



HST High Speed Precision Air Chuck Installation & Service Manual



Overview

The MicroCentric HST series air chucks are the most advanced jaw chuck available for high speed precision turning applications. The HST chuck features a titanium body, and utilizes a patented external wedge design that minimizes the effects of centrifugal force. This design enables the chuck to maintain holding force at high spindle speeds. HST chucks are also available with a patented non-rotating air tube assembly that eliminates the vibration typically associated with rotating air tube designs at very high spindle speeds.

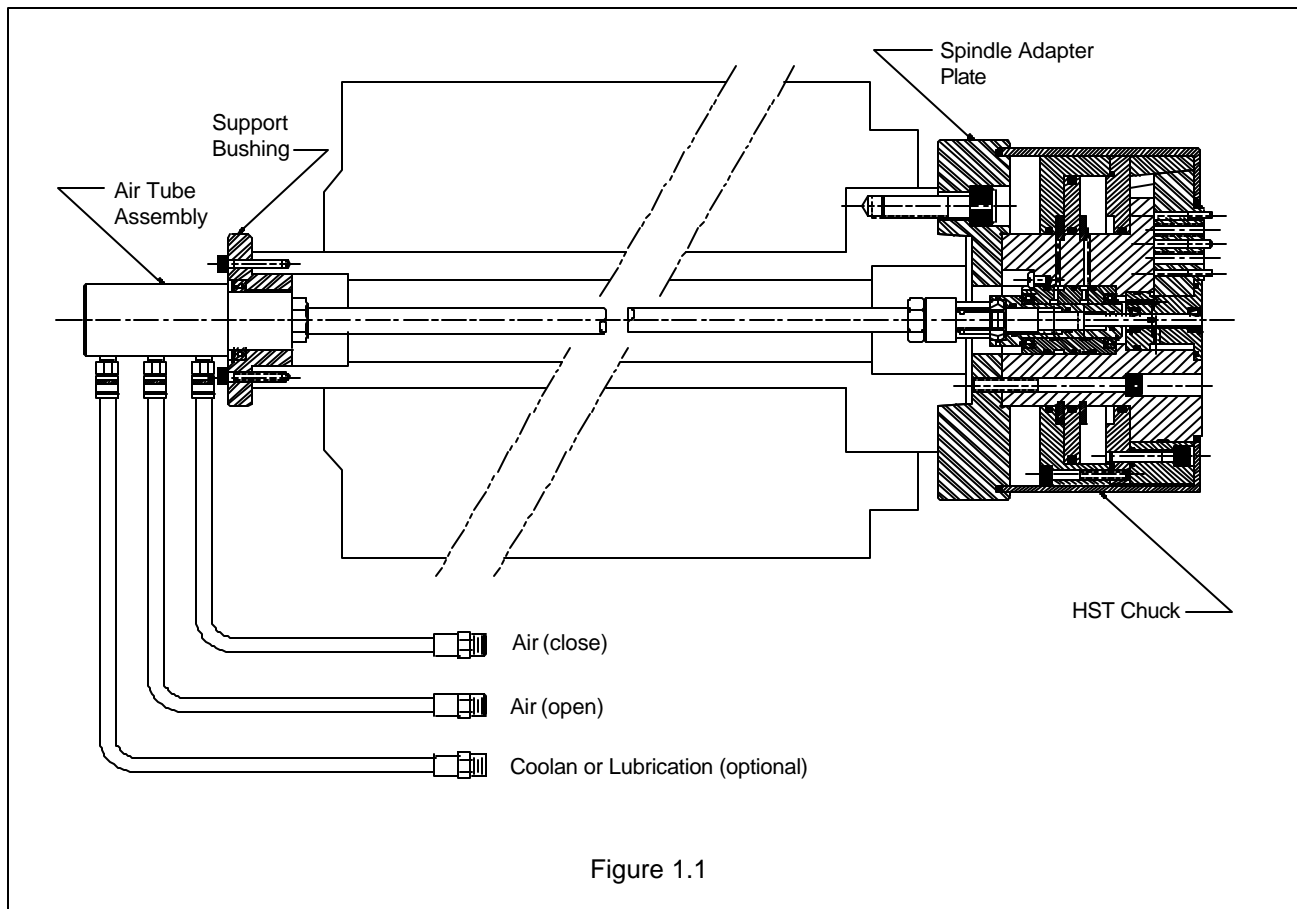
When correctly installed and properly maintained, HST chucks will deliver unsurpassed accuracy and long term performance. It is recommended that you familiarize yourself with the design and operation of the chuck prior to installation and operation. Therefore, please read this manual in its entirety prior to installation.

An important element in the overall performance and precision of the HST workholding system is the design and manufacture of top jaws. A section of this manual is devoted to top jaw design and manufacture. It is very important to follow the recommendations in this section to not only achieve best possible chucking accuracy, but optimum high speed capability as well.

We also invite you to contact our applications staff regarding installation, operation, the design and manufacture of top jaws, or to answer any other questions you may have regarding HST chucks.

The following are required to mount an HST air chuck to a machine spindle:

- Spindle adapter plate
- Air tube assembly
- Air tube support bushing
- Air filter/regulator/lubricator unit
- Four way air valve (manual or electronic)



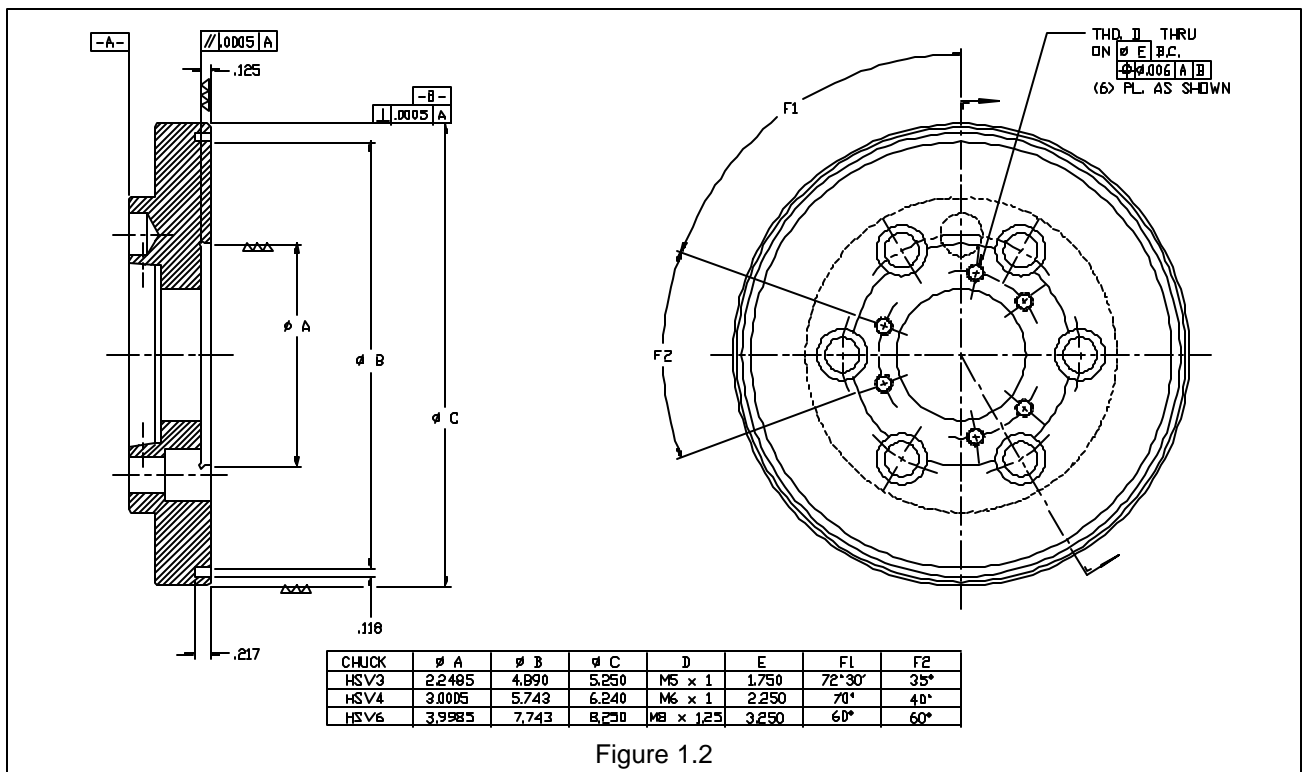
Installation Procedure

Spindle Adapter

If your HST chuck was not ordered with a spindle adapter plate, one must be manufactured in order to mount the chuck to the machine spindle. Refer to figure 1.2 for recommended dimensions and required configuration to correctly mount the HST chuck to the adapter. Note that the adapter plate must mate with the chuck's outer guard to seal the rear of the chuck.

Consult your machine's operating manual for spindle nose configuration and chuck mounting information.

In order to achieve a high level of chucking accuracy, it is critical that the adapter plate be manufactured precisely. The chuck pilot and the spindle pilot should be concentric within .0002". All mounting faces should be parallel, and square to the spindle pilot, within .0002".



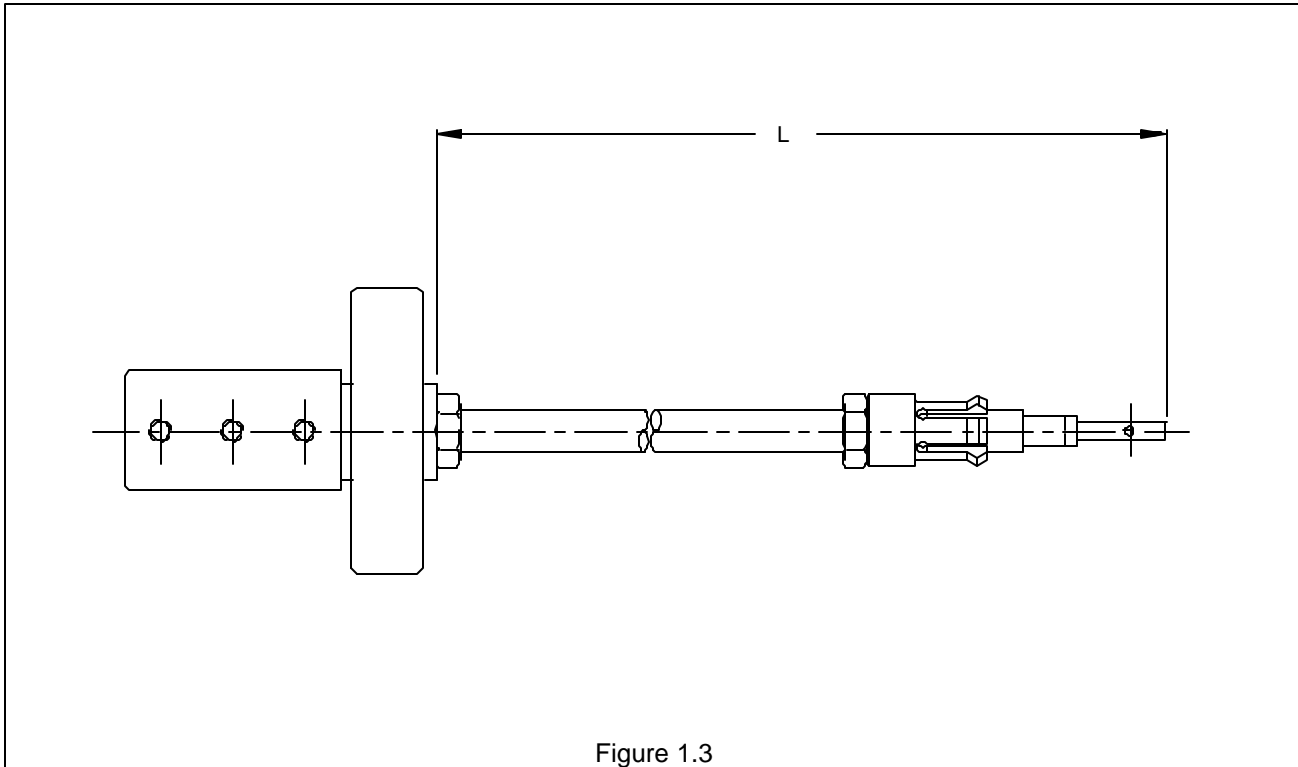
Air Tube

The HST chuck operates with the patented model NR50 non-rotating air tube assembly. This air tube is available in coolant through or (AL) automatic lubrication configurations.

It is important that the air tube assembly is the correct length for the machine on which the chuck is installed. Refer to figure 1.3 for the recommended length of the air tube assembly.

Recommended clearance between the air distributor and the rear of the machine spindle is 1.00" to 3.00".

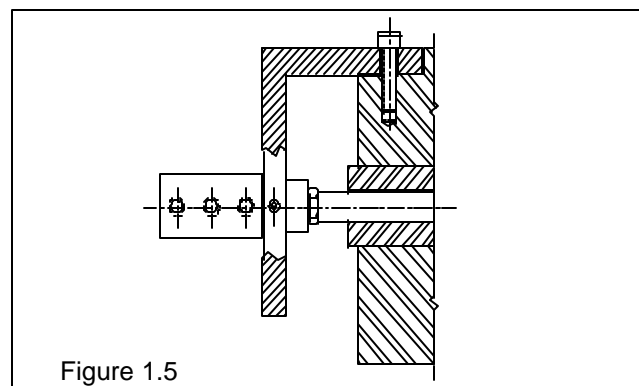
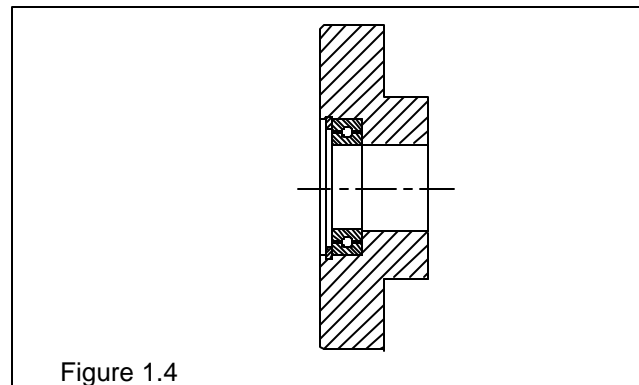
Caution: Clearance between the air distributor and the rear of the machine spindle is not to exceed 3.00".



Since the air tube does not rotate with the machine spindle, the tube must be supported either by a bushing assembly which incorporates a ball bearing, or a bracket connected to the machine frame.

Refer to figure 1.4 for an example of a fixed type support bushing. This bushing is available as an optional accessory.

Figure 1.5 illustrates a support bracket which is mounted to the machine frame.



Chuck Installation

1. First mount the adapter plate to the spindle nose of the machine. Make certain that the adapter and the spindle are free from nicks or foreign material which would prevent the proper seating of the adapter plate. Tighten the mounting bolts alternately and evenly. Tighten securely but do not over-torque.

2. After the adapter plate is mounted, measure the radial and lateral runout of the adapter with a .0001" dial test indicator. The female pilot for the chuck, and the face to which the chuck mounts should both run true within .0002" T.I.R. See figure 1.6.

3. Next remove the outer guard from the chuck. This is accomplished by unfastening the six flat head cap screws on the perimeter of the face of the chuck body.

4. With the outer guard removed, mount the chuck to the adapter plate. Make certain that the mounting surfaces of the chuck and adapter are free from nicks or foreign material which will prevent the proper seating of the chuck. Lightly snug up the mounting bolts. Do not fully torque the mounting bolts at this time.

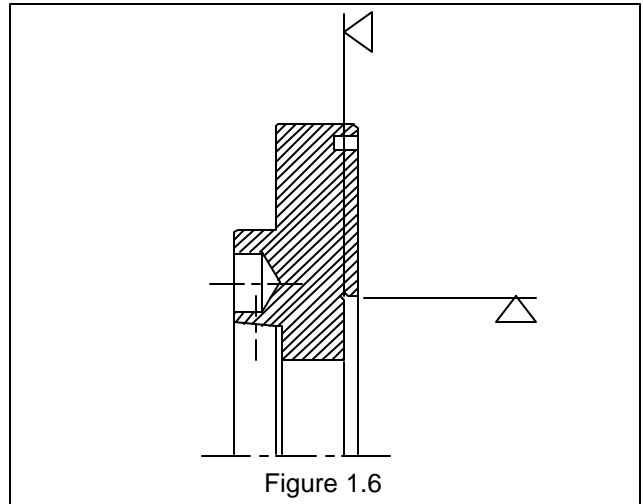
5. Use the test indicator to measure the radial runout of the chuck, by indicating the O.D. of the actuator ring. Since there is clearance between the chuck and adapter plate, the chuck can be trued to run concentric to the machine spindle. Adjust the chuck to run within .0002" T.I.R.

6. Now tighten the mounting bolts alternately and evenly. Tighten securely but do not over-torque.

7. Fasten the support bushing to the rear of the machine spindle.

8. Slide the air tube through the rear of the machine spindle, coupling the tube into the rotating air bearing inside the chuck.

On installations using a bracket to support the air tube, mount the bracket to the machine prior to installing the air tube. Insert the air tube through the bracket then into the machine spindle, and couple the tube into the rotating air bearing. Secure the rear of the tube to the bracket, and adjust the bracket to be positioned in line with the spindle bore.



9. Connect the air lines from the operating valve to the air distributor at the rear of the air tube.

10. Connect the operating valve to an air filter/regulator/lubricator unit.

11. Set the lubricator to provide a minimum of two drops per minute of lubricant to the air supply. This will assure that the rotary air bearing assembly inside the chuck will be continuously lubricated as the chuck is operated.

12. Set the air pressure to 40 psi and open and close the chuck. Next set the air pressure at 15 psi and open and close the chuck several times. Checking the operation of the chuck at a low air pressure verifies that the chuck's operating mechanism is moving freely..

13. Install the outer guard to the chuck making certain that it is seated properly on the chuck body. Tighten the mounting bolts alternately and evenly. Tighten securely but do not over-torque. Once again verify smooth operation of the chuck at 15 psi air pressure.

Coolant Through Machine Spindle

The standard HST chuck will accommodate coolant or air through the machine spindle.

To utilize the coolant through feature, connect a coolant line to the coolant port at the rear of the model NR50 air tube assembly.

Automatic Lubrication

In place of coolant, lubrication can be supplied to the chuck through the model NR50 air tube assembly.

This option is recommended for high volume continuous production applications. A lubrication pump is installed on the machine which will supply lubrication to the HST chuck at a pre-set interval.

To utilize the automatic lubrication feature, the model NR50/AL air tube assembly must be ordered. The lubrication line is connected to the rear port of the model NR50/AL tube. Refer to the lubrication section in this manual for recommended lubricants, and lubrication cycle.

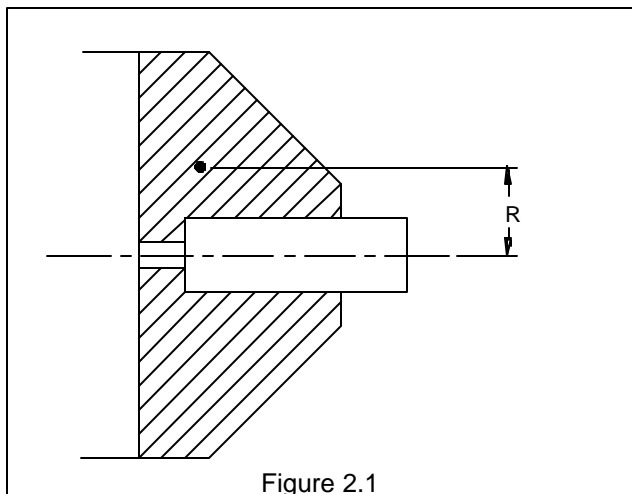
Top Jaw Design & Machining

Top Jaw Design

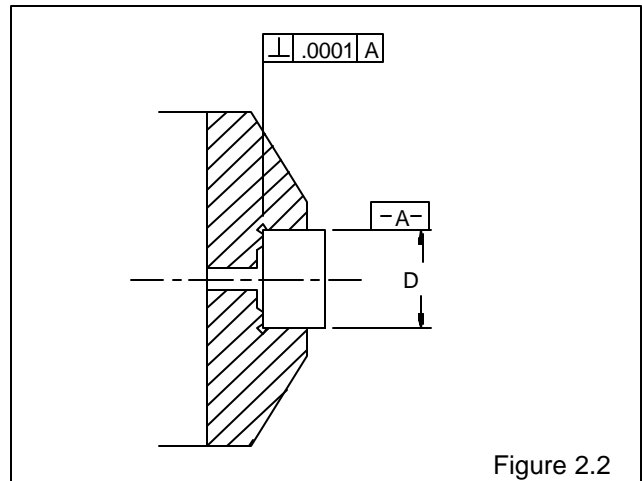
Top jaw design is one of the most important elements in the overall performance, accuracy, and efficiency of a chucking system.

To achieve utmost accuracy as well as the best possible holding capability, the following points should be considered in the design of top jaws.

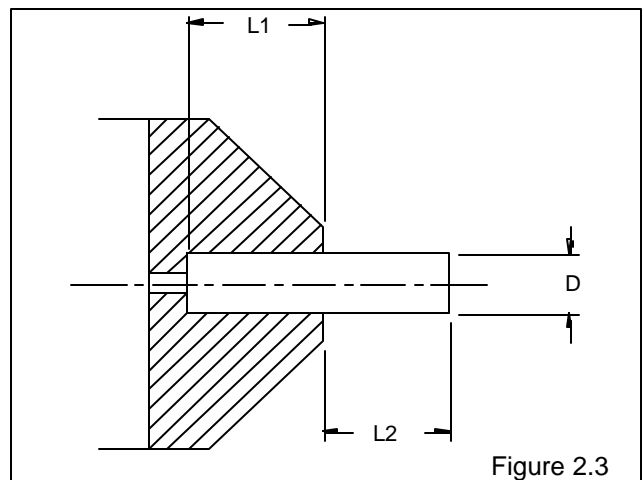
1. Workpieces must have an accurately machined holding diameter, in terms of size, roundness, and squareness to locating surface, for precise chucking.
2. When chucking thin walled workpieces, the size and roundness tolerances of the holding diameter will determine the degree to which the workpiece is distorted during chucking, and how accurately the workpiece can be machined.
3. The workpiece should be clamped as close to the face of the chuck as possible.
4. The holding surfaces of the workpieces and top jaws must have good surface finishes, and be absolutely clean and free of burrs.
5. For external grip applications, the top jaws should be lightened as much as possible to minimize the effects of centrifugal force. It is important to reduce the weight at the largest radius. Refer to figure 2.1.



6. Short workpieces must have a true face which locates it against a banking face in the top jaw. Refer to figure 2.2.



7. Workpieces with no shoulder support must be held on a length twice their diameter. Refer to figure 2.3.

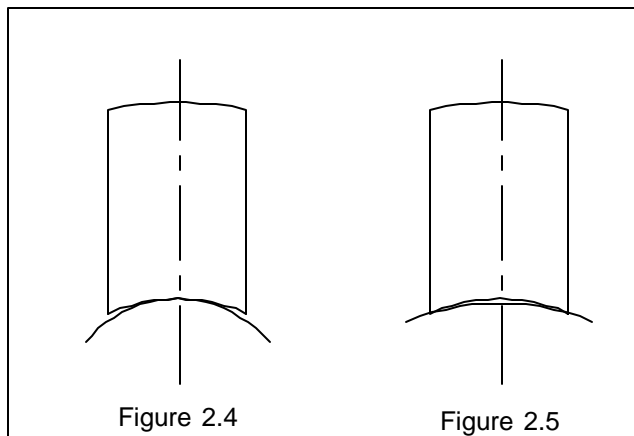
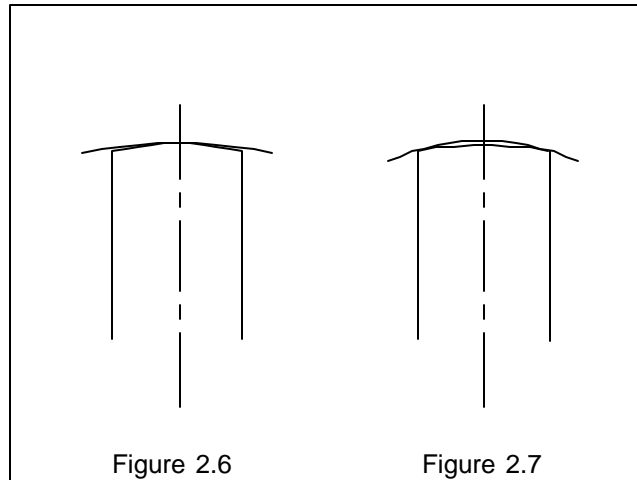


8. Long workpieces should not extend from the face of the top jaw more than one and one half times the length being chucked, unless an end support is used. Refer to figure 2.3.

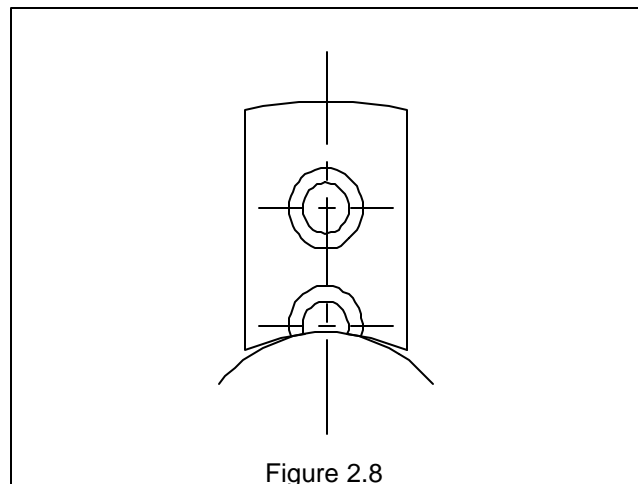
9. For external chucking applications, the holding diameter of the top jaw should be equal to or larger than the upper tolerance limit of the workpiece's holding diameter.

When the workpiece's holding diameter is smaller than the top jaw diameter, a line contact occurs as illustrated in figure 2.4. This condition is acceptable and will produce accurate and concentric workholding.

If the workpiece's holding diameter is larger than the top jaw diameter, a two-line contact occurs as shown in figure 2.5. This condition is beneficial for high holding force applications, but results in a loss of chucking accuracy.



11. In instances where the top jaw's counterbored screw holes interfere with the holding diameter, it is extremely important that the holding diameter be machined to the exact diameter of the workpiece diameter. Otherwise a two-line contact occurs as in figure 2.8, resulting in a loss of chucking accuracy.



10. For internal holding applications, the holding diameter of the top jaws should be equal to or smaller than the lower tolerance limit of the workpiece's holding diameter.

When the workpiece's holding diameter is larger than the top jaw diameter, a line contact occurs as shown in figure 2.6. This condition is acceptable and will produce accurate and concentric workholding.

If the workpiece's holding diameter is smaller than the top jaw diameter, a two line contact occurs as shown in figure 2.7. This condition is beneficial for high holding force applications, but results in a loss of chucking accuracy.

Top Jaw Machining

To achieve the best possible chucking accuracy, it is absolutely essential that top jaws are finish machined, under load, on the chuck.

The proper loading method, surface finish of the holding diameter and locating surface, and the size of the holding diameter will all contribute to the overall performance of the chuck with respect to accuracy and repeatability.

Consider the following when machining top jaws.

1. Always load the chuck in the same direction the chuck is clamping. For O.D. holding applications the chuck must be closed on a loading pin or ring. For I.D. applications the chuck must open on a loading ring.
2. Determine at what position within the jaw stroke of the chuck the jaws will be machined.

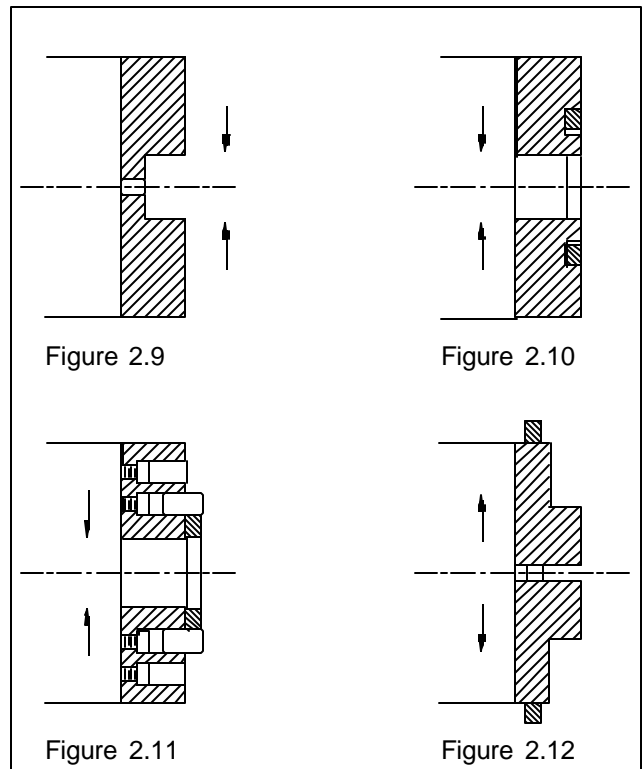
It is recommended that the top jaws be machined near the upper end of the chuck's stroke to permit reboring of the jaws. This is accomplished by loading the chuck further down in the stroke with a smaller diameter pin or ring.

3. Load the top jaws further down in the chuck's stroke to allow sufficient opening on automatic loading applications. An opening of .030 on diameter is generally recommended for automatic part loading.
4. Top jaws should be machined at the same air pressure at which the workpiece will be chucked during production.

In certain instances where either the loading ring or the top jaws are subject to deflection during loading, it is recommended that the top jaws be machined at an air pressure of 20 to 30 psi.

5. Recommended loading configurations are illustrated in figures 2.9, 2.10, and 2.11 for O.D. holding applications, and 2.12 for I.D. workholding.

It is not recommended that the loading configuration shown in figure 2.10 be used with top jaws exceeding 2.00" in height.



6. Carefully clean the mounting surfaces of the master jaws and top jaws before mounting the top jaws to the chuck.

Top jaws should fit snugly on the locating pins. First tighten the jaw mounting screws lightly, and chuck the loading pin or ring several times to assure that the top jaws are properly seated on the dowel pins. With the chuck clamped on the loading pin or ring, tighten the mounting screws alternately and evenly. The mounting screws should be securely tightened, but do not over torque.

7. Top jaws can be rough machined on a turning fixture, but must be finish machined under load on the chuck to achieve chucking accuracy.

8. Top jaws must be remachined each time they are reinstalled on the chuck to achieve chucking accuracy.

9. When top jaws are finished on a machine other than that used in production, it is necessary to establish a true reference diameter and face which can be indicated when mounting the chuck to the production machine.

Chuck Maintenance

The long term performance of your HST chuck will be greatly increased with proper care and regular maintenance.

Observe the following to assure long term performance.

1. Lubricate the chuck at regular intervals as determined by actual operating condition.

For automated application it is recommended that the chuck be lubricated at least once each day. On lower volume installations the chuck must be lubricated at least once per week.

2. Do not exceed the maximum recommended air pressure for your chuck model. Few devices will perform at their best over a long period if consistently operated at their maximum level. Highest accuracy and repeatability are attained at low and medium air pressures. As a general rule, operate the chuck at the lowest air pressure compatible with each application.

3. Disassemble the chuck at regular intervals, as determined by actual operating conditions. At least once each year is recommended as a minimum, however it may be necessary to disassemble the chuck every few months for cleaning, replacement of O-Rings, and to determine the effectiveness of the lubrication schedule.

4. Protect the chuck when it is not on the machine. The chuck should be lubricated, and the mounting surfaces protected from damage. Any open access to internal components of the chuck should be covered to keep dirt and chips out.

Lubrication

The HST chuck is supplied with a grease gun and one quart of Mobil DTE-HH oil.

The chuck is lubricated by pumping oil into the three grease fittings located on the face of the chuck. Insert the nozzle of the grease gun into the grease fitting and pump the grease gun two to three times while simultaneously opening and closing the chuck. Repeat this procedure for each grease fitting.

Caution: Do not over lubricate the chuck.

NOTES



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