner bushings in the fixture plate should be primary liners and the center distance tolerance should be ± 0.002 . For slightly less accurate repeatability (within .0015 of true position), use one primary and one secondary liner with a center distance tolerance of ± 0.001 .

Q. Is there a preferable location for the liner bushing?

A. The location of the liner bushing is not critical, but in order to be consistent, we recommend that wherever possible, locate the liner bushings at bottom left and top right.

Q. What are the advantages of using the Ball Lock System over the conventional method of dowel pins and cap screws?

A. Both locating and locking are accomplished in the same motion. Two and one half turns are the maximum needed to lock (whereas a 1/2–13 cap screw with one and a half diameters of thread engagement would need ten turns to lock). On C.N.C. machines, the repeatability of fixture locations makes indicating of the fixture unnecessary.

Q. If I need to recess the fixture plate in order to have a clear surface, what do I have to do?

A. Counterbore the fixture plate to a diameter large enough to allow easy removal of the shank. Note: The thickness of the plate section under the head of the shank is critical! It must conform to plate thickness recommended in the catalog.

Q. What if my plate is thinner than the recommended thickness?

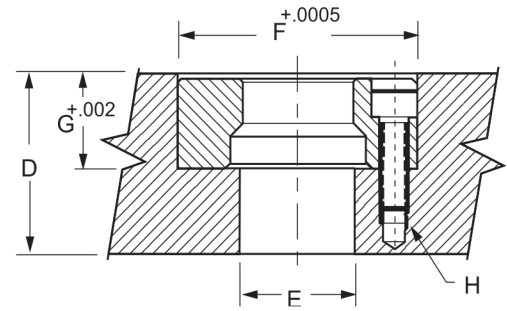
A. It is possible that by adjusting the depth of the counterbore for the receiver bushing, you can still use the Ball Lock System. If there are any questions on this type of application, please call 1-800-423-2431.

Q. Can I use the shanks in a heated environment?

A. The shank is made of alloy steel, heat treated to 40-45Rc and should stand temperatures up to 400° F. However, the "O" Ring that retains the balls could disintegrate. **Note!** Be aware that thermal expansion of your plate could affect the center distance tolerance and repeatability.

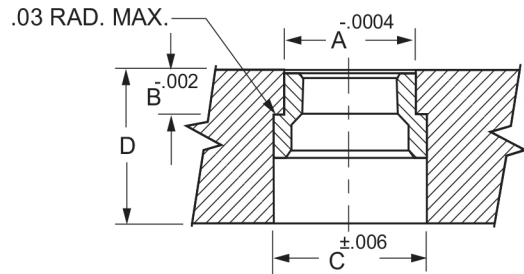
Two styles of receiver bushings are available. Generally, the face mount receiver bushing is utilized in blind hole applications (Slip Fit). The back mount receiver bushing is used in through hole applications (Light Press Fit).

FACE MOUNT



Note: Installed bushings should be approximately .012" below subplate surface. **See reference below for installation of back mount style bushings.**

BACK MOUNT



RECEIVER BUSHINGS - FACE MOUNTED INSTRUCTIONS

Heated Treated - Black Oxide Finish.

P/N	INSTALLATION DIMENSIONS							
	Shank Diameter	Actual O.D.	Min. Subplate Thickness D	E	F	G	*H	Bolt Cir Cle Meter 3 PL Equally Spaced
610-13	13mm	1.3750	3/4	11/16	1.3750	.469	8-32 x 5/16	.984
610-16	16mm	1.4370	3/4	13/16	1.4370	.469	8-32 x 5/16	1.125
610-20	20mm	1.6873	1-1/8	13/16	1.6873	.637	10-32 x 3/8	1.362
610-25	25mm	2.0623	1-1/4	1	2.0623	.799	1/4-28 x 1/2	1.644
610-30	30mm	2.2654	1-1/4	1-3/16	2.2654	.871	1/4-28 x 3/4	1.876
610-35	35mm	2.6873	1-3/8	1-9/16	2.6873	.904	5/16-24 x 7/8	2.178
610-50	50mm	3.4998	1-13/16	2-5/32	3.4998	1.239	3/8-24 x 1	2.916

RECEIVER BUSHINGS - BACK MOUNTED

Heated Treated - Black Oxide Finish.

P/N	INSTALLATION DIMENSIONS				Minimum Subplate Thickness D
	Shank Diameter	A	B	C	
610-14	13mm	.7870	.277	1.000	3/4
610-17	16mm	.8760	.285	1.155	3/4
610-21	20mm	1.0950	.345	1.280	7/8
610-26	25mm	1.3763	.416	1.593	1
610-31	30mm	1.6264	.432	1.906	1-1/4
610-36	35mm	1.8764	.493	2.155	1-5/16
610-51	50mm	2.6269	.621	2.988	1-3/4

* Cap Screws Supplied with Face Mount Bushings.

Locating repeatability will determine if one primary and one secondary or two primary liners are needed. With two primary liners, repeatability of $\pm.0005$ " can be maintained if the two holes for receiver bushings are held to a centerline distance of $\pm.0002$ " tolerance.



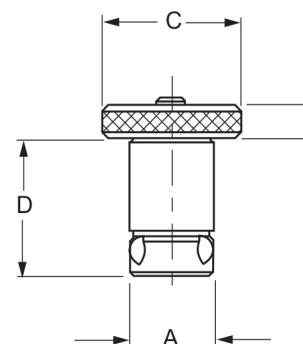
Note on Installation of Back Mount Style:

To alleviate the possibility of binding the shank in the bore, the maximum interference fit between bore and bushing O.D. should not exceed $.0005$ ".

LINERS				
Heated Treated - Black Oxide Finish.				
PRIMARY LINER P/N	SECONDARY LINER P/N	DIMENSIONS		
		FIXTURE PLATE THICKNESS $\pm.005$	SHANK DIAMETER	LINER O.D. -.0004
610-66	610-68	.50	13mm	.7518
610-67	610-69	.75	13mm	.7518
610-54	610-57	.50	16mm	1.0018
610-55	610-58	.75	16mm	1.0018
610-61	610-63	.75	20mm	1.3772
610-62	610-64	1.00	20mm	1.3772
610-71	610-73	.75	25mm	1.3772
610-72	610-74	1.00	25mm	1.3772
610-81	610-83	.75	30mm	1.7523
610-82	610-87	1.00	30mm	1.7523
610-91	610-95	.75	35mm	1.7523
610-92	610-96	1.00	35mm	1.7523
610-93	610-97	1.50	35mm	1.7523
610-94	610-98	2.00	35mm	1.7523
611-01	611-05	.75	50mm	2.5025
611-02	611-06	1.00	50mm	2.5025
611-03	611-07	1.50	50mm	2.5025
611-04	611-08	2.00	50mm	2.5025

FEATURES:

- Material: Shank/Bushing, 4340
Liner, 52100
- Finish: Black Oxide
- Heat Treat: Shanks, 40-45 Rc
Bushings, 50-54 Rc
Liners, 62-64 Rc
- Stainless Steel Available in 13 & 16mm sizes
- Available for High Temperature Applications (800° F Max)



U.S. Patent No's. 3,498,653, 4,135,415

Any Ball Lock application requires at least two sets of shanks, receiver bushings and liners. The liners are placed into the fixture plate to insure extremely accurate positioning. If more than two shanks are required (to provide additional hold down force), omit the liner bushing so that these additional holes will not interfere with your primary locating holes



BALL LOCK REPAIR KITS

Each Kit Includes:

- Replacement Screw
- Locking Balls
- Drive Ball
- O-Ring

BALL LOCK MOUNT SYSTEM - LOCATING SHANKS AND REPAIR KITS

Case Hardened - Black Oxide Finish.

P/N	DIMENSIONS								
	FIXTURE PLATE THICKNESS ±.005	A	B	C	D	MAXIMUM HOLDDOWN FORCE (lbs)	MAXIMUM SCREW TORQUE (ft/lb)	HEX WRENCH SIZE FOR SET SCREW	REPAIR KIT P/N
611-10	.50	13mm	.25	.87	1.08	750	1.2	3/32	612-10
611-11	.75	13mm	.25	.87	1.33	750	1.2	3/32	612-11
611-15	.50	16mm	.32	1.50	1.15	1200	3	1/8	612-15
611-16	.75	16mm	.32	1.50	1.40	1200	3	1/8	612-16
611-20	.75	20mm	.38	1.75	1.53	3000	4	1/8	612-20
611-21	1.00	20mm	.38	1.75	1.78	3000	4	1/8	612-21
611-25	.75	25mm	.38	2.00	1.70	7000	9	5/32	612-25
611-26	1.00	25mm	.38	2.00	1.95	7000	9	5/32	612-26
611-30	.75	30mm	.50	2.25	1.88	10000	15	3/16	612-30
611-31	1.00	30mm	.50	2.25	2.13	10000	15	3/16	612-31
611-35	.75	35mm	.50	2.25	1.97	15500	25	1/4	612-35
611-36	1.25	35mm	.50	2.25	2.22	15500	25	1/4	612-36
611-37	1.50	35mm	.50	2.25	2.72	15500	25	1/4	612-37
611-38	2.00	35mm	.50	2.25	3.22	15500	25	1/4	612-38
611-50	.75	50mm	.75	3.00	2.45	20000	50	3/8	612-50
611-51	1.00	50mm	.75	3.00	2.70	20000	50	3/8	612-51
611-52	1.50	50mm	.75	3.00	3.20	20000	50	3/8	612-52
611-53	2.00	50mm	.75	3.00	3.70	20000	50	3/8	612-53