

TITAN-1M CNC Building Blocks Machining Guide

This comprehensive machining guide provides detailed setup and operational instructions for the TITAN-1M Building Blocks project. The document outlines required tooling, workholding specifications, and critical machining parameters for both the first and second operations. Follow these precise technical guidelines to ensure accurate and repeatable results when machining the TITANS of CNC Building Blocks.



by **Tylor Good**

Required Tooling for First Operation

Tool Description	Quantity	Part Number
STELLRAM 5720 3"	1	5673338
SHELL MILL		
CARBIDE MILLING INSERT	4	5665949
3/8" X 1" X 3" END MILL	2	3870468
1/4" CHAMFER MILL	2	6464004
0.1772" SOLID CARBIDE DRILL	2	4150202
10-32 UNC ROLL TAP	4	5945352

The tooling specified above is required for the first operation of the TITAN-1M Building Blocks project. Each tool plays a specific role in the machining process, from the initial facing operations with the shell mill to detailed feature creation with end mills, drills, and taps. Ensure all tooling is properly measured and verified before beginning the machining operation.



First Operation Workholding Setup

Proper workholding is critical for successful machining of the TITAN-1M Building Blocks. The setup requires:

- Hard jaws with parallels positioned inside
- Material height of 1.0" from the top of the jaws
- Hold .100" to .200" of the material in the hard jaws
- Ensure sufficient stock above jaws for Z-.76 deep profiling without tool-jaw interference
- Soft jaws can be used as an alternative workholding method

Carefully verify the workpiece extends high enough above the jaws to allow for the profiling operation without collision. Improper workholding can result in damaged parts, broken tools, or unsafe machining conditions. Always double-check your setup before starting the program.

First Operation Work Coordinate Setup



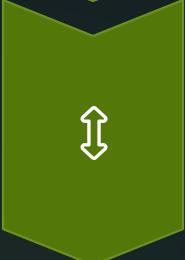
X-Axis Origin Setup

Set X-axis zero at the left edge of the stock. Move in X+.050 from the rough stock edge and set this as your program zero.



Y-Axis Origin Setup

Set Y-axis zero at the back dead jaw. Move in Y-.050 from this reference surface and establish this position as your program zero.



Z-Axis Origin Setup

Set Z-axis zero at the top surface of the workpiece. After establishing this reference, drop Z-.020 for the facing operation.

Accurate work coordinate setup is essential for precise machining. Take your time to establish reliable reference points and verify your work offset settings before executing the program. Consider using an edge finder or probe for more precise setup if available.

Required Tooling for Second Operation



STELLRAM 5720 3" SHELL MILL

Quantity: 1 | Part Number: 5673338



CARBIDE MILLING INSERT

Quantity: 4 | Part Number: 5665949



1/4" CHAMFER MILL

Quantity: 2 | Part Number: 6464004

The second operation requires fewer tools compared to the first operation. This toolset focuses on finishing operations including facing and chamfering. Ensure all tools are preset to the correct length and diameter compensations before beginning the second operation. Tool wear should be evaluated between operations to maintain dimensional accuracy.

Second Operation Workholding Setup

For the second operation, the workpiece must be flipped 180 degrees from left to right with a left-hand stop for positioning. This ensures proper alignment with the previous operation and maintains geometric relationships between features machined in both operations.

The workholding specifications are as follows:

- Hard jaws height: 1.75 inches
- Parallel height: 1.25 inches
- Hold the part .500 inches deep in the hard jaws

This configuration provides secure workholding while exposing the necessary surfaces for machining. Verify that the part is seated firmly against the parallels and the stop to ensure consistent positioning.

Second Operation Work Coordinate Setup

X-Y Coordinate Zero

Position the X-Y zero at the upper-left corner of the workpiece. This reference point serves as the primary datum for all second operation toolpaths and feature locations.

Z-Axis Zero

Set the Z-axis zero at the top of the finished part, which is positioned .750 inches above the parallels. This ensures proper depth control for all machining operations.

Verification Steps

After setting work coordinates, run a dry cycle or use machine verification modes to confirm toolpath accuracy before cutting. This prevents potential collisions or dimensional errors.

Consistent and accurate work coordinate setup between operations is critical for feature alignment and dimensional accuracy. Take particular care when establishing the Z zero, as depth control directly impacts part functionality and appearance.

Machining Process Best Practices

Operation Sequence

1. Complete all first operation machining with the specified tooling
2. Inspect critical dimensions before removing from the first operation setup
3. Flip the part and secure according to second operation specifications
4. Complete second operation machining
5. Perform final inspection and deburring

Quality Considerations

- Verify all tool offsets before beginning each operation
- Monitor tool wear throughout the machining process
- Check critical dimensions between operations
- Maintain consistent coolant flow to prevent heat-related distortion
- Deburr edges carefully to maintain design intent and functionality

Following these best practices will help ensure successful completion of the TITAN-1M Building Blocks project. Remember that attention to detail during setup and operation is the key to producing high-quality, precision machined components. Document any process improvements or issues encountered for future reference.