

Workholding and Automation

Industrial Hardware

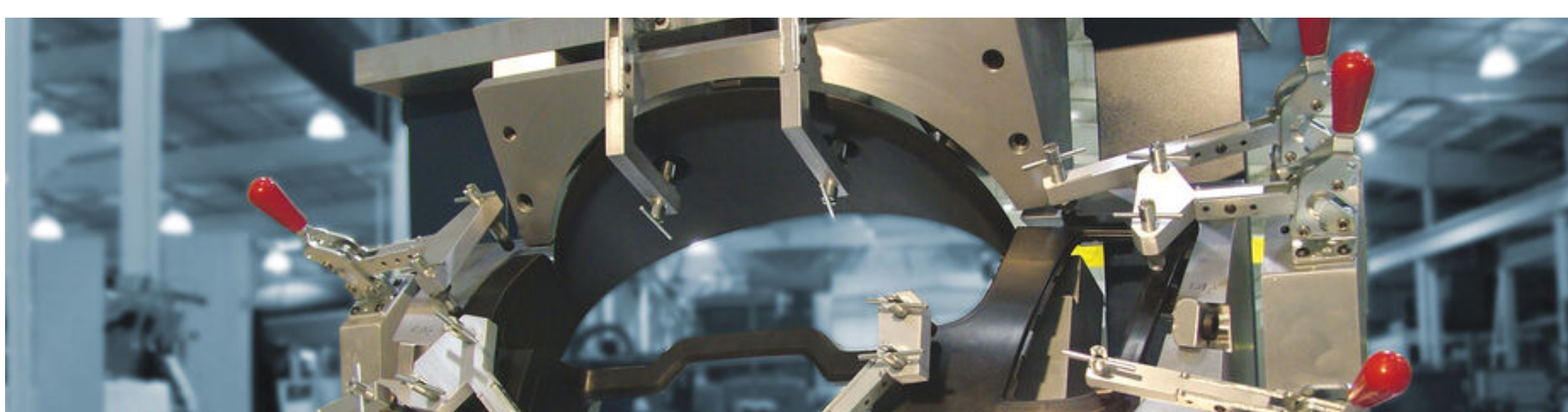
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Fixture Clamping Solutions



Do you know how to use fixture clamps to properly hold a workpiece in your machining systems?

In this article we will take a closer look at:

1. [What is Clamping?](#)
2. [Basic Clamping Principles](#)
3. [Types of Clamps](#)
 - > [Manually Operated Clamps](#)
 - > [Power Operated Clamps](#)
4. [Summary](#)



What is Clamping?

Once a workpiece is located in an industrial workholding fixture, it is necessary to press it against the fixture's locating surfaces and hold it there to ensure that the workpiece is not displaced by cutting tool or other forces acting upon it. In tool design, this action is known as clamping and the mechanisms used are known as clamps.

Basic Clamping Principles

- > Clamps should firmly hold the workpiece without distorting it.
- > Clamps should overcome the maximum possible force exerted on the workpiece while using minimum clamping force.
- > Clamps should be easy to operate.
- > Vibrations should tighten any cams or wedges in the clamp design and not loosen them.
- > Clamps should be placed directly above the workpiece supports to avoid part distortion and springing and to resist cutting tool forces.

The most efficient clamping design is one where the clamping is adequate and the clamping device minimizes the operating time of the jig or fixture. For high production rates, quick-acting clamps are essential. For small work batches, simple clamps are usually sufficient.

Types of Clamps

Securely holding the workpiece is an essential function of any jig or fixture. The first step in selecting and applying clamps is to understand their basic actions and the characteristics of efficient clamping.

Clamps usually fall into one of two primary classifications:

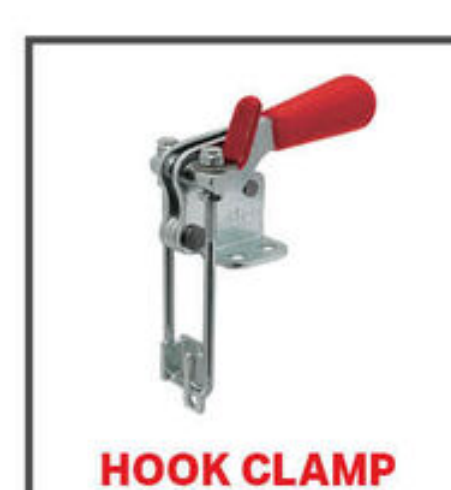
- > [Manually Operated Clamps](#)
- > [Power Operated Clamps](#)

Manually Operated Clamps

Manually operated clamps can be divided into several basic groups: [heavy-duty strap clamps](#), screw clamps, swing clamps, [edge clamps](#), C clamps, cam clamps, and [toggle clamps](#). Some clamps fit into more than one classification.

Jig and fixture clamps for machining and fixturing applications include compact fixture clamps which allow you to fixture more parts on the machine table. They are available in cam edge clamps, [toe clamps](#), and [wedge clamps](#). These economical, low-profile clamps make programming easier because there are no clamps to jump over.

- > [ID expansion clamps](#) by Mitee-Bite are excellent for palletized setups in secondary operations on lathe parts.
- > [Hook clamp](#) and [swing clamp](#) assemblies are ideal for set-ups where space is limited.
- > [Machine strap clamps](#) are used to secure large or oddly shaped workpieces directly to the table.
- > [Cam handle edge clamps](#) provide quick locking action and high holding pressure.
- > [Adjustable clamp rests](#) are used to support and level clamps in mills and other machining applications.
- > [Set-up wedges](#) are used for leveling and to provide extra height to the workpiece or strap clamps.
- > [Triangular step blocks](#) have long angled serrated edges that fit together so the top block is the same height as the workpiece to level a set-up clamp.
- > [Adjustable stroke plunger clamps](#) can be adjusted to hold and position various part sizes.



Power Operated Clamps

Power-driven clamps like pneumatic and hydraulic clamps can perform a range of motions including hold-downs, swings, and linear strokes to make your process easy to use and repeatable with no loss of quality.

Like manual clamps, power clamps are used to position and hold workpieces. But unlike hand-operated manual clamps, power clamps are controlled by air pressure or fluid pressure. [Pneumatic clamps](#) and [hydraulic clamps](#) are designed to perform a range of motions and increase production output through automation.

- > [Pneumatic hold-down clamps](#) apply clamping force from the top, wedging the workpiece down against the work surface.
- > [Pneumatic and hydraulic swing clamps](#) have arms that swing or lift out of the way to make loading and unloading easier.
- > [Pneumatic push-pull clamps](#) apply clamping force vertically in a straight-line action.
- > Pneumatic retractor clamps have an arm that moves forward and then pivots downward to apply a clamping force to the workpiece. The arm retracts completely into the unit, making it easier to load and unload.
- > [Clamp arm extensions](#) and [blank clamp arms](#) that can be customized are also available.
- > [Mounting blocks](#) provide recessed mounting options for power swing clamps.
- > [Switches and sensors](#) that send signals from the power clamp to a programmable controller or electronic device are also available.



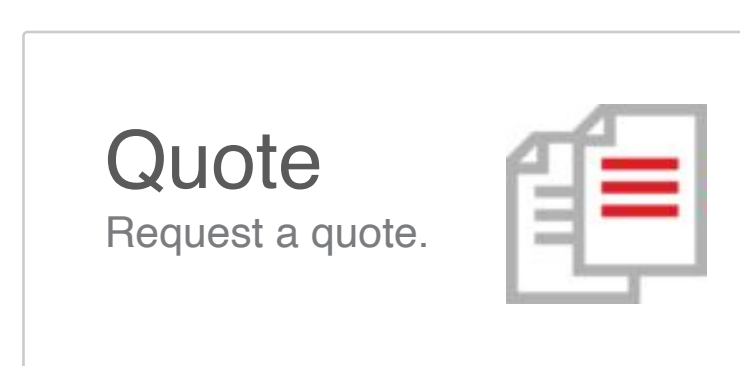
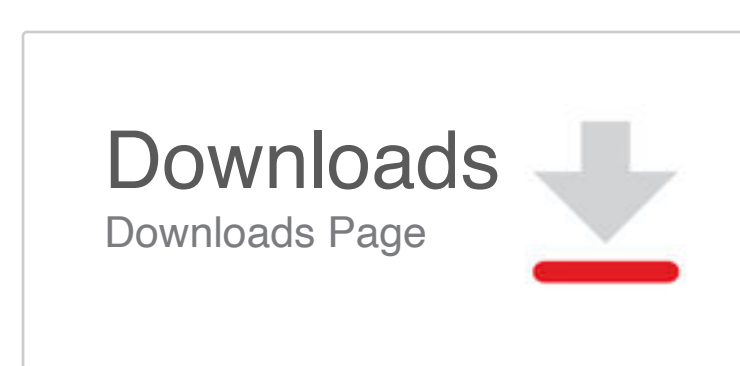
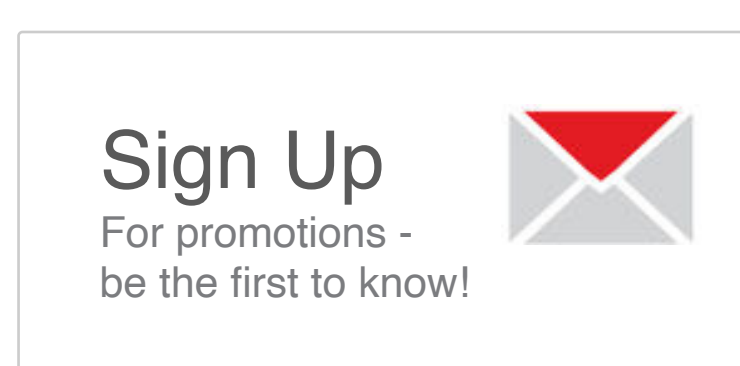
Summary

Fixture clamping designs depend upon the knowledge and understanding of:

- > [Locating a workpiece in the fixture](#)
- > [Basic clamping principles](#)
- > [The types of clamps available and their uses](#)

Once a clamping solution is determined, a fixture design can be completed which is safe, repeatable, easy to use and ensures accurate and quality products.

Finally, various clamping solutions are used with jigs and fixtures in many industries among which are automotive vehicle welding and assembly, engine and transmission machining and assembly, aerospace manufacturing and the medical and pharma industries.


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