

Tech Brief

CleanTop



Tech Brief: Joined Optical Tables

Optical tables provide a flat, rigid, stable surface for mounting optical components. If an optical beamline is overly long or complex it often requires more than one table. In fact, many applications require numerous optical tables joined together to form a stiff, flat, vibration-free base for beamlines and other applications. However not all joined optical tables are created equally. In this tech brief we discuss some key features to look for when purchasing joined optical tables.

Where the tables meet there is naturally a joint to join them. The joint must be manufactured to ensure rigidity and precise alignment are maintained throughout the entire joined structure and the table flatness, stiffness and damping remain constant. Key features to look for include:

Thick welded plates that run the entire width of the table and from the top skin to the bottom skin. Plates on adjacent tables are bolted together to form the joint.

Alternative designs simply screw the skins together with bracketry. Precise alignment cannot be maintained and the void between the tables dramatically compromises the strength of the joint due to the discontinuity between the two honeycomb cores with no structural reinforcement in the space between the two tables

TMC uses two 0.75" (19 mm) thick steel plates that run the entire span from the top skin to the bottom skin of the table. These plates are welded to the top and bottom skins and mated together with 1" (25.4 mm) coupling nuts to keep the tables joined. These plates are actually stiffer than the honeycomb core inside the table and provide the ultimate in rigidity and stability.

The joiner plates bridge the gap between the endwalls of the individual tables to provide continuous core integrity over the length of the joined table assembly. And, because the joiner plates are thick plates machined flat, there are no air voids between the joiner plates ensuring maximum strength and stiffness of the joint.

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- Avoid "tongue and groove"
- Look for thick welded plates for maximum contact in joints
- Large coupling nuts for rigidity
- Matching machined pins and holes to easily align joints





Other joint designs are often just a tongue and groove style design, or a clamp style, that only attach to the top and bottom skins, leaving the core of the tables unattached. These designs are not very rigid and can twist or flex when stressed. This can compromise the overall flatness of the tables.

Plates are welded to the top and bottom skin to provide maximum stiffness. When joined together the plates are 1.25" (38mm) in total thickness.





Male plate on left, female plate on right

It's nearly impossible and very cost-prohibitive to ship a large joined table already assembled. For this reason, individual tables are shipped separately and joined on site. Therefore, the joints need to be strong and easy to assemble.

When the machined plates are joined together by 1" (25.4mm) coupling nuts this creates contact between tables from the top skin to the bottom skin providing maximum rigidity. Some joined tables can be very large, up to 60 (18m) feet with many sections. This requires maximum rigidity and stiffness to maintain a flat surface from one end to the other.

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Steel dowel pins ensure precision alignment. The chamfered pin fits into a hole on the opposite plate of the joint for easy alignment.

Four pins per joint (two on either side) ensure precision alignment. The chamfered pin fits into a hole on the opposite plate of the joint for easy alignment.

When the two parts of a joint are brought together, the steel pins guide the two parts together accurately. This ensures precision alignment of the joint which results in co-planarity of the two tables. Once in position the joint is sealed by securing the coupling nuts associated with each steel plate. Since the thick plates have been ground flat the contact area between the two tables is the entire area of the joint, top skin to bottom skin, one edge to the other.



Summary

Not all joined optical tables are created equal. Pay particular attention to the way tables are joined. Larger and more complex projects will put more stress on the joints. You want to ensure that your joined tables will give you the stiffness, flatness and damping that your project requires.

