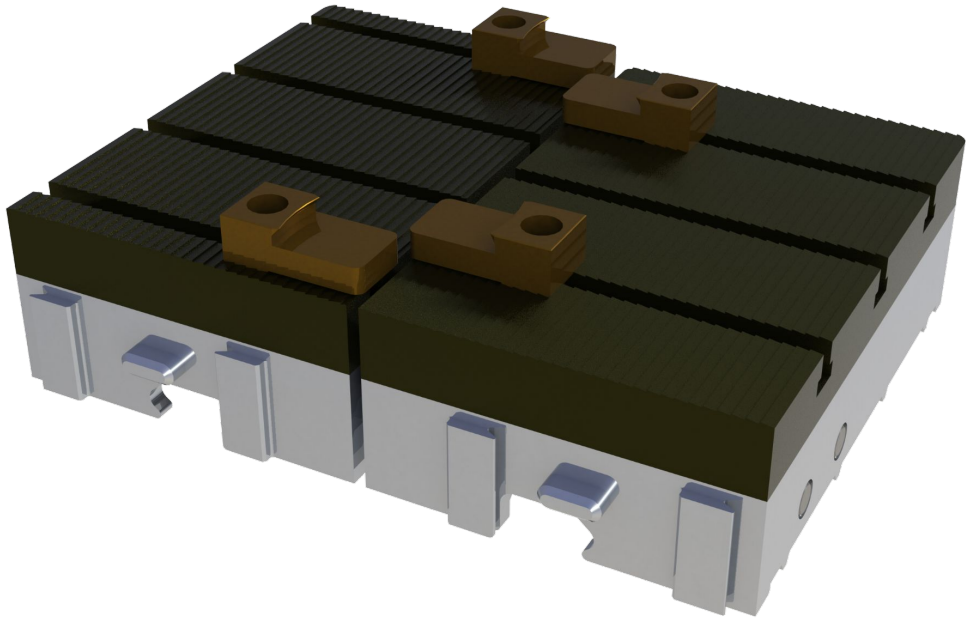
VERSA BUILT ROBOTICS



Universal Jaw
User Manual

Table of Contents

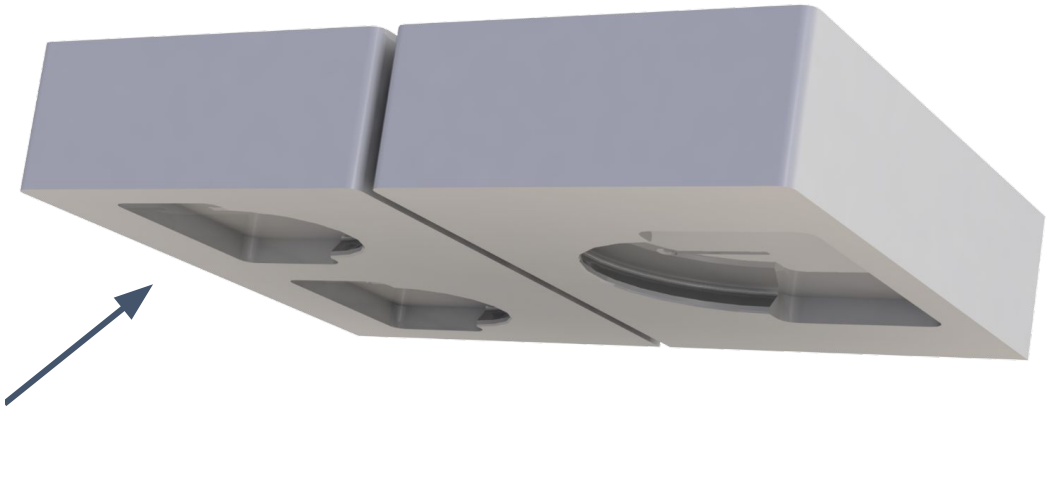
Introduction

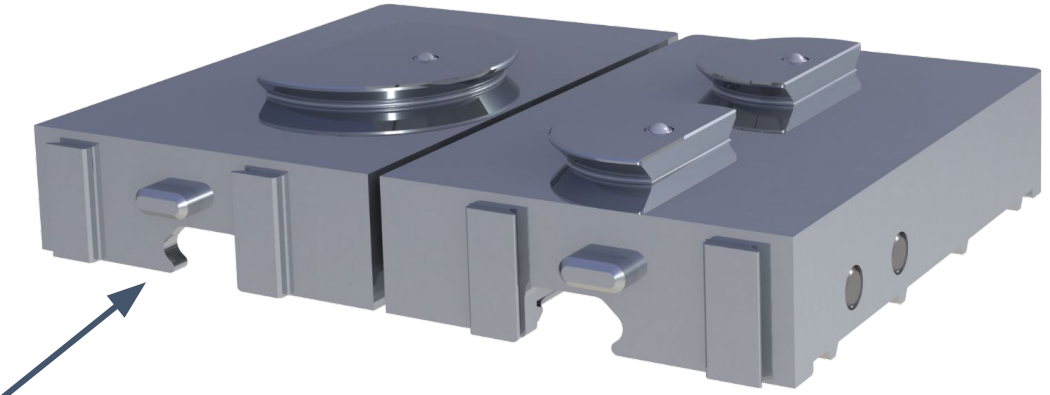
Section 1

Introduction

MultiGrip Jaws

MultiGrip Jaws provide quick-exchange of workholding for manual and automatic loading and unloading of CNC machine tools. MultiGrip Base Jaws can be used as a platform for Top Jaws, with MultiGrip Vise interface features on the bottom, MultiGrip Gripper features on the front and an interface for Top Jaws on top. Top Jaws can be machined to provide a workholding pocket to hold any part for pick, place and machining.

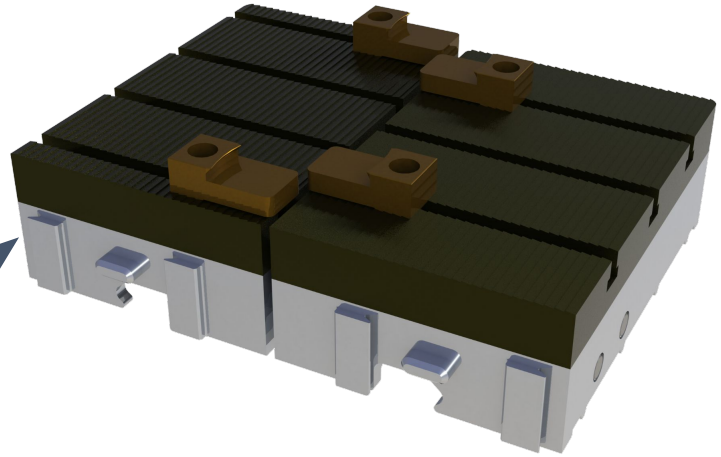




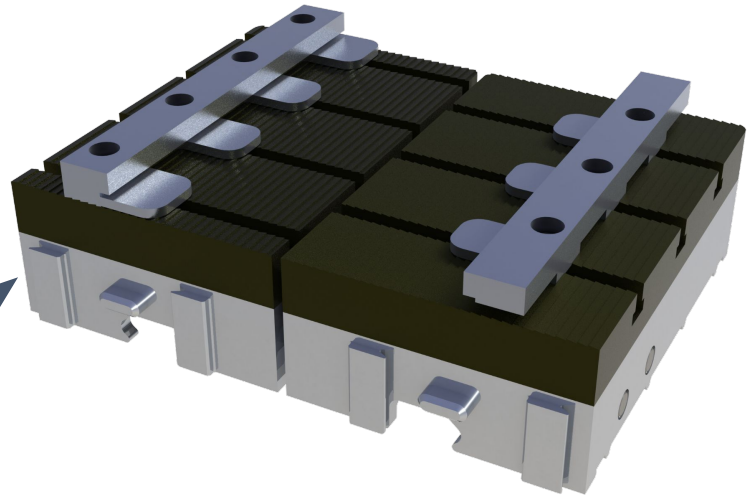
Introduction

Universal Jaws

Universal Jaws are a line of products for quick-change, flexible-use workholding with MultiGrip Base Jaws, for a wide range of raw material sizes and part shapes. Universal Jaws are a combination of Universal Top Jaws and a line of part interface products called VersaBites and VersaRails.



MultiGrip Base Jaws w/ Universal Top Jaws and VersaBites



MultiGrip Base Jaws w/ Universal Top Jaws and VersaRails

Universal Jaws are rated for clamping with MultiGrip FJ Vises, up to 120 psi

Introduction

3D Models of all products are available at www.versabuilt.com or by request via sales@versabuilt.com

Universal Top Jaws

Section 2

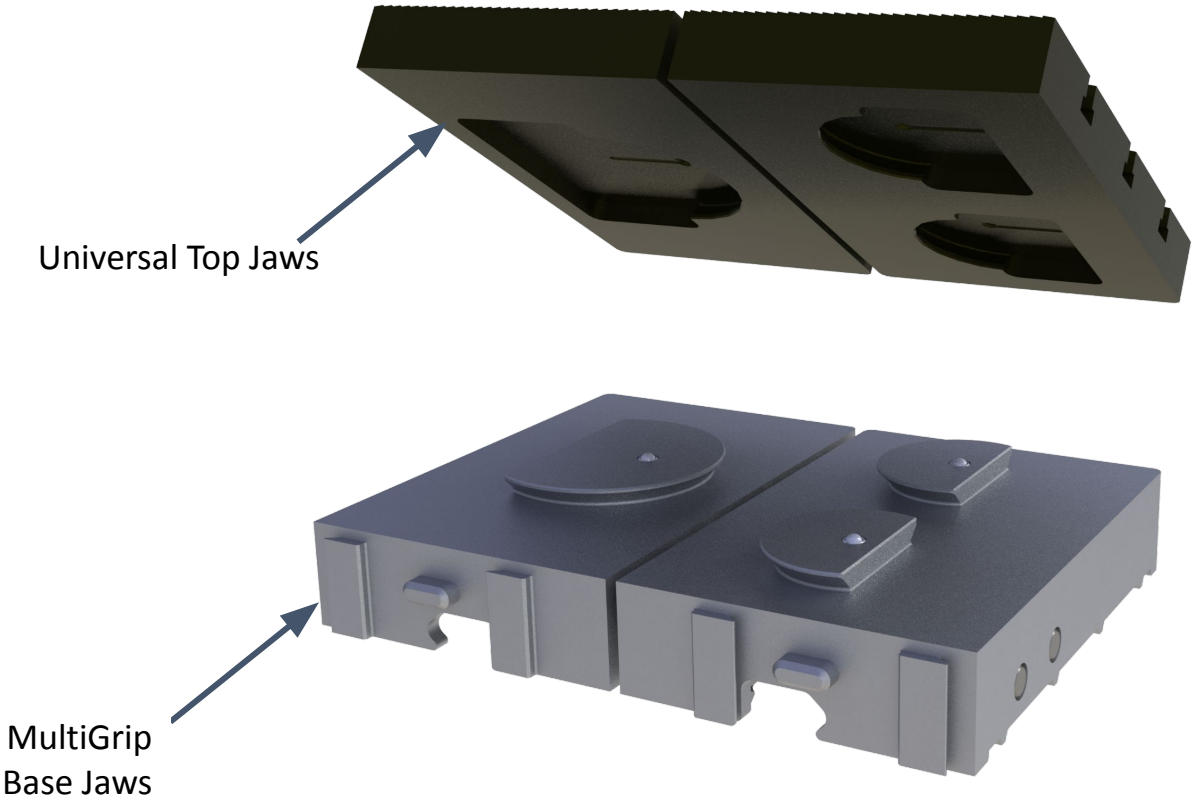
5007070 – Universal Top Jaws

Universal Top Jaws

Universal Top Jaws (5007070) connect to MultiGrip OD Base Jaws, and optional accessory interface products called VersaBites and VersaRails.

Universal Top Jaws connect to Base Jaws with Dovetail and ball-plunger to ball-detent interface, with right jaw fixed and left jaw allowed to swivel.

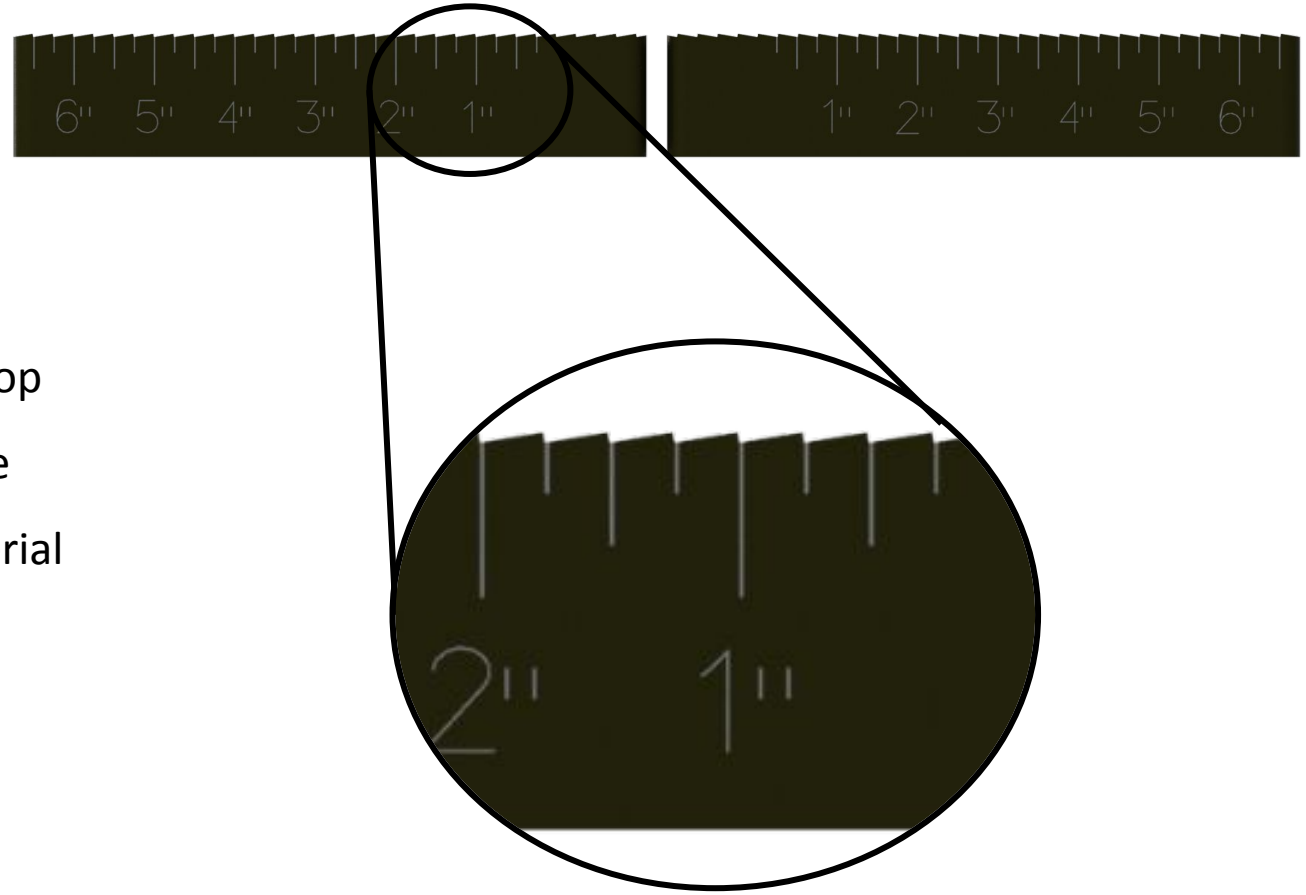
VersaBites and VersaRails attach to Universal Top Jaws with M5 bolts and T-nuts, and locate in position with serrations with 0.125” pitch.



5007070 – Universal Top Jaws

Details:

- Includes left and right top jaws
- For use with MultiGrip OD Jaw Bases
- Type III Anodized 6061 Aluminum
- Engraving on the back side of the Universal Top Jaws gives a visual indication of how to locate VersaBites and VersaRails for a range of material widths.



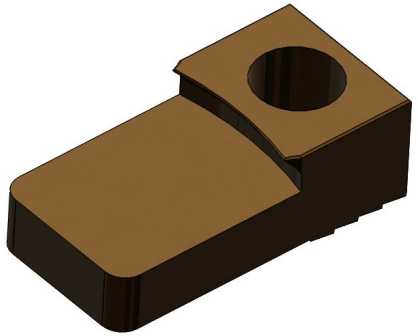
VersaBites

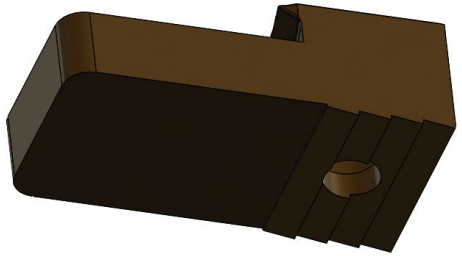
Section 3

VersaBites

VersaBites

- VersaBites are a family of products assembled to Universal Top Jaws, for multi-use applications and a range of part widths, with primary application for Op1 workholding.
- VersaBites are hardened steel and are available in two z-depths, 3/16” and 1/8”.
- 3/16” provide greater automation compliance are are recommended by default unless the application requires less z-purchase.
- VersaBites attach to Universal Top Jaws with M5 bolts and T-nuts, and locate in position with serrations with 0.125” pitch.
- Accommodates rectangular parts widths from 0.25” to 6.75” and part lengths from 1.5” to 8.0”, with overlapping features allowing part settling operations on narrow parts (parts will not fall through the jaws, if the gripper or vise opens and closes)

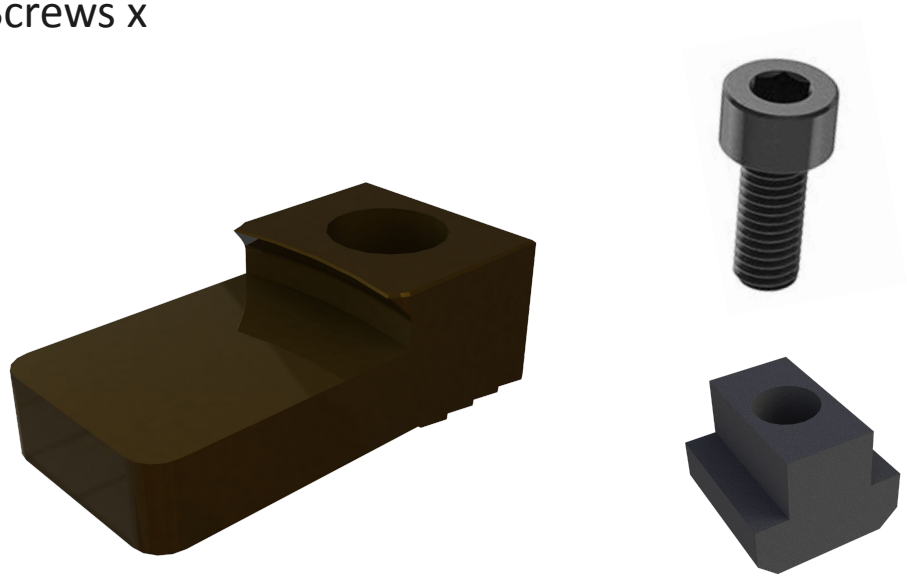




VersaBites

VersaBites

- Individual VersaBites are sold with M5x0.8 Socket Head Cap Screws x 12mm L and M5x0.8 T-Nuts

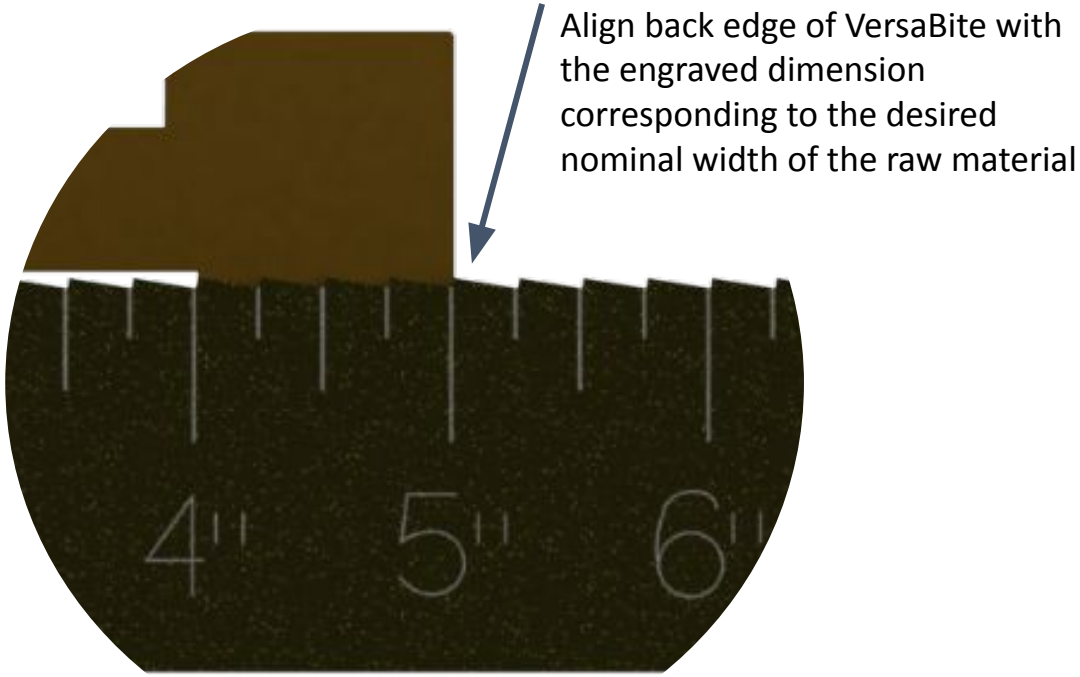


VersaBites

- Locate the VersaBite in position by lining up the backside of the VersaBite surface with the engraved ruler marks on the back side of the Universal Top Jaws

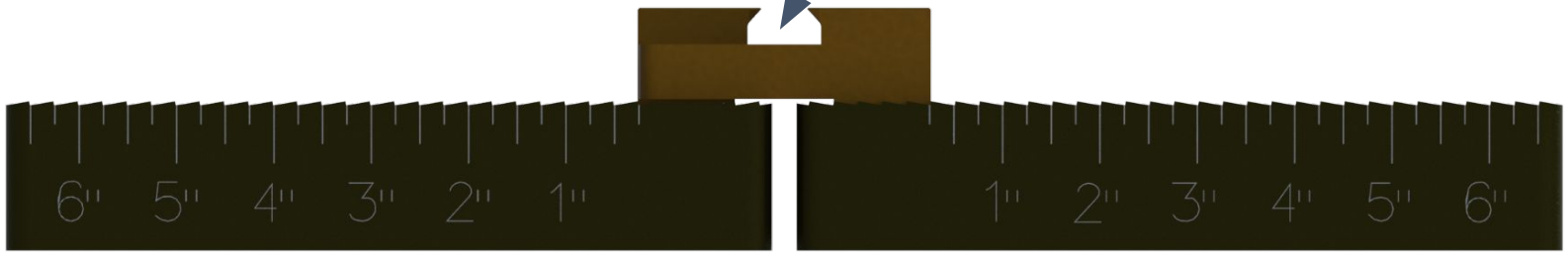
- When securing VersaBites in place, push the VersaBite serrations against the Universal Top Jaw serrations while tightening down the M5 socket head screw.

- The following page shows examples of VersaBites placed for different part widths.



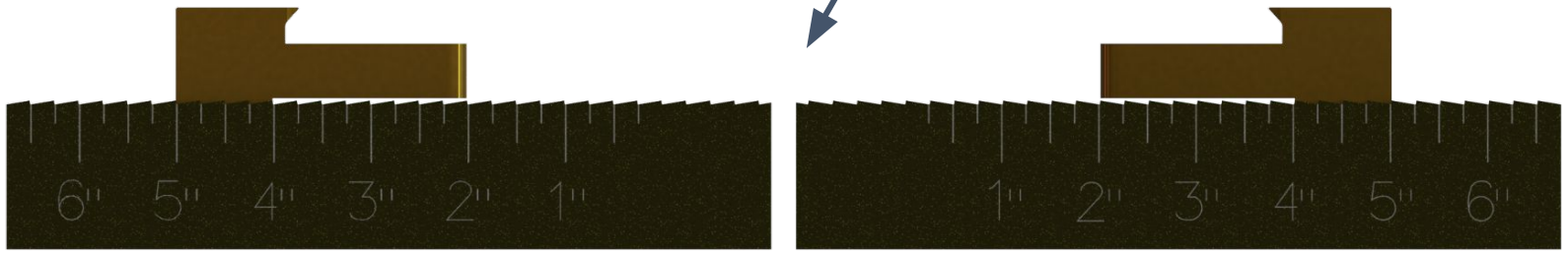
VersaBites

Note the Z-surface overlap, to accommodate jaw open/close while holding narrow parts



VersaBites in 0.25” Material position

Part width assumes a nominal gap between the left and right jaws of 0.125” while clamping on material



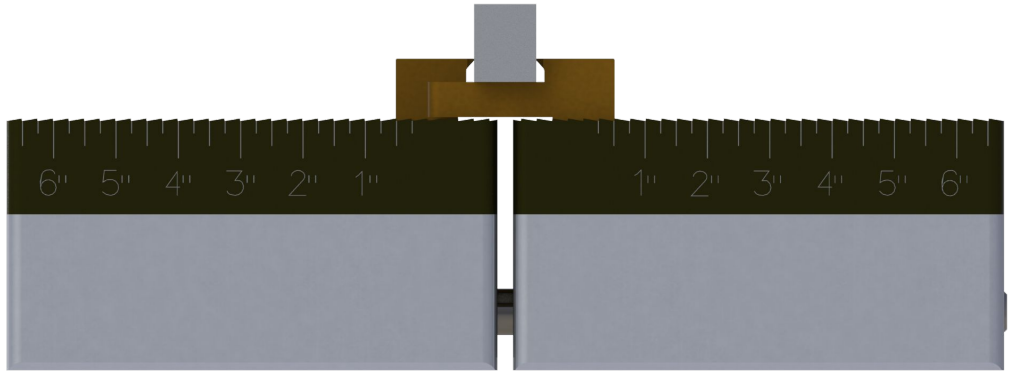
VersaBites in 5” Material position

VersaBites - Material at 0.25” Increments

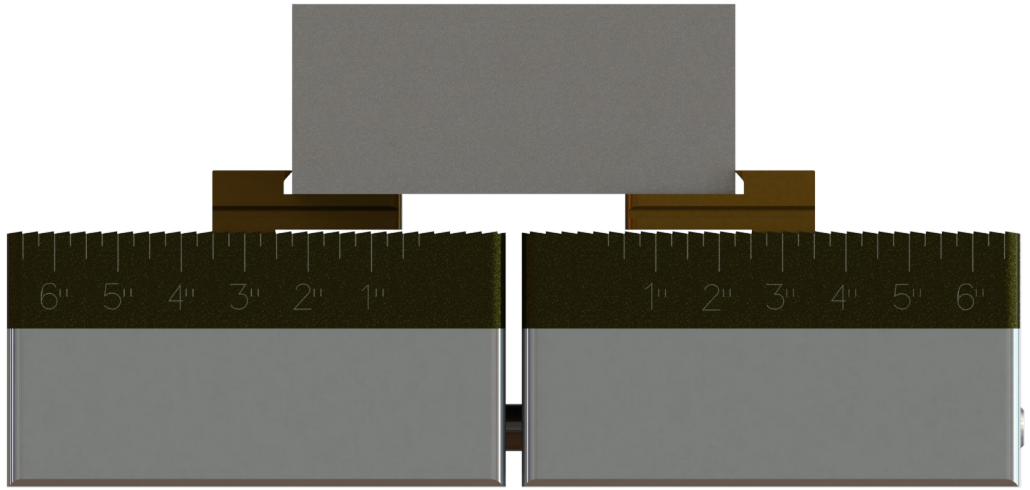
Centered Parts - 0.25” width increments:

- The serration interface on VersaRails and VersaBites have a 0.125” pitch, providing part width adjustment in 0.25” increments from 0.25 to 6.75” when parts are centered on jaws in x-direction

- See the images to the right showing part setup examples with parts centered in the x-direction



VersaBites in 0.50” position on Universal Top Jaws

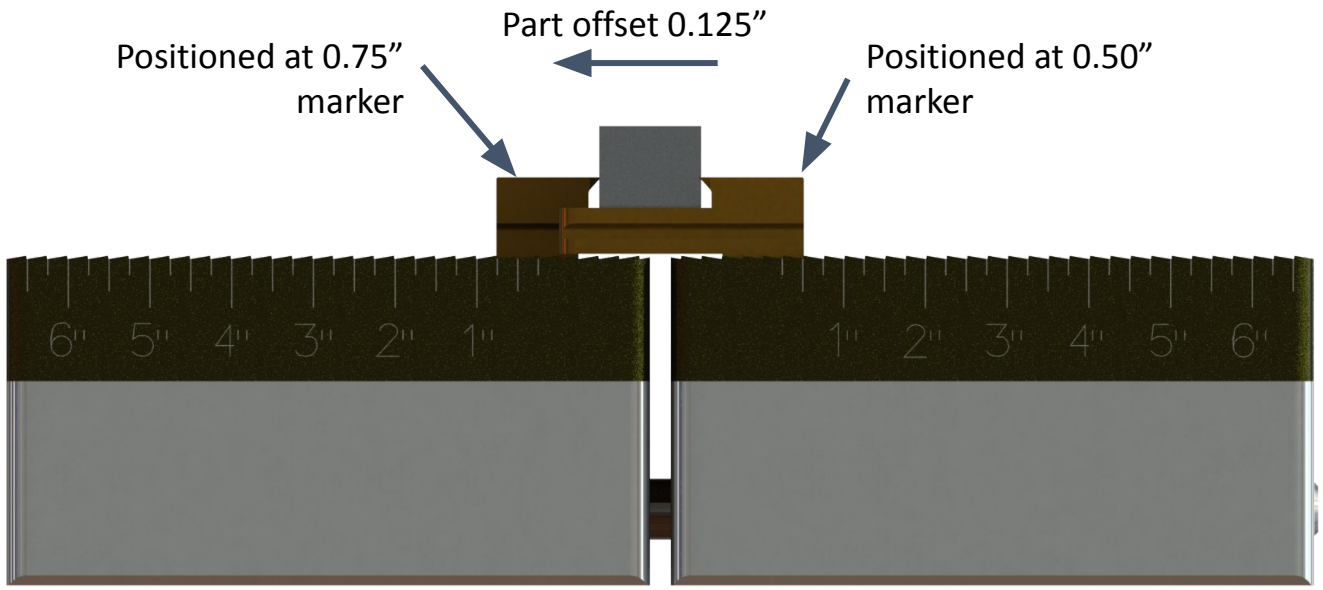


VersaBites in 3.50” position on Universal Top Jaws

VersaBites - Material at 0.125” Increments

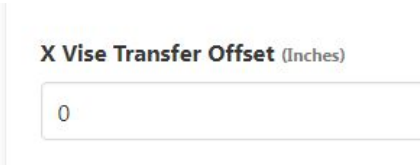
Off-center parts 0.125 increments:

- For part width within the range of 0.25 to 6.75”, but fall between the 0.25” increments (e.g., 3.125 or 5.625”), move one VersaBite or VersaRail on one side of the jaw to create the desired gap
- By moving one side asymmetric to the other, the part is no longer clamped on center in X. Note offset for machining and robot processing is required.



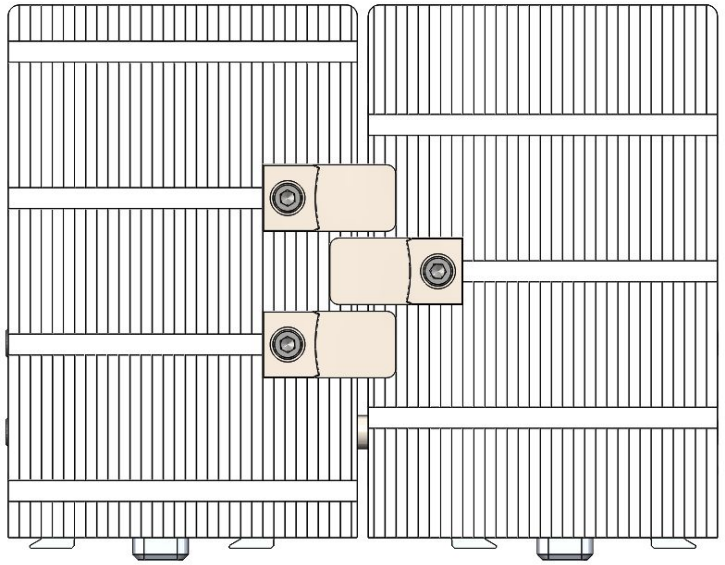
VersaBites in 0.625” position on Universal Top Jaws

In a Mill Automation System, part transfer picking offsets can be added to part configurations in the “Advanced Options”, adding 0.125” to the “X Vise Transfer Offset” field

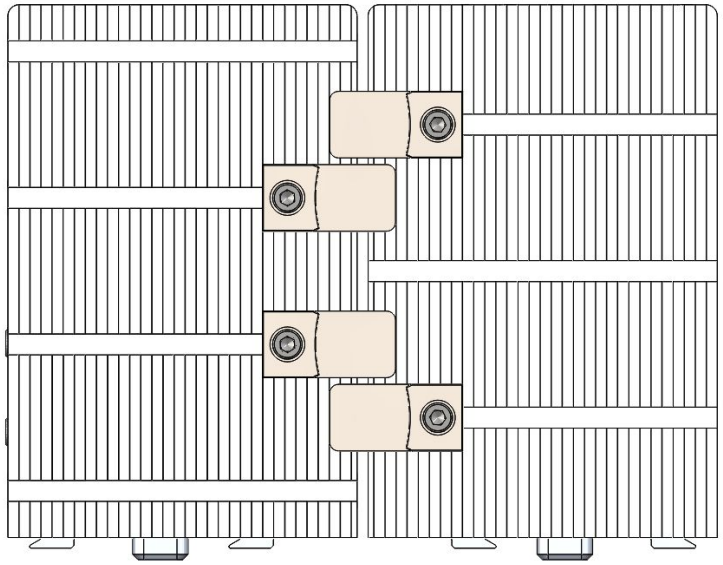


VersaBites

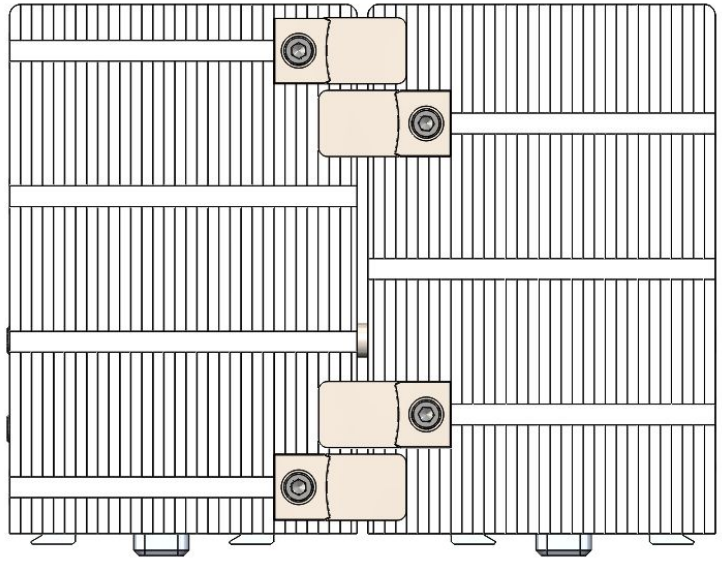
VersaBites can be arranged on Universal Top Jaws to accommodate a variety of material lengths. Refer to the images below.



Short Material Lengths - 1.50” to 3.25”



Medium Material Lengths - 3.25” to 5.00”

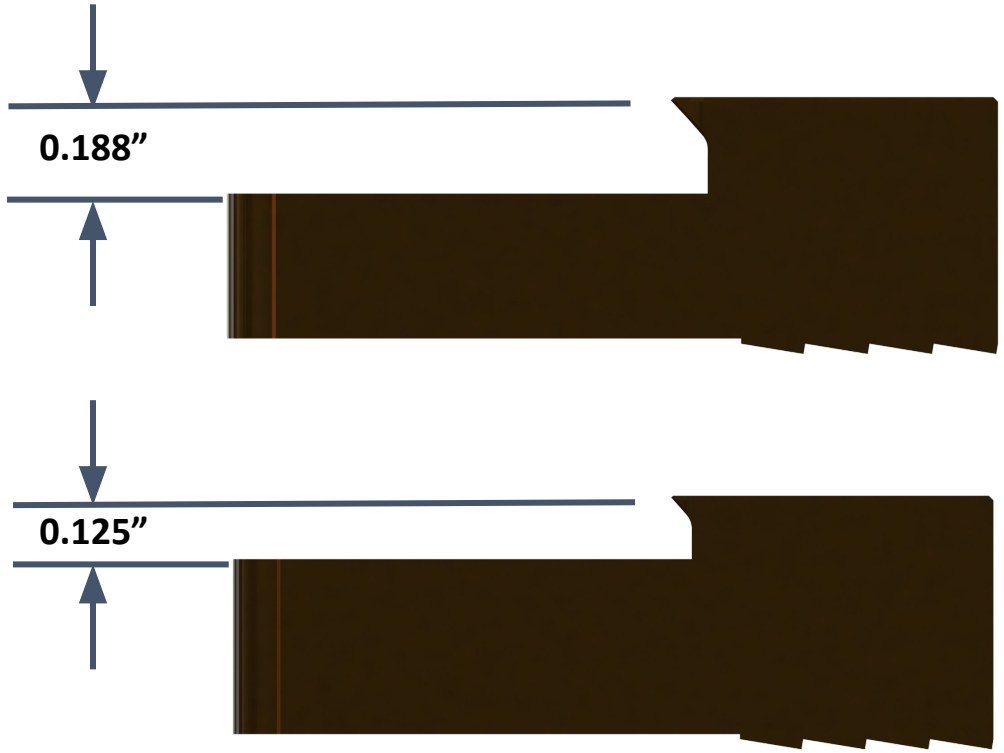


Long Material Lengths - 5.00” to 8.00” *

*__Note__: max length may depend on application and required surface finish. Lengths up to 12-inches can be used with robot loading

VersaBites

- 5008114 - VersaBite, 3/16” z-depth
- 5009510 - VersaBite, 1/8” z-depth

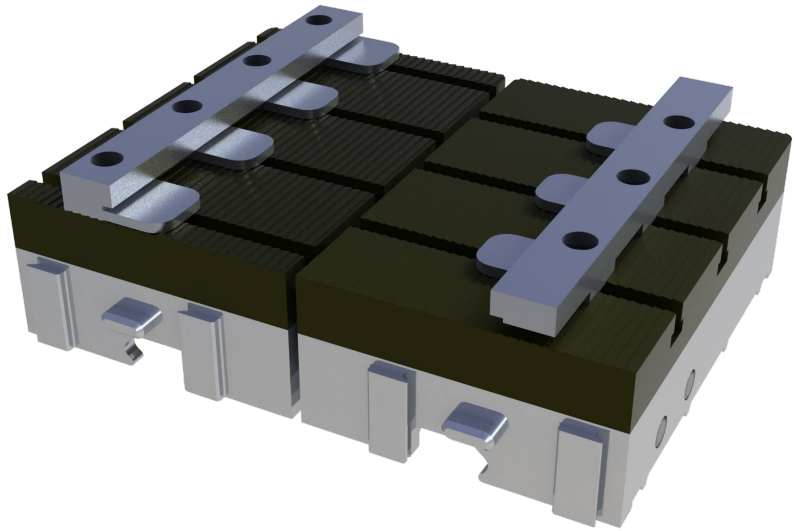


VersaRails

Section 4

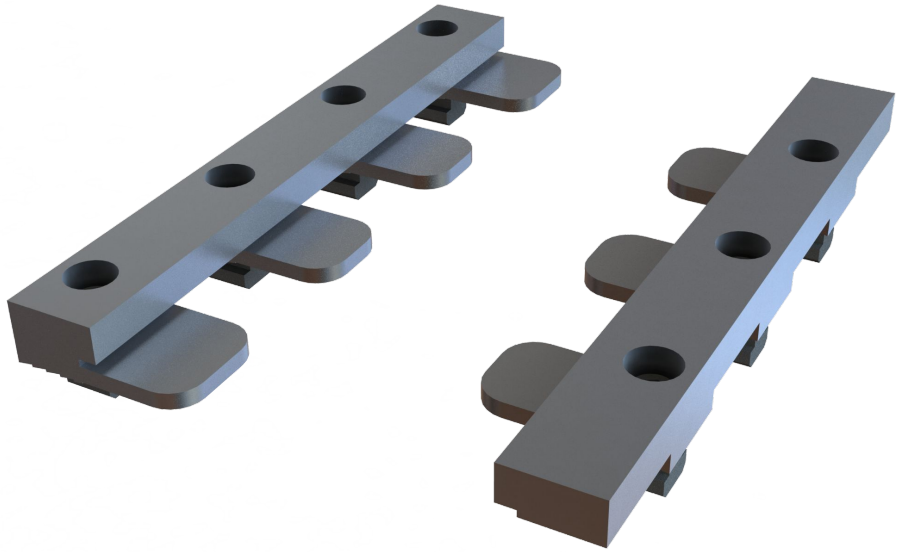
Machineable VersaRails

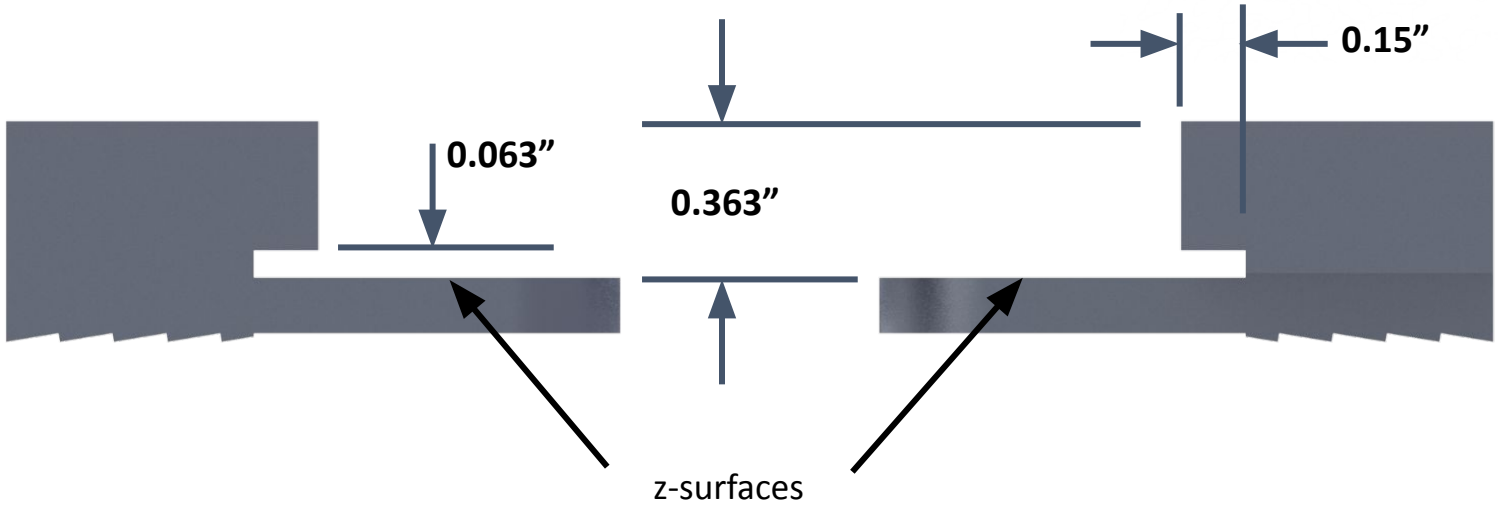
- Machinable VersaRails are assembled to Universal Top Jaws, for use as machinable soft jaws for a range of part widths, with primary application for clamping on finished surfaces in Op2, Op3, etc.
- Machineable VersaRails are 6061-T6 Aluminum, with extra-material for machining a flat surface or custom surface profile to match a unique part profile.
- The advantage of Machinable VersaRails vs. standard MultiGrip Top Jaws, is 1) less material requires machining for custom jaw pockets, 2) they allow full z-support for narrow parts when vises or grippers need to open/close, and 3) for common side wall parts, they can accommodate a range or part widths.
- VersaRails attach to Universal Top Jaws with M5 bolts and T-nuts, and locate in position with serrations with 0.125” pitch.
- Accommodates parts widths from 0.25” to 6.75”, with overlapping features allowing part settling operations on narrow parts (parts will not fall through the jaws, if the gripper or vise opens and closes).



Machinable VersaRails

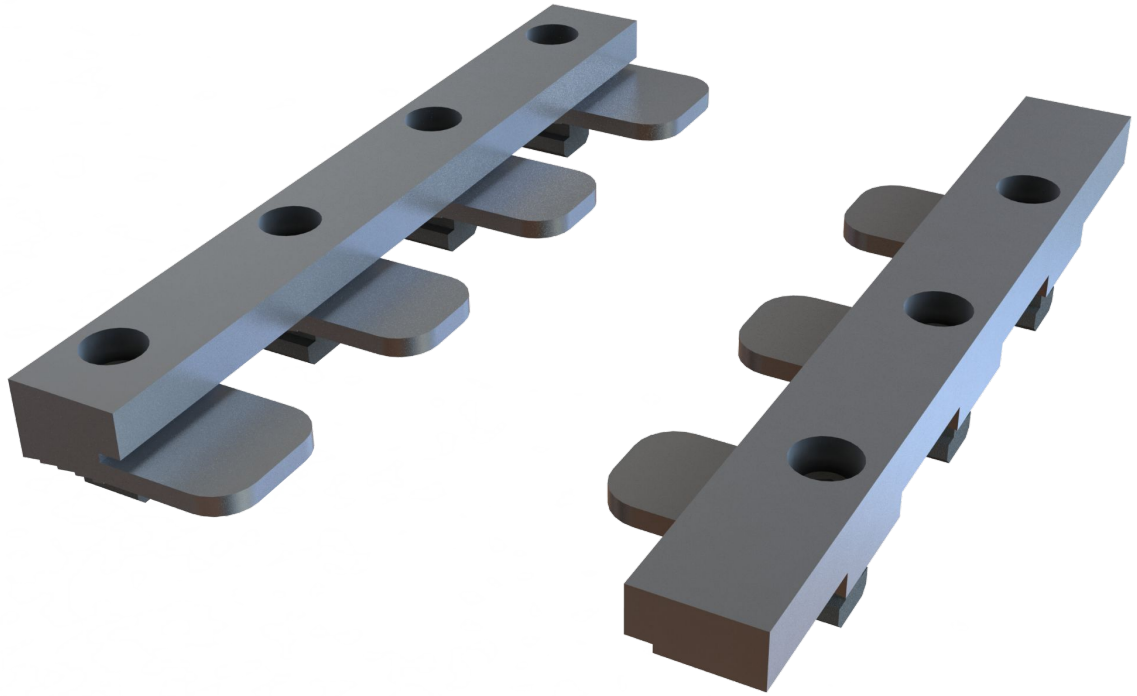
- 5009630 - VersaRails, 6061-T6





Machineable VersaRails

- VersaRails are sold as a set (left and right VersaRails) with QTY: 7 M5x0.8 Socket Head Cap Screws x 12mm L and M5x0.8 T-Nuts



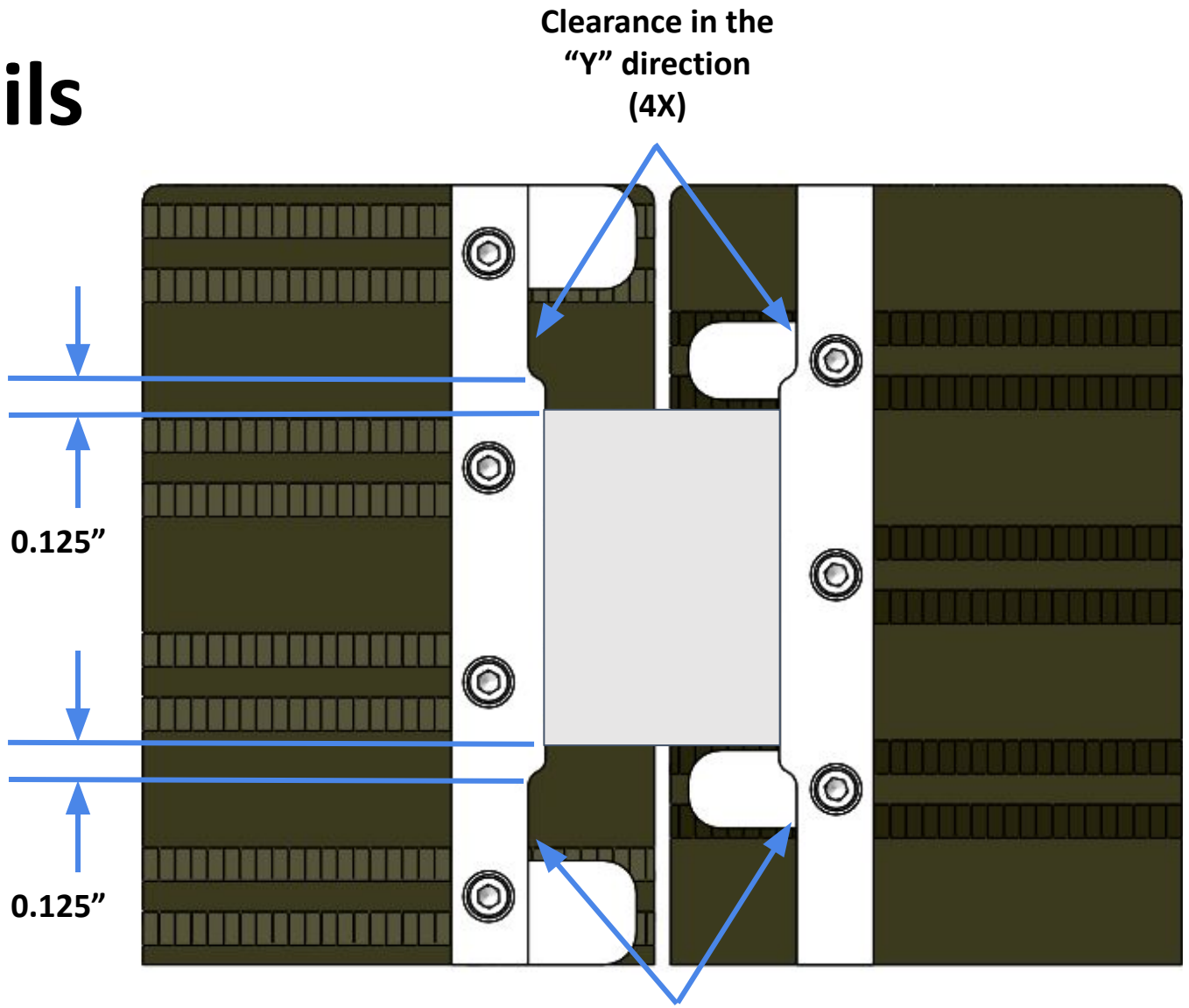
Machinable VersaRails

- When setting up Machinable VersaRails for a custom profile, consider the following steps:
    1) Determine the width of the custom profile to be clamped
        - Refer to tables at end of this section showing range of widths available to clamp for each VersaRail setup position
    2) Determine the jaw z-depth required for the application
        - Minimum depth with standard screws = 0.20”
        - For z-depth less than 0.20”, consider replacing the standard screws with low-profile or ultra-low-profile socket head cap screws (for example, McMaster-Carr #90358A011 or #93070A121)
    3) Refer to tables at the end of this section of the manual to determine the VersaRail position for the part width
    4) Download Solid Models of VersaRails, with files available for all width setups
    5) Design pocket for part and prep to cut
    6) Clamp on 0.125” spacer between inside surfaces of Universal Top Jaws and mill pocket for part

Refer to example applications at the end of this manual

Machineable VersaRails

- When machining the VersaRails you must take into account the adjacent parts on the VersaCart in the “Y” direction.
- If the part length is less than 5.75”, clearance in the “Y” direction or a high drop off for finished parts needs to be implemented.
- Clearance within 0.25” of the part (on both sides) will ensure you don’t hit the part in front of or behind the one you are dropping off parts while using VersaRails.

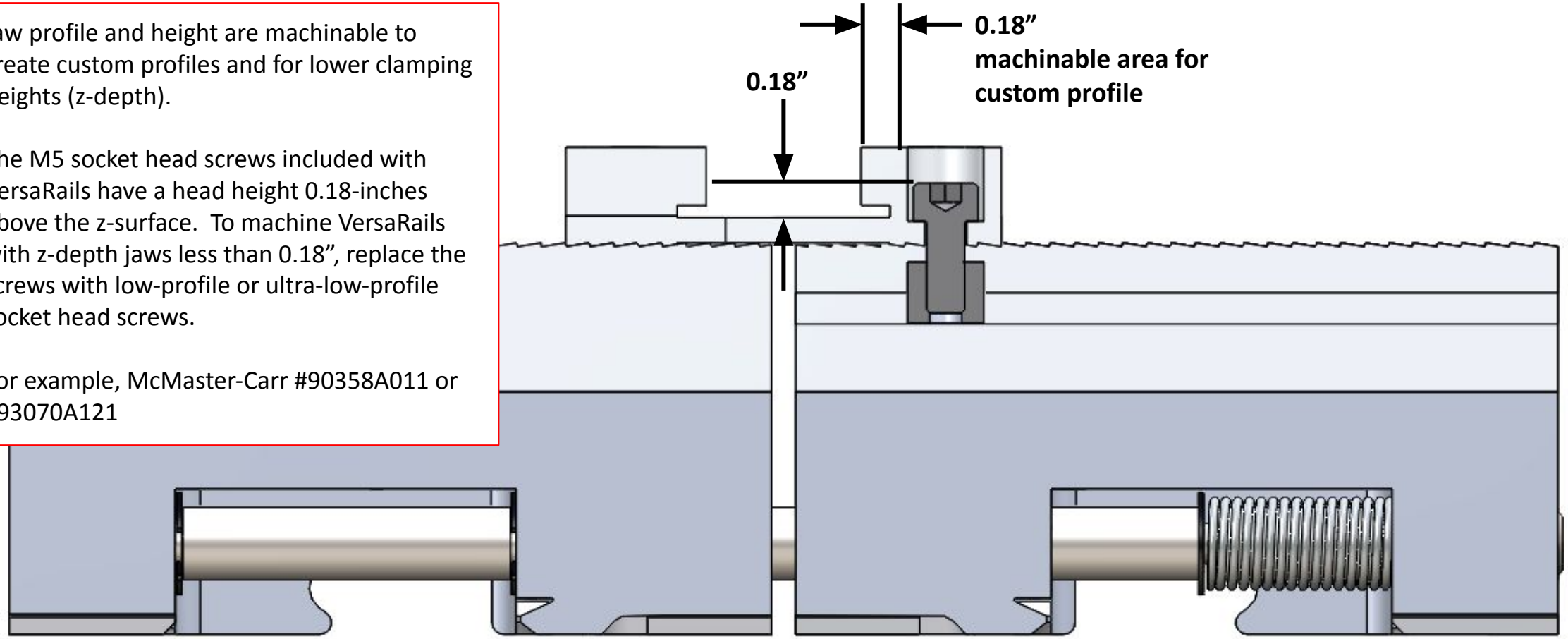


Machinable VersaRails

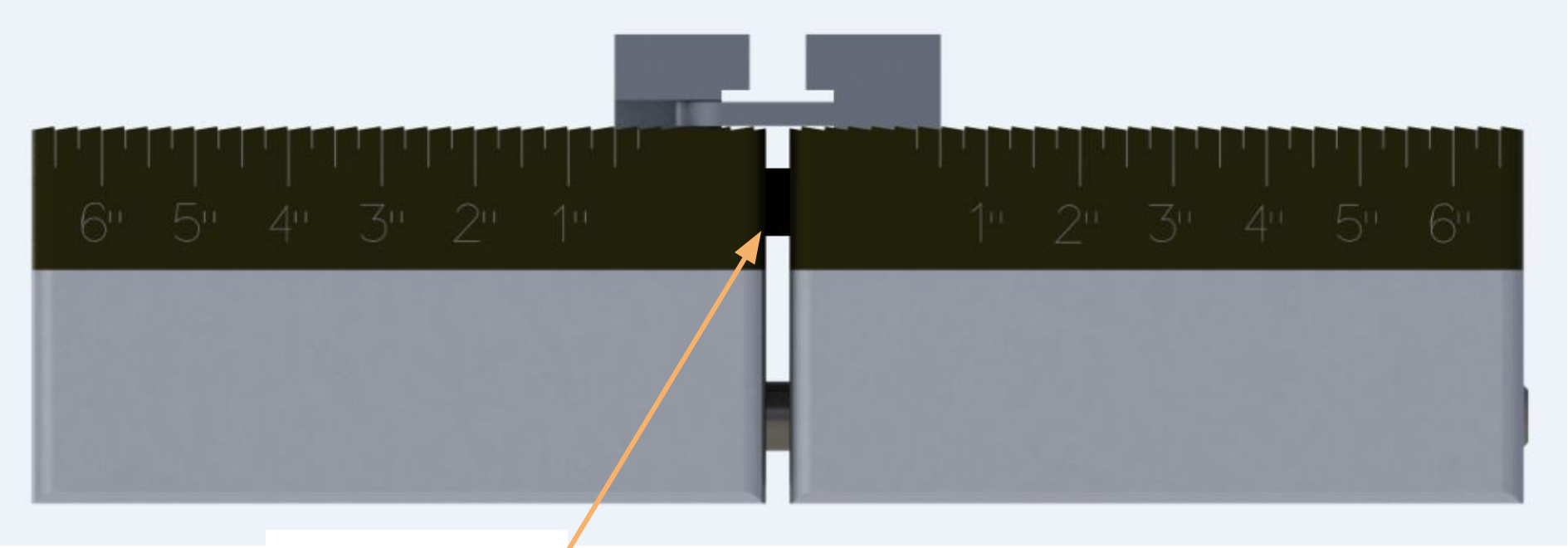
Jaw profile and height are machinable to create custom profiles and for lower clamping heights (z-depth).

The M5 socket head screws included with VersaRails have a head height 0.18-inches above the z-surface. To machine VersaRails with z-depth jaws less than 0.18”, replace the screws with low-profile or ultra-low-profile socket head screws.

For example, McMaster-Carr #90358A011 or #93070A121



Machinable VersaRails



Machinable VersaRails

VersaRail/Universal Top ruler position	Min part width (unmachined surface)	Max part width (machined surface)
0.25”	0.05”	0.41”
0.50”	0.30”	0.66”
0.75”	0.55”	0.91”
1.00”	0.80”	1.16”
1.25”	1.05”	1.41”
1.50”	1.30”	1.66”
1.75”	1.55”	1.91”
2.00”	1.80”	2.16”
2.25”	2.05”	2.41”
2.50”	2.30”	2.66”
2.75”	2.55”	2.91”
3.00”	2.80”	3.16”

Machinable VersaRails

VersaRail/Universal Top ruler position	Min part width (unmachined surface)	Max part width (machined surface)
3.25”	3.05”	3.41”
3.50”	3.30”	3.66”
3.75”	3.55”	3.91”
4.00”	3.80”	4.16”
4.25”	4.05”	4.41”
4.50”	4.30”	4.66”
4.75”	4.55”	4.91”
5.00”	4.80”	5.16”
5.25”	5.05”	5.41”
5.50”	5.30”	5.66”
5.75”	5.55”	5.91”
6.00”	5.80”	6.16”

Machinable VersaRails

VersaRail/Universal Top ruler position	Min part width (unmachined surface)	Max part width (machined surface)
6.25”	6.05”	6.41”
6.50”	6.30”	6.66”
6.75”	6.55”	6.91”

Example applications

Section 5

Piston part

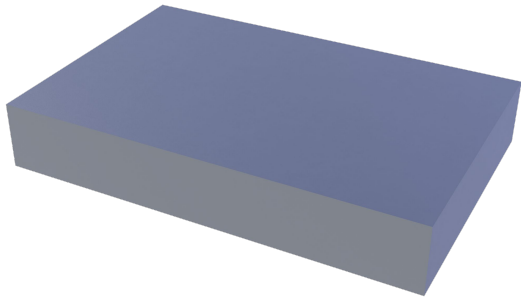
example is available for download

- The example shown to the right and in the following pages show how VersaBites and VersaRails can be used for a 2 operation part

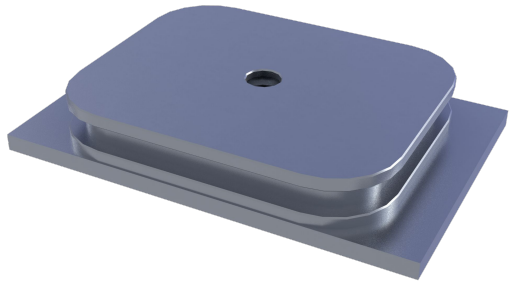
- Raw Material:

  6061-T6, 1.0 x 4.0 x 6.12” cut length

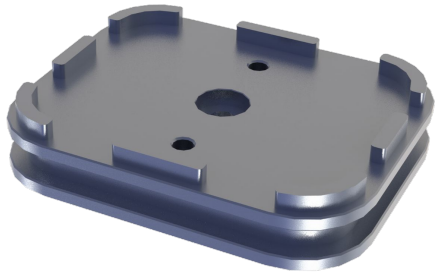
- 1 finished part from 1 piece of raw material
- Example requires 2 sets of Universal Top Jaws for automated processing

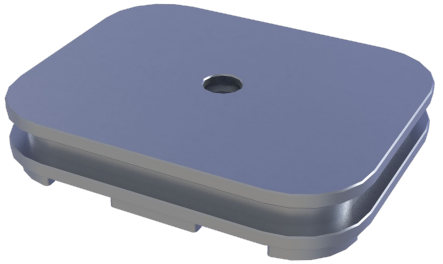


Raw Material



Op1 Machining Complete





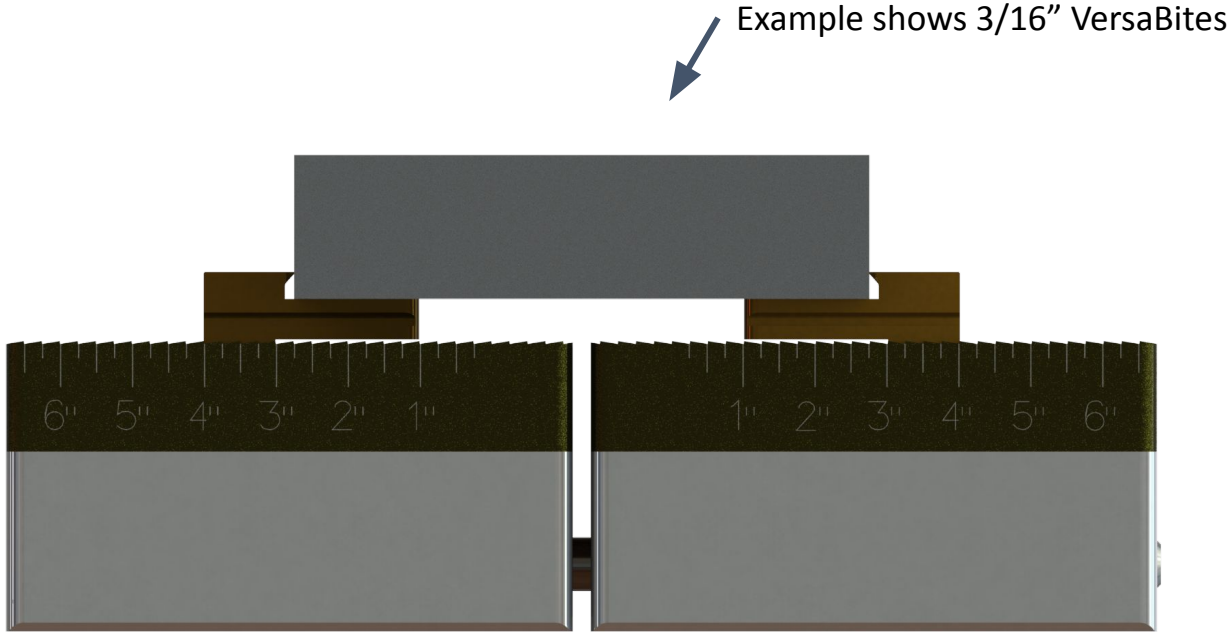
Finished Part

Piston part

Step 1: Position VersaBites on Universal Top Jaws in 4.0” position, as shown on the right

Note: With softer material, like 6061-T6 in this example, the VersaBites will “bite” into the material yielding a nominal gap between the left and right jaws less than 0.125-inches. As long as the gap between the jaws is 0.08 to 0.15-inches, the gap is sufficient.

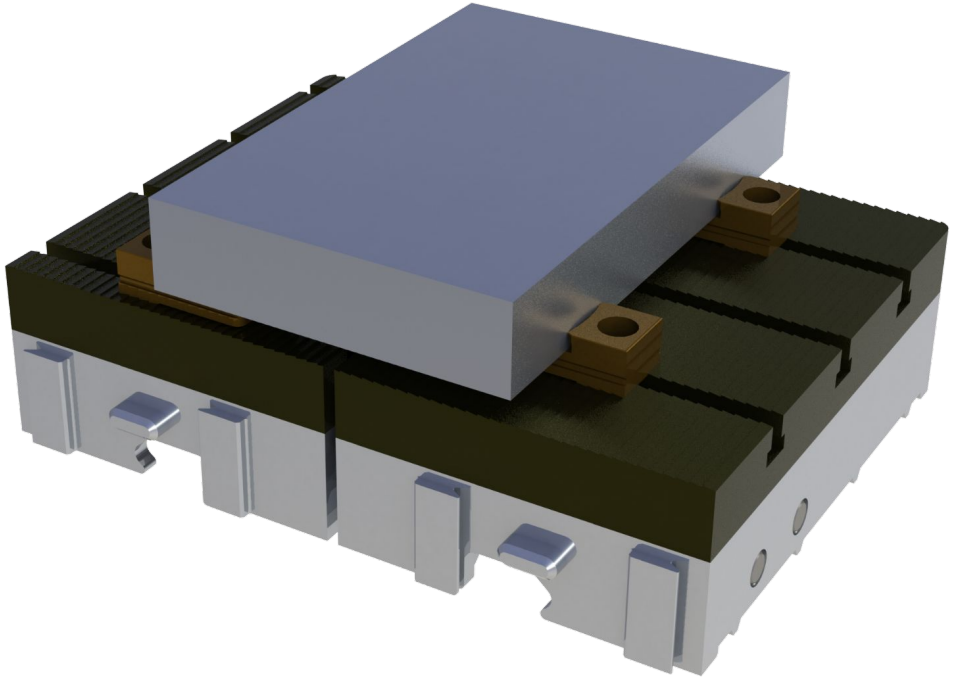
Note: Because the MultiGrip FJ Vise is a fixed jaw vise, the center of the part will move to the right by the distance the VersaBite “bites” into the material. Consider the movement of the part into the VersaBites when determining the X location of the raw material in the vise.



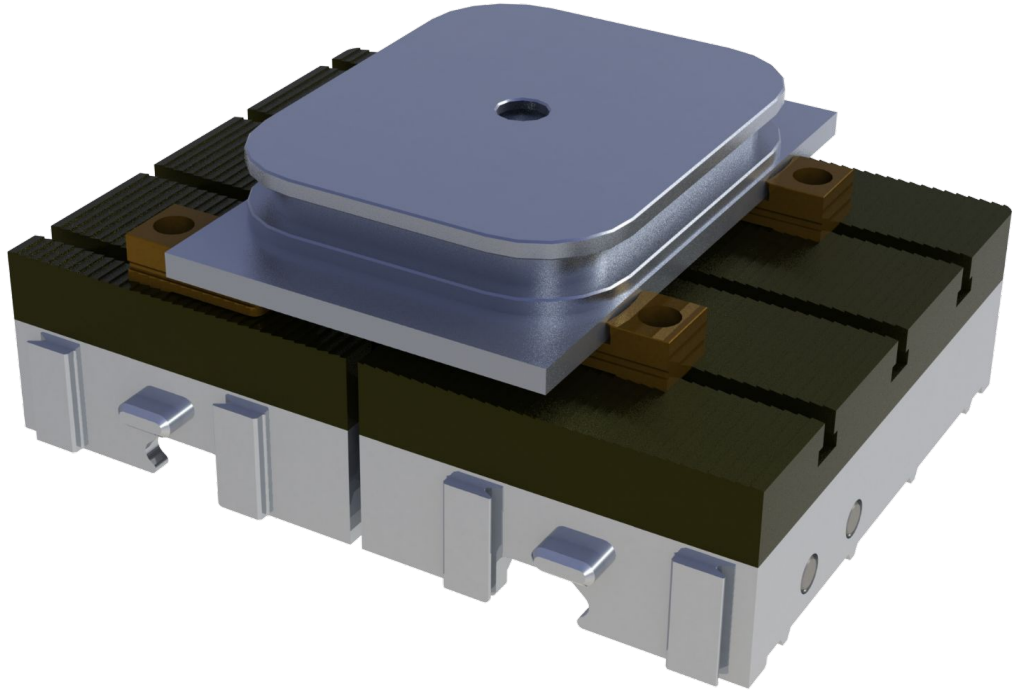
VersaBites clamping on 4.00” wide raw material

Piston part

Step 2: Prove out Op1 machining



VersaBites clamping on 4.00” wide raw material

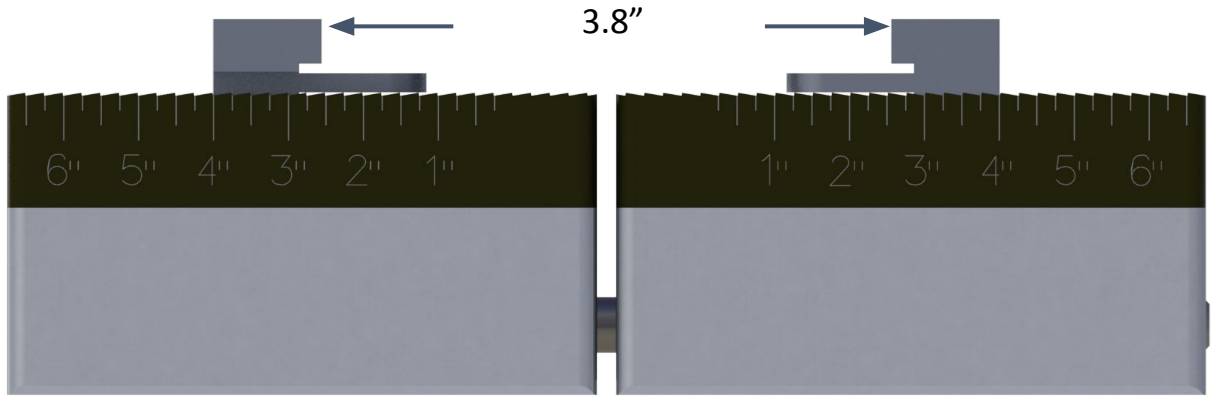


Op1 complete

Piston part

Step 3: Assemble VersaRails on 2nd set of Universal Top Jaws

- Op1 profile is 3.95” wide
- Referring to tables in Section 4, the optimal position for the VersaRail is to place VersaRails at 4.0” location, where faces of unmachined VersaRails will be 3.80” apart

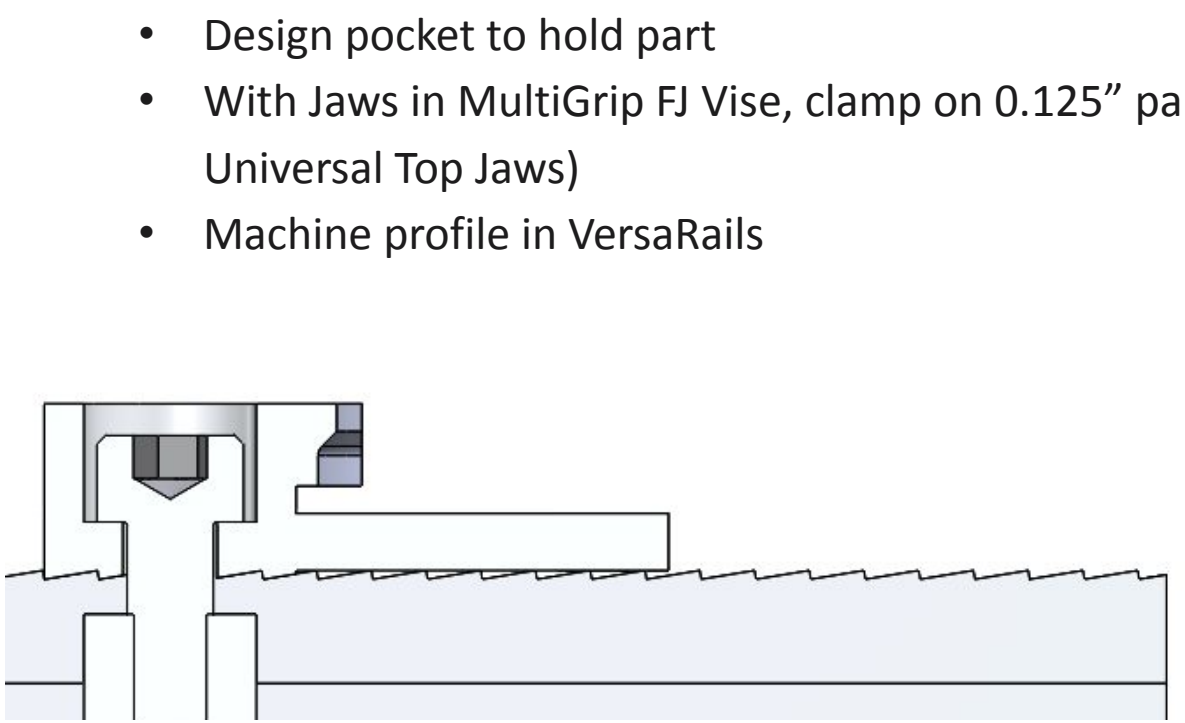


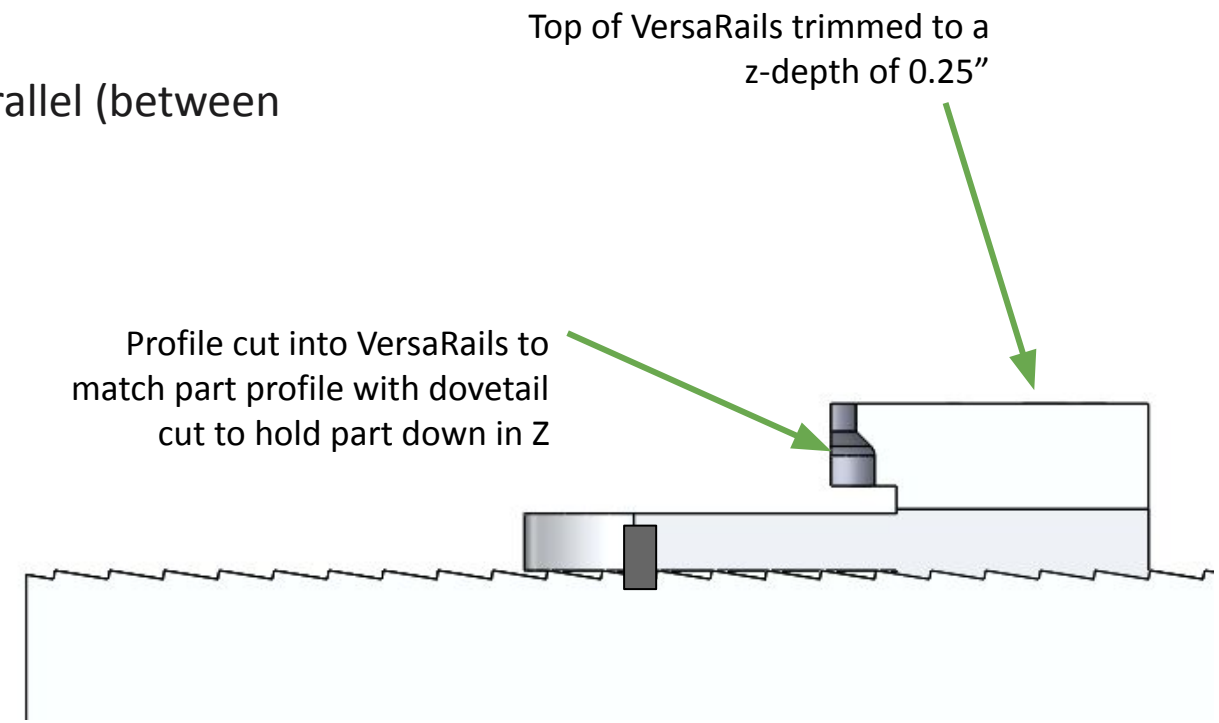
VersaRails in 4.00” location
(before machining part profile)

Piston part

Step 4: Machine profile in VersaRails for Op2 Jaws

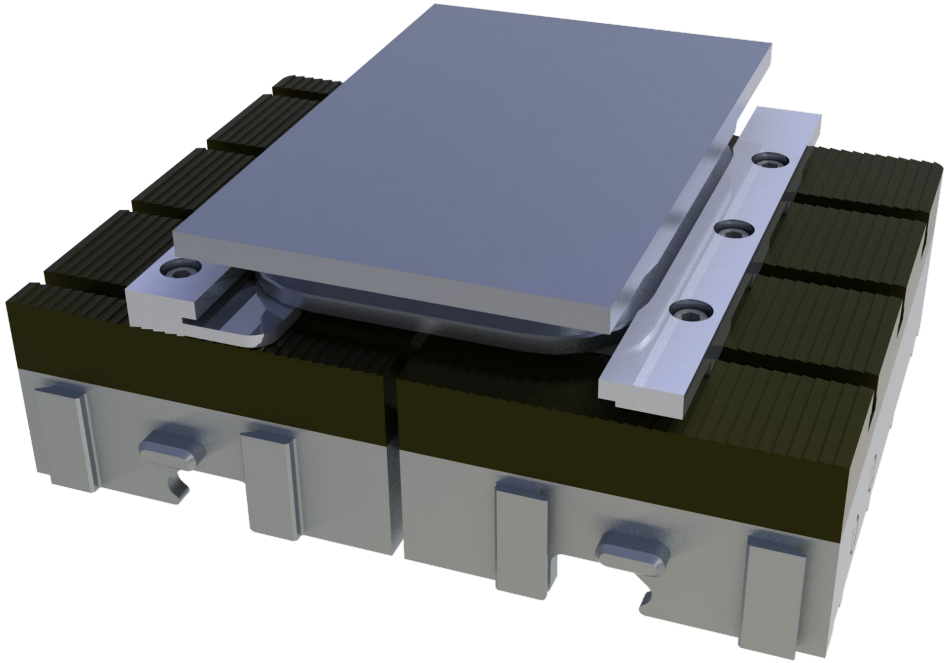
- Download solid model of VersaRails in 4.00” width position
- Design pocket to hold part
- With Jaws in MultiGrip FJ Vise, clamp on 0.125” parallel (between Universal Top Jaws)
- Machine profile in VersaRails

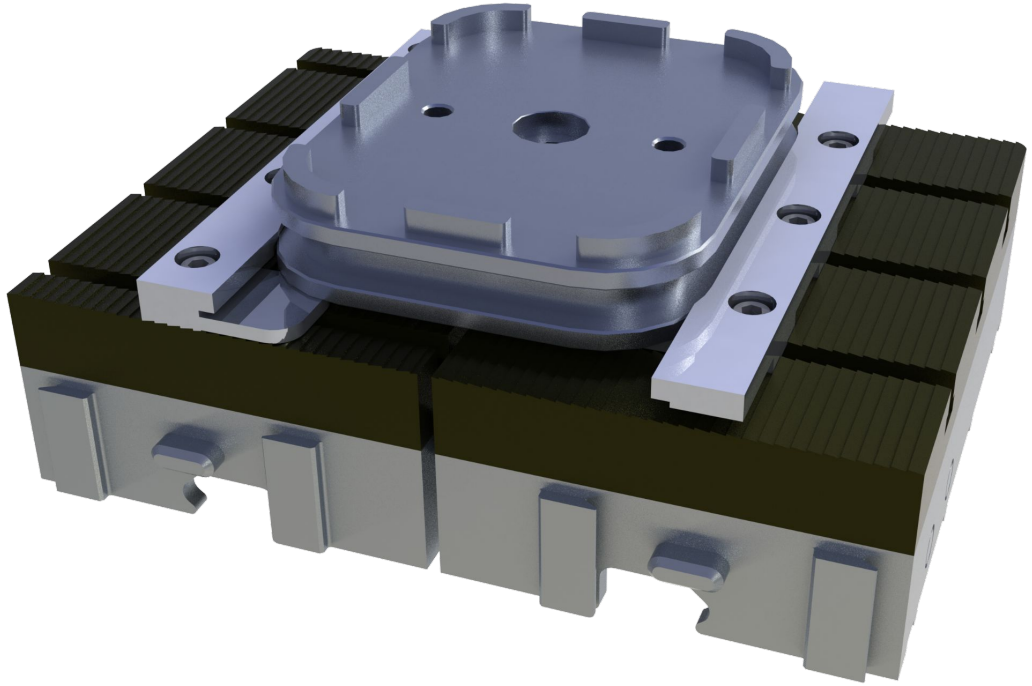




Piston part

Step 5: Prove out Op2 Machining





Narrow part, Multi-Up Machining

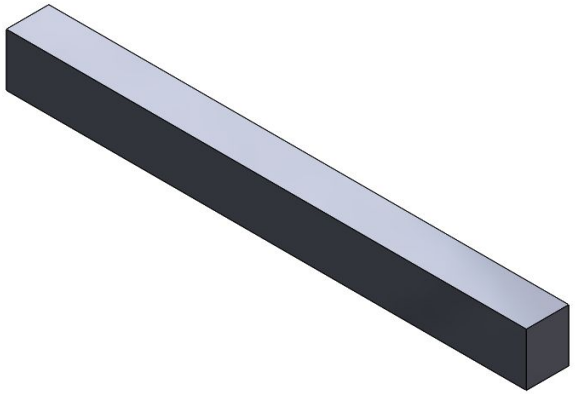
example is available for download

- The example shown to the right and in the following pages show how VersaBites and VersaRails can be used

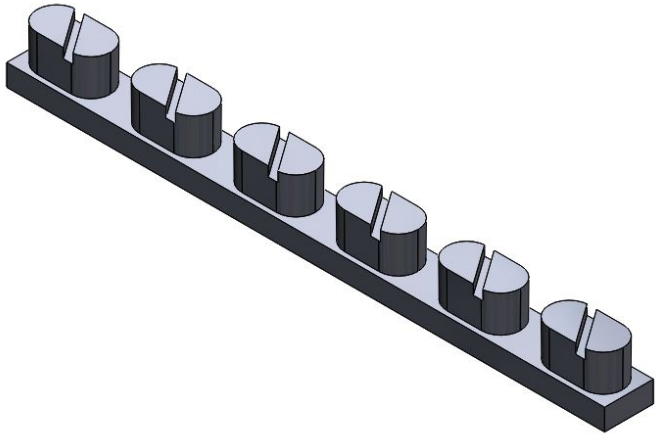
- Raw Material:

  6061-T6, 0.50 x 0.625 x 6.15” cut length

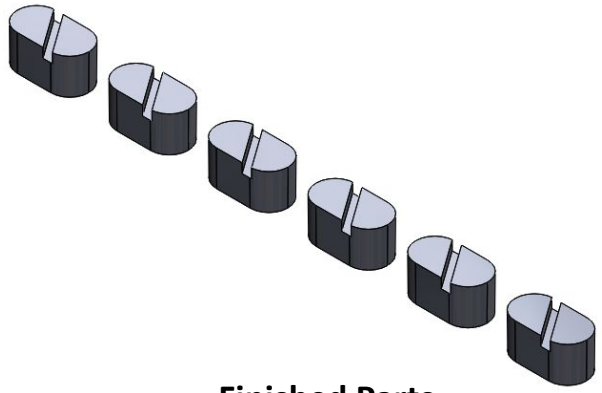
- 6 pieces from 1 piece of raw material (multi-up)
- Example requires 2 sets of Universal Top Jaws for automated processing



Raw Material



Op1 Machining Complete



Finished Parts

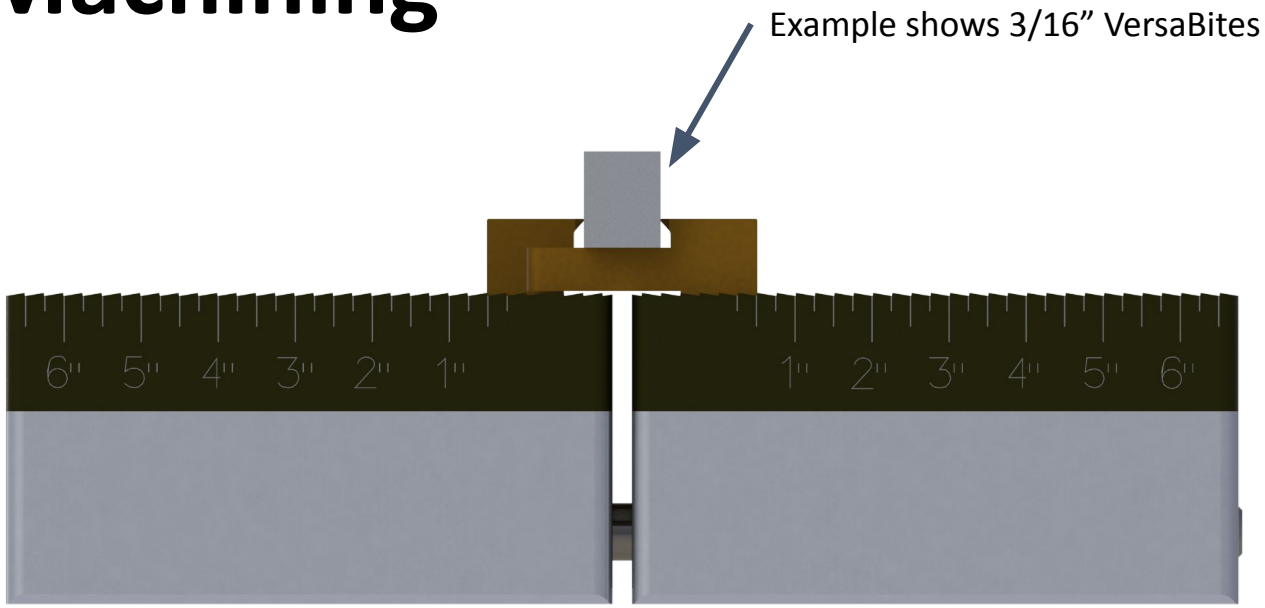
For Multi-Up Machining, it is recommended to include a draft angle or dovetail feature to hold the individual parts during and after Op2 Machining. This example includes a draft angle.

Narrow part, Multi-Up Machining

Step 1: Position VersaBites on Universal Top Jaws in 0.50” position, as shown on the right

Note: With softer material, like 6061-T6 in this example, the VersaBites will “bite” into the material yielding a nominal gap between the left and right jaws less than 0.125-inches. As long as the gap between the jaws is 0.05 to 0.15-inches, the gap is sufficient.

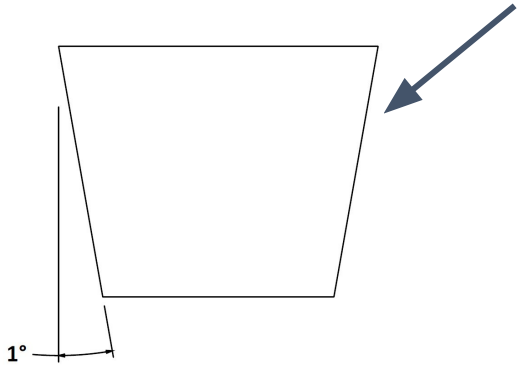
Note: Because the MultiGrip FJ Vise is a fixed jaw vise, the center of the part will move to the right by the distance the VersaBite “bites” into the material. Consider the movement of the part into the VersaBites when determining the X location of the raw material in the vise.



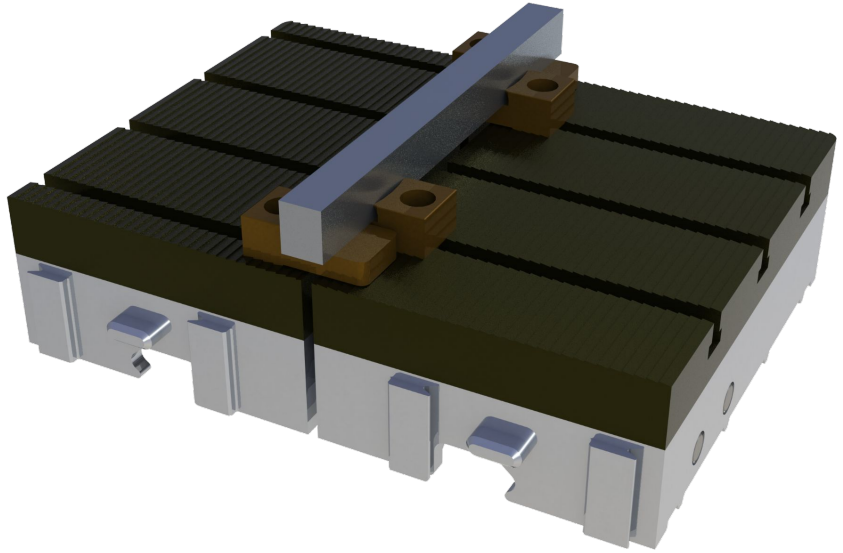
VersaBites clamping on 0.50” wide raw material

Narrow part, Multi-Up Machining

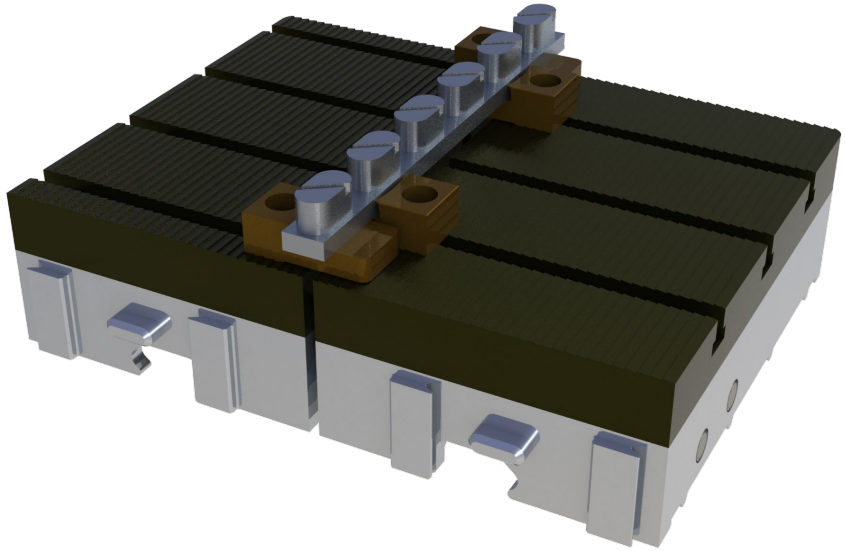
Step 2: Prove out Op1 machining



1-degree draft angle machined using a 1-degree taper mill in Op1 to aid Op2 hold when parts are separated (exaggerated for clarity)



VersaBites clamping on 0.50” wide raw material

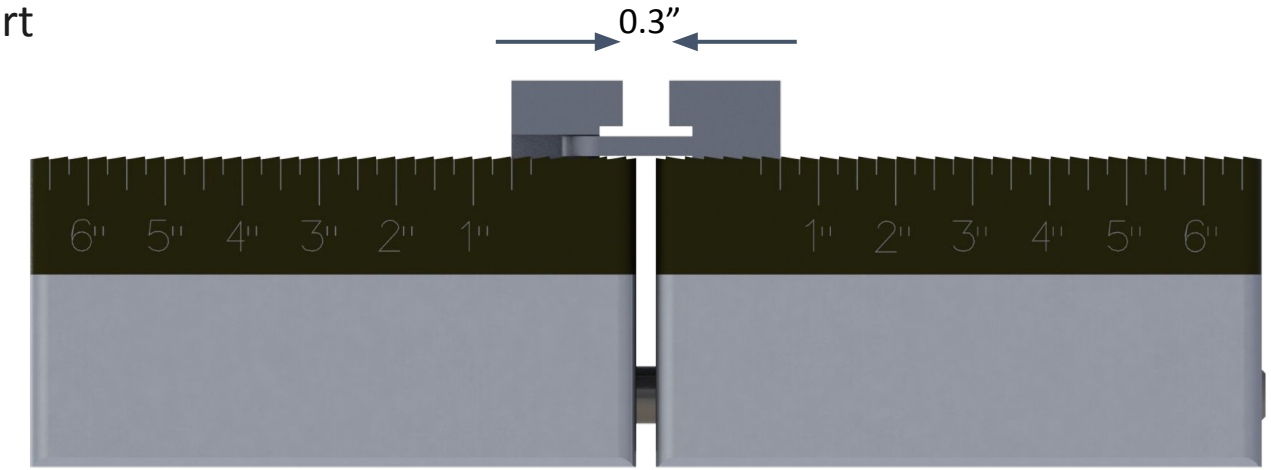


Op1 complete

Narrow part, Multi-Up Machining

Step 3: Assemble VersaRails on 2nd set of Universal Top Jaws

- Op1 profile is 0.40” wide with a 1-degree taper
- Referring to tables in Section 4, the optimal position for the VersaRail is to place VersaRails at 0.50” location, where faces of unmachined VersaRails will be 0.30” apart

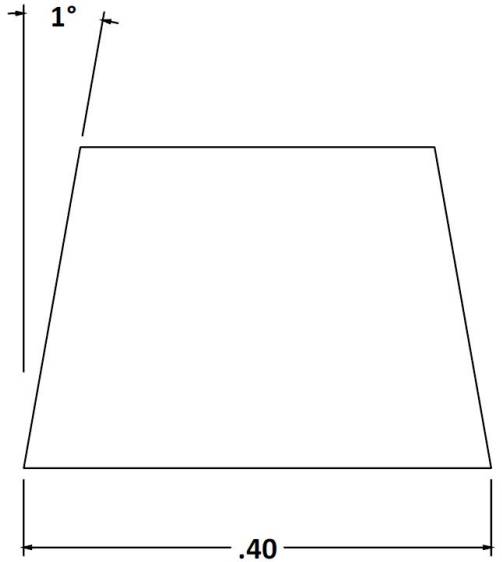


VersaRails in 0.50” location
(before machining part profile)

Narrow part, Multi-Up Machining

Step 4: Machine profile in VersaRails for Op2 Jaws

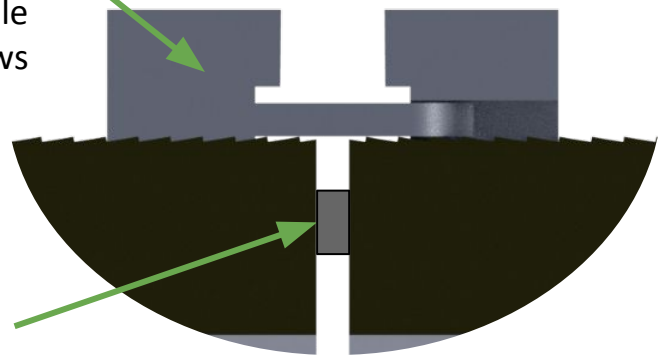
- Download solid model of VersaRails in 0.50” width position
- Design pocket
- With Jaws in MultiGrip FJ Vise, clamp on 0.125” parallel (between Universal Top Jaws)
- Machine profile in VersaRails



Part Profile

0.18” can be trimmed from top of VersaRails, if needed for low profile part *more can be trimmed if socket head screws are replaced by ultra-low profile screws

Clamp on 0.125” spacer between Universal Top Jaws, then machine profile



Machined VersaRails

Narrow part, Multi-Up Machining

Step 5: Prove out Op2 Machining