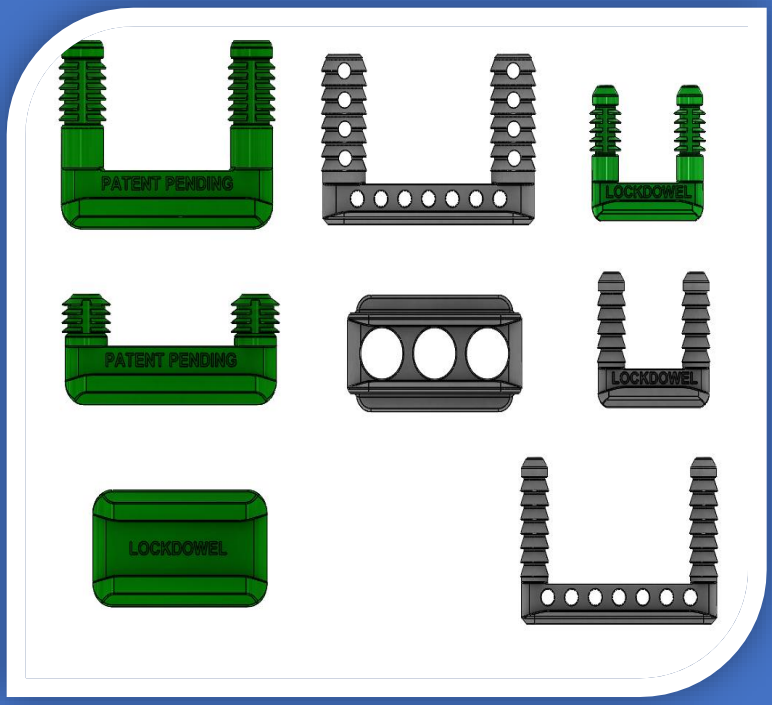
LOCKDOWEL, INC.



Implementation Manual for Lockdowel Channel Lock products

July 5, 2019

USER Manual

ECLIPS:

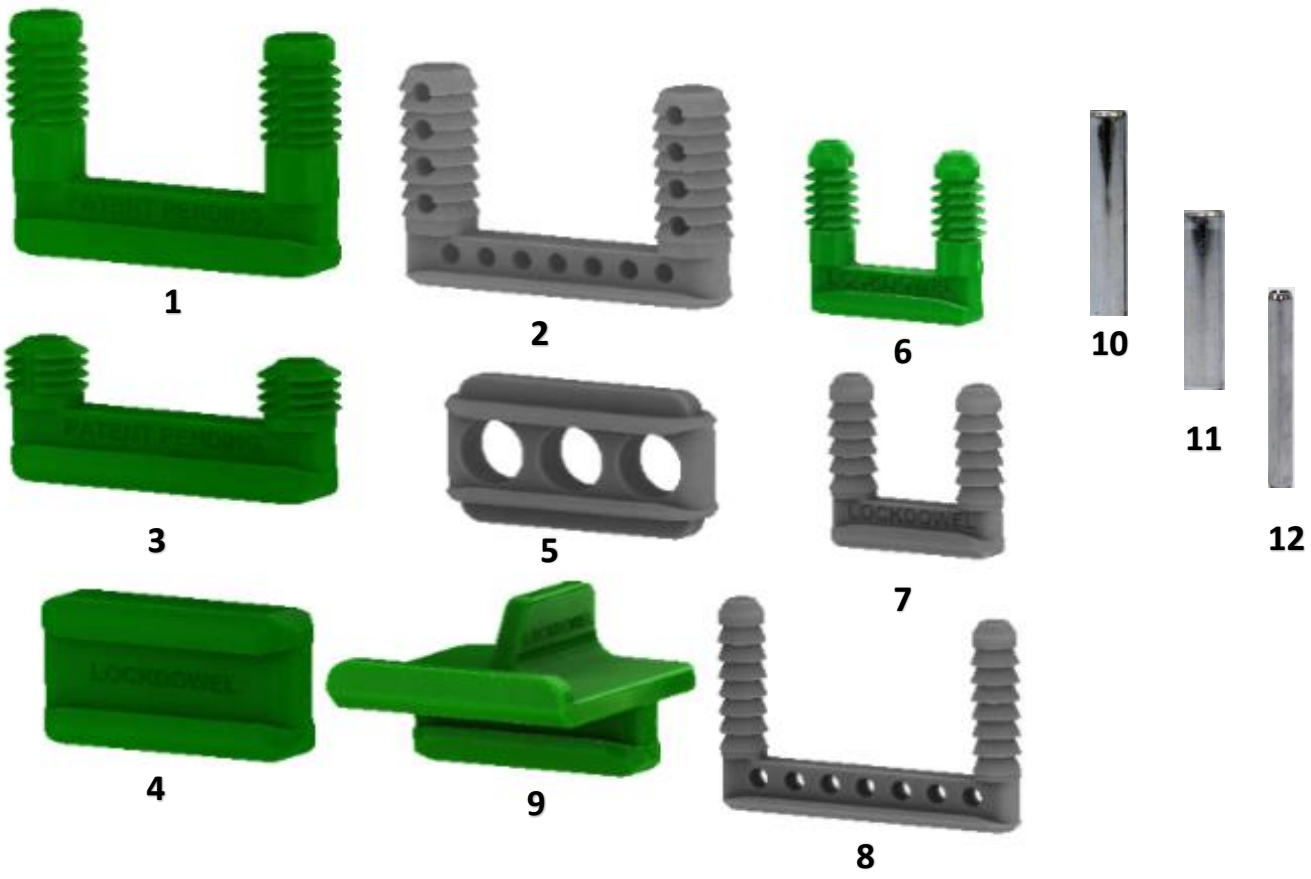
- Plastic Barbed Channel Lock, E900BP
- Metal Barbed Channel Lock, E900BM
- Mini Plastic Barbed Channel Lock, E900BPMini
- Plastic Barbed Channel Lock 9 mm, E900BP-9
- Plastic barbed Channel Lock Mini Metal, E900BMMini
- Plastic Double Channel Lock, E900P
- Metal Double Channel Lock, E900M
- Metal Barbed Channel Lock Mini- 32mm E3229BM
- Face Frame Channel Lock,

Introduction: The purpose of this manual is to provide the basic implementation data specifically for the Lockdowel Channel Lock products. Lockdowel Channel-Lock fastener systems provide for an extremely sturdy, invisible joint that requires no glue and no tools for assembly. With proper care taken in the implementation of the Channel Lock fasteners into the users manufacturing environment the use of the Lockdowel systems can add tremendous value to both the user's customer and to the significant reduction in the costs related to shipping and manufacturing. The use of Lockdowel fasteners when implemented correctly can contribute substantially to further develop a lean manufacturing operation and contribute to your CIP (continuation in improvement) goals.

ECLIPS Channel Lock Fasteners:

Channel Lock fasteners come in several different shapes and sizes and materials. All plastic fasteners are molded from Nylon 6/6 resin and all the Channel Lock metal fasteners are molded from Zamac 5 (zinc/aluminum alloy). The spring pins are formed in spring steel that is heat treated to the correct spring condition and then electroplated with a bright zinc coating.

The nylon fasteners can be used in all wood types to include particle board, MDF, plywood and most soft and hard woods. The metal fasteners are typically used when the substrate being drilled, such as some hard woods and plastics will leave a very smooth and polished finish on the hole surface. Hard and smooth hole surfaces will not allow the nylon barbs to take a set into the side of the hole so use the metal variations of the fastener is recommended. Metal Channel locks are also selected for high temperature and high tensile stress applications.



As seen from the picture the top left Channel lock **(1)** is the most commonly used variety with 32 mm center to center on the 8mm diameter barbed posts and 20 mm in length. This fastener is used in boards that are 5/8 in (15.875 mm) thick or greater.

The Zamac metal fastener **(2)** to the left has exactly the same dimensions and can be used interchangeably with its nylon counterpart.

The center left nylon fastener **(3)** is also dimensionally the same as the one above it with the exception of the 5 mm diameter barbed post with a length of 8mm. This fastener is used when channel locks are required on coincidental holes on opposing sides of the same board.

The nylon fastener at the bottom left **(4)** has a double channel rail and is used to connect edge to edge panels or face to face panels such as decorative end panels on cabinets.

The Zamac equivalent in dimension to this fastener is shown in the center **(5)** of the group.

The smaller nylon fastener shown on the top right-hand side **(6)** of the picture is a smaller version the channel lock and used for board thicknesses of 12.7 mm or ½ inch. The barbed 5 mm posts are 16 mm center to center.

The Zamac equivalent in dimension to the fastener is shown immediately below it. **(7)**

The bottom left fastener **(8)** is equivalent to the two above it with the exception its over all length being 32 mm center to center from each post and the post length of 20 mm compared to the 15 mm on the smaller version.

The middle bottom nylon fastener **(9)** is a special design of the channel lock used primarily for locking down frames for cabinets, bookcases and other furniture styles.

On the far-right hand side are shown 3 different size spring pins: **(10) 8** mm dia x 40 mm L; **(11)** 8 mm dia. X 30 mm L; (**12)** 5 mm dia x 36 mm L. spring pins. On panel edges where it is not possible to add channel locks but require attachment to another panel spring pins are often used. Spring pins are also used to "lock" designs or add strength or rigidity to a design. The heat treated; zinc plated spring steel pins provide over 1000 lbs. of shear strength to the attachment. ***Caution: Wood dowels are never used but often tried. Wood dowels used with Lockdowel assemblies do not provide enough shear strength in most cases and expand and shrink greatly depending on the relative humidity in the assembly environment.***

Design using Channel Lock products: To begin using Lockdowel fasteners it must be incorporated into the user's software. Many of the popular software packages listed below have included Lockdowel Channel Lock fastener inclusion into their software packages.

1. Cabinet Vision
2. Microvellam
3. Mosaic
4. KD Pro
5. Wood Wop
6. 20/20
7. InGo (China)
8. SuWood Software

Designing Lockdowel Channel lock fasteners into your products is easy once you understand the best parametric placing of the fasteners along with spring pins or other hardware. The first effort might seem a little challenging as the channel locks are placed in such a way that the panels are allowed to slide together during assembly and the panel edges need to align when in the final locked position. During the design phase it is also important to predetermine the proper sequence which panels go together. In almost every case the sequencing of the order in which the panels are to be assembled determines which edges and faces will have Channel lock fasteners and which will have spring pins if needed.

***Note: As a new Lockdowel customer you are invited to send your first design to the Lockdowel engineering group for review and comment**.

*** Sample design drawings are located in Appendix B & C***

**** parametric chart for fastener placement tables are located in Appendix D***

Equipment: having the correct equipment to bore holes and rout key hole slots is of the utmost importance before beginning installation of Lockdowel fasteners. The key hole slot is cut using a specially designed router bit that you can purchase from Lockdowel. The bit is made from solid carbide and is designed so that it can be used for a plunge cut into the face or edge of the panel to begin the keyhole slot. ***Caution: It should be noted that you should never ramp the router bit entry into the wood face while cutting the keyhole slot. Doing so will leave a heel at the back end of the slot and make it impossible or very difficult to place the fastener into the keyhole entry area.*** The router bit chart below provides the correct feed and speeds to be used for particle board, plywood and MDF. For other materials such as Acrylic, POM, PVC and other plastic panels consult with the manufacture of those materials.

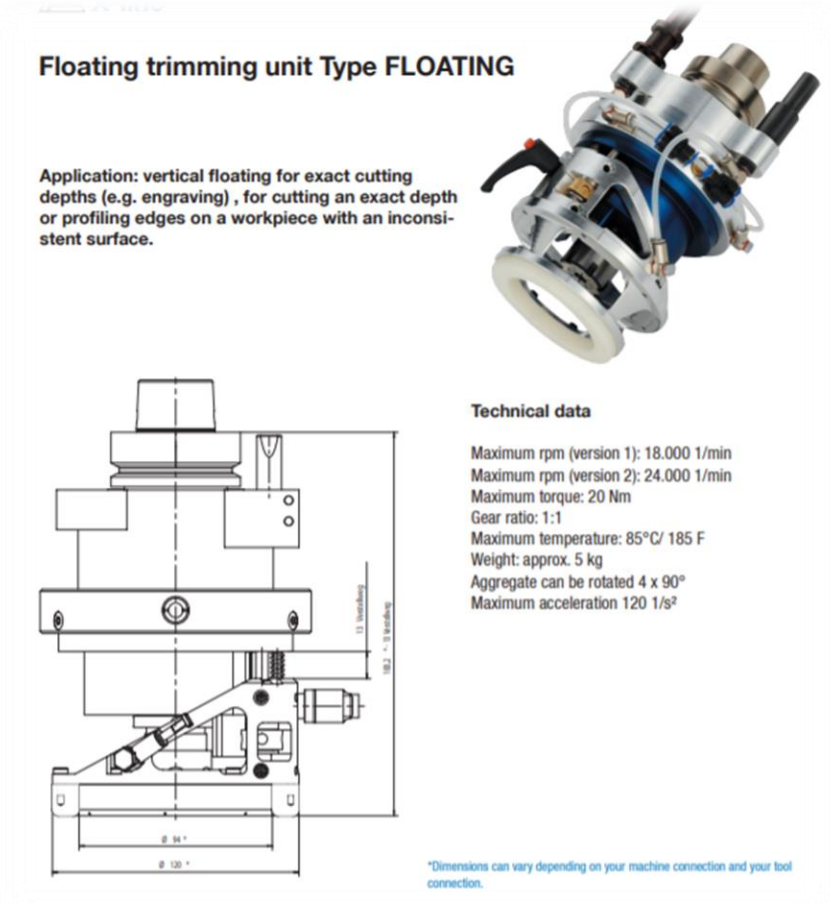
The router bits for the larger channel lock have an outside cutter diameter of 8.3 mm. When the cutter diameter wears to 8.1 mm it needs to be removed from service. Failure to do so will result in a tight fit for the fastener and will require a great deal more pressure to slide the panels into position. The smaller router bit used for the mini channel lock parts has a 5.3 mm cutter diameter and should be replaced when the diameter is reduced to 5.1 mm. If used correctly and in accordance to the chart feeds and speeds, the router bits should be able to cut between 5,000 and 8,000 keyhole slots in most wood types before needing to be replaced.

Of critical importance is the ability of your router to maintain slot depth at all times. This is a precision rout and it forms the female counterpart to the fastener. Too shallow a slot and the assembly resistance is too loose; cutting too deep and the assembly resistance is too tight.

Depth control is the single most important element to making Lockdowel Channel Lock furniture and cabinets assembly work. In many instances board thickness can vary as much as 1mm as in the case of plywood, from

one end to the other and even from one side to the other. It is less of a problem for most laminated or veneered particle board and MDF. However, it is possible to have laminated particle board with thickness variations of 0.3 mm and sometimes greater from board to board.

To deal with this problem, Lockdowel strongly recommends the use of either a laser depth-controlled CNC router or a mechanical depth control tool holder.



Mechanical depth control products are available from Benz, Inc. (https://www.benztooling.com/) or from Techniks, Inc. (https://www.techniksusa.com/)

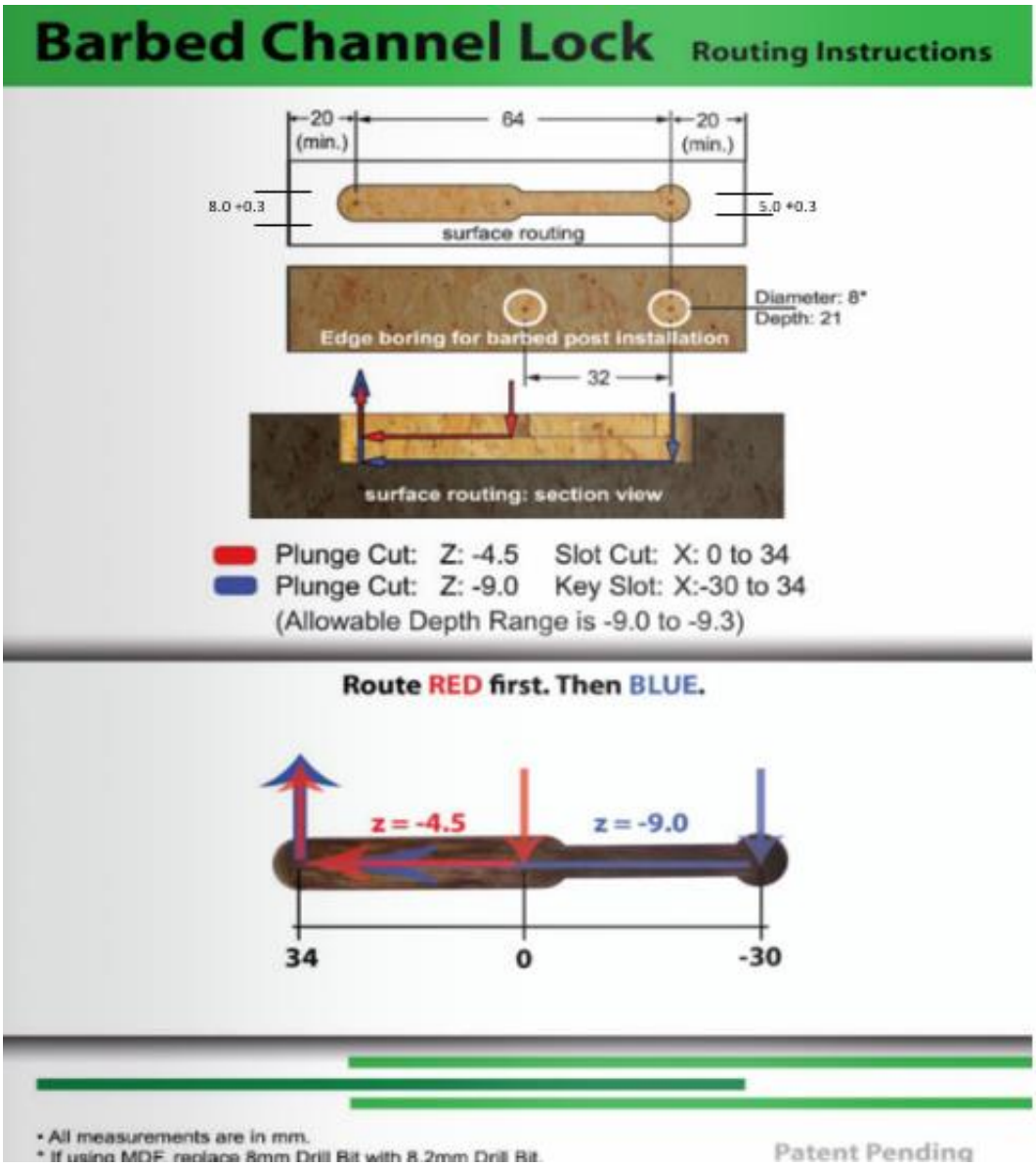
Machining:

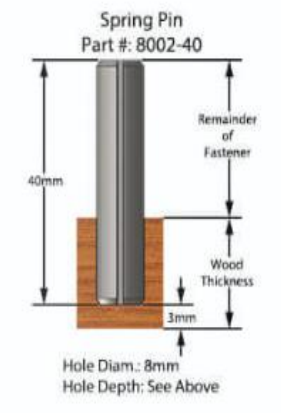
Use of Lockdowel fasteners requires precision boring into the edge of the panel and matching precision keyhole slots routed into the face, or in some cases the edge of the adjoining panel. To accomplish this in a production manufacturing environment requires the use of a CNC nested base router and horizonal edge boring machine, or, in the alternative, a CNC rail & pod router/edge borer. While either set up can be used It is important that caution is used in preparing the machine for proper depth control. With pod and rail routers make certain that the rails are placed under the areas where the routs are cut so as not to incur any deflection of the board during the Keyhole rout.

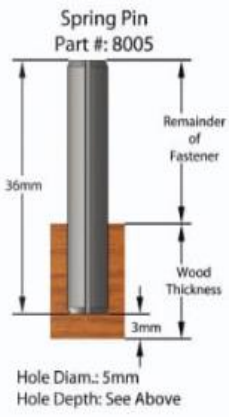
Instructions as to how to program the router to make the keyhole slot are below. The red arrows depict the first cut and the blue arrows depict the second cut.

Instructions for hole bore size for placing spring pins into the panel face and the mating panel edge are below. It is very important to ensure that the total hole depth (face hole length, plus edge hole length equal the length of the spring pin

or 1 to 2 mm longer. If the hole depth is too short the fastener will prevent the boards from butting up one to the other and leave a noticeable gap at the joint seam.





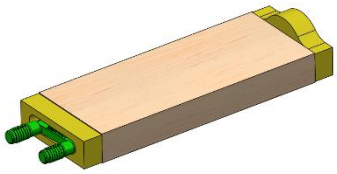


Assembly:

The choice of insertion methods of the Lockdowel channel locks barbed posts into the two 8 mm holes is critically important. Lockdowel recommends the use of an automatic edge boring and fastener insertion machine for best quality and high production requirements. However, for some operations doing smaller projects we recommend installing the fasteners with a hand tool like device shown below. The end effector of the device is machined so that the channel lock has a loose fit into the pocket and the depth of the pocket is exactly the height of the body of the channel lock (9 mm). A direct hit on the channel lock top with a rubber mallet can sometimes cause the channel lock to move further into the surface of the wood and cause the joint to be tighter than it should be or in some cases fail. Drawings as to how to make your own insertion tool are located in Appendix E.

The assembly process with Lockdowel Channel Lock fastener is fairly easy and straight forward. However, in some cases, it can be confusing if there are many panels sliding together to know which is first, second and so forth. To be successful it is extremely important to ensure an exploded view of the product be provided to the assembler showing the sequence of the construction. For products manufactured for RTA retail customers, Lockdowel highly recommends the use of an assembly code consisting of different color stripes printed on the panel surfaces. The stripes can be different colors or different in number so that the customer understand what the panel sequence of construction is and how they are supposed to line up. NOTE: Lockdowel does not recommend that the manufacturer allow a retail customer to insert the fasteners into the panel edges. This can result in panel edges being broken and fasteners installed improperly and thus the panels do not fasten as expected. The use of different colors and numbers of stripes can be understood by all customers regardless of their understanding of a certain written language.

Fastener installation tool



Quality control; *in process* quality control at each step of the manufacturing process is critical to ensuring confidence in the assembly process whether performed by employee assemblers or the consumer in the case of RTA products. Lockdowel highly recommends the use of *a first in, last out* check on all dimensional elements of the panels to include measurement control over the depth and width of the keyhole slot.

An inexpensive digital tire gage (> $10.00 USD) allows for an easy yet accurate way to measure keyhole cut depth and spring pin hole depth at the machine operator location.

The customer should be aware that a special chemical taggant with a laser response key is embedded into the Lockdowel fasteners. Lockdowel has available a laser pistol style device that is used to authenticate all incoming Lockdowel product from any imitations or copies that may from time to time be found in the market. It is strongly recommended that all Lockdowel customers obtain an authentication device in order to protect themselves from the use of any fraudulent purchases of copy cat and potentially inferior quality product imitations. **See Appendix F for " in process" quality control posters for each operation.**