Over 40 years have been passed since P.M.T.(Pioneer Machine Tools, Inc.) was founded. We, as appeared in the company name, have been developing the innovative products and produced, in case of air chucks, over 40,000 pcs since the first one was launched into the market 30 years ago. We’ve been aiming to be a company helpful for every customers until today, and we, together with other group companies, are endeavoring to promote the sales and service furthermore in the future.

40 going on another 40

Contribute to High Tech Industries together with group companies!

PIONEER air chucks have been contributing to the progress of high tech industries such as automobile, computer, OA equipment and etc.
PIONEER = Synonym of High Precision Air Chucks & Reliability

It holds workpiece soft and evenly to reduce the distortion when clamping, and perform the highest accuracy in turning and grinding. There are two basic models to meet the various applications different in the shape, material, hardness, mass, wall thickness of clamping part, spindle speed, and the accuracy required.

1 Diaphragm Type High Precision Air Chuck
Soft & even contact to the workpiece for highest accuracy!

2 Slide Jaw Type Precision Air Chuck
Variety of types for wide range of precision turning & grinding!

**Accuracy Comparison Example**
Following is a guide of roundness comparison.
(It doesn’t necessarily fall to the every different applications.)

- **Hydraulic Chuck 6°**
  - Roundness: 0.00047"

- **Slide Jaw Type Precision Air Chuck 6°**
  - Roundness: 0.000118"

- **Diaphragm Type High Precision Air Chuck 6°**
  - Roundness: 0.000118"

[ Test piece ]
Material: SUS

Abbreviation being used in the catalog:
- AC: Slide Jaw Type Air Chuck
- DC: Diaphragm Type Air Chuck
- ASA: Air Supply Apparatus
- JMB: Seats for Jaw

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Diaphragm Type Air Chuck

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Diaphragm Type Air Chuck

Main Features

- Repeatability: Within 0.0000157"
- 100% sealed: No maintenance required (No lubrication required)
- Excellent high speed capability up to 12,000 rpm (Counter-weight incorporated)
- Flexible adjustment of air pressure for flexible control of clamping power
- High durability & Long life
- Both internal & external clamp possible with one (1) chuck

DC Operation System (Structure & Function)

Structure & Mechanism

DC is to clamp WP by utilizing the elasticity of diaphragm material, which is generated when the diaphragm moves back and forth through the piston to be actuated by air.

Example: OD Clamping

1) Feed air to cylinder A
   → Piston moves forward
   → Diaphragm moves forward
   → Jaw open

2) Load jaw with workpiece

3) Release air from cylinder A
   → Piston moves backward
   → Diaphragm moves backward
   → Jaw close

4) Workpiece is clamped.**
   → Piston moves backward further
   → Diaphragm moves backward further
   → Clamping power is increased by the additional clamping power obtained from above operation.
1. DC Operation System (Structure & Function)

Example: ID Clamping

- **Operation Example when the jaw is form-machined: ID clamp**
  1. Feed air to cylinder B
     - Piston moves backward
     - Diaphragm moves backward
     - Jaw moves toward close side
  2. Load jaw with workplace
  3. Release air from cylinder B
     - Piston moves forward
     - Diaphragm moves forward
     - Jaw moves toward open side
  4. WP is clamped.
     - Feed air to cylinder A when more clamping power is required.
     - Piston moves forward further
     - Diaphragm moves forward further
     - Clamping power is increased by the additional clamping power obtained from above operation.

This example is the operation example when WP is clamped by the pressure to be caused when the jaw returns to the original position after released the air from cylinder B.

- **System Outline**

Intensifying system is to stabilize the supply of air pressure during the operation, and/or to use higher air pressure than the normal std. factory air pressure (usually 72.5psi) to increase the clamping power.

- **Name and Performance of each access**

<table>
<thead>
<tr>
<th>No.</th>
<th>Part Name</th>
<th>Performance</th>
<th>For more info</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Jaw</td>
<td>Clamp workpiece</td>
<td>P.14~</td>
</tr>
<tr>
<td>2</td>
<td>DC</td>
<td>High Precision Diaphragm Chuck Body</td>
<td>P.05~</td>
</tr>
<tr>
<td>3</td>
<td>Chuck Adapter</td>
<td>To fix DC with spindle nose</td>
<td>–</td>
</tr>
<tr>
<td>4</td>
<td>Pipe</td>
<td>To feed air and/or coolant to DC</td>
<td>–</td>
</tr>
<tr>
<td>5</td>
<td>ASA Adapter</td>
<td>To fix ASA with rear end of spindle</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>S.R. Bushing</td>
<td>To install ASA with DC, and for safety</td>
<td>P.48</td>
</tr>
<tr>
<td>7</td>
<td>Rotary Journal</td>
<td>Rotary bearing housing perform also as terminal for air and coolant</td>
<td>P.48~50</td>
</tr>
<tr>
<td>8</td>
<td>Port</td>
<td>For coolant and air blow</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
<td>Port</td>
<td>To drain returned coolant</td>
<td>–</td>
</tr>
<tr>
<td>10</td>
<td>Regulator</td>
<td>To regulate the air to open and close the jaw</td>
<td>–</td>
</tr>
<tr>
<td>11</td>
<td>Solenoid Valve</td>
<td>Auto change valve for On/Off of air</td>
<td>–</td>
</tr>
<tr>
<td>12</td>
<td>Air Set</td>
<td>Consists of air regulator and air filter</td>
<td>–</td>
</tr>
<tr>
<td>A</td>
<td>Air for Jaw Close</td>
<td>Port/Regulator for jaw close</td>
<td>–</td>
</tr>
<tr>
<td>B</td>
<td>Air for Jaw Open</td>
<td>Port/Regulator for jaw open</td>
<td>–</td>
</tr>
</tbody>
</table>
2 Model No./Dimension/Spec.

Model No./Dimension/Spec.

- 6 div
- 8 div

![Diaphragm Type Air Chuck](image)

**Diaphragm Type Air Chuck**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A (ø)</th>
<th>B (ø)</th>
<th>E</th>
<th>I (ø)</th>
<th>J (ø)</th>
<th>PCD F</th>
<th>PCD N</th>
<th>N</th>
<th>Speed</th>
<th>Chucking cap.</th>
<th>Wgt. lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/SN6 (6)-3</td>
<td>3.228&quot;</td>
<td>2.362&quot;</td>
<td>1.417&quot;</td>
<td>1.417&quot;</td>
<td>0.984&quot;</td>
<td>2.756&quot;</td>
<td>1.201&quot;</td>
<td>8 (6)</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 1.575&quot;</td>
<td>2.2</td>
</tr>
<tr>
<td>3/HN6 (6)-3</td>
<td>3.228&quot;</td>
<td>2.362&quot;</td>
<td>2.165&quot;</td>
<td>1.417&quot;</td>
<td>0.984&quot;</td>
<td>2.756&quot;</td>
<td>1.201&quot;</td>
<td>8 (6)</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 1.575&quot;</td>
<td>3.7</td>
</tr>
<tr>
<td>4/HN6-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>6-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/HN6-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>8-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/SN6B-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>6-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/SN6B-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>8-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/SN6-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>6-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/SN6-3</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.165&quot;</td>
<td>1.880&quot;</td>
<td>1.260&quot;</td>
<td>3.500&quot;</td>
<td>1.575&quot;</td>
<td>8-M5</td>
<td>12,000 rpm</td>
<td>0.079&quot; — 2.362&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4/5WZ6-2-2B</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.087&quot;</td>
<td>2.362&quot;</td>
<td>1.732&quot;</td>
<td>3.500&quot;</td>
<td>2.047&quot;</td>
<td>8-M6</td>
<td>8,000 rpm</td>
<td>0.118&quot; — 3.543&quot;</td>
<td>15.7</td>
</tr>
<tr>
<td>4/5WZ6-2-2B</td>
<td>3.397&quot;</td>
<td>2.525&quot;</td>
<td>2.087&quot;</td>
<td>2.362&quot;</td>
<td>1.732&quot;</td>
<td>3.500&quot;</td>
<td>2.047&quot;</td>
<td>8-M6</td>
<td>8,000 rpm</td>
<td>0.118&quot; — 3.543&quot;</td>
<td>15.7</td>
</tr>
<tr>
<td>5/5WZ6-3</td>
<td>4.961&quot;</td>
<td>4.000&quot;</td>
<td>2.283&quot;</td>
<td>2.362&quot;</td>
<td>1.732&quot;</td>
<td>4.500&quot;</td>
<td>2.047&quot;</td>
<td>8-M6</td>
<td>8,000 rpm</td>
<td>0.118&quot; — 2.756&quot;</td>
<td>8.4</td>
</tr>
</tbody>
</table>

**Dimensions & Specification**

- 8 or 6 after HN signify the number of seats where the jaw is mounted on, i.e., the number of slits of jaw to be used with DC.

**Original design. There's a projection around the outer surface of type WZ, and that is to allow the additional machining to arrange the workpiece support. Additional machining to arrange workpiece support around the outer DC surface is now possible on all HN models without the projection.**

**Jaw Stroke**

Attention to secure the clearance required for auto loading/unloading is required as the jaw stroke of DC is relatively small, much smaller than that of slide jaw type air chuck. Refer to page 13 for stroke chart.

**Gripping Force**

Refer to the graph of page 13.

**3 Speed**

Speeds described above are nearly considered as max. Generally speaking, higher the spindle speed, bigger the centrifugal force. The mass of workpiece, therefore, will affect the speed. The max. speed will also depend on the cutting conditions, the accuracies required and etc. Generally speaking, smaller and lighter the mass, higher the spindle speed can be applied. On the other hands, bigger and heavier the mass, lower the speed will have to be applied.

**4 Chucking Range**

The chucking capacity (range) can't be summed up easily due to the unique configuration of jaw. It has to be affected by the configuration, weight, material of workpiece, spindle speed, cutting conditions and accuracies required. Please take the figures described above as the reference range. In general, as an example, when the real high accuracy, micron or sub micron, is required, usually the workpiece has to be relatively light and small, and its diameter needs to be smaller than the PCD of bolt hole jaw.
Quick Change System

Chuck can be changed without dismounting the ASA. Changeover time is drastically reduced, and machine’s down time is also significantly reduced.

Models listed below are standard and available from stock.
Quick change type is basically available on any type of diaphragm chucks shown in page 10.

- 1 M10 for 6HN and 6/BHN
- 2 No threads for 4HN/14 and 6/BHN/30 (through hole type)

**Dimensions & Specification**  Refer to the equivalent model of page 10 for the spec. of mounting bolt etc.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A (inch)</th>
<th>B (inch)</th>
<th>E (inch)</th>
<th>I (inch)</th>
<th>J (inch)</th>
<th>Wgt.lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>3HN6-3-QTN</td>
<td>3.228&quot;</td>
<td>2.362&quot;</td>
<td>1.772&quot;</td>
<td>1.417&quot;</td>
<td>0.984&quot;</td>
<td>4.9</td>
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<tr>
<td>3HN6-3-QTN</td>
<td>3.228&quot;</td>
<td>2.362&quot;</td>
<td>1.772&quot;</td>
<td>1.417&quot;</td>
<td>0.984&quot;</td>
<td>4.9</td>
</tr>
<tr>
<td>4HN6-3-Q</td>
<td>3.937&quot;</td>
<td>3.250&quot;</td>
<td>2.165&quot;</td>
<td>1.890&quot;</td>
<td>1.260&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4HN6-3-Q</td>
<td>3.937&quot;</td>
<td>3.250&quot;</td>
<td>2.165&quot;</td>
<td>1.890&quot;</td>
<td>1.260&quot;</td>
<td>5.7</td>
</tr>
<tr>
<td>4HN14-3-Q</td>
<td>3.937&quot;</td>
<td>3.250&quot;</td>
<td>2.165&quot;</td>
<td>1.890&quot;</td>
<td>1.260&quot;</td>
<td>5.5</td>
</tr>
<tr>
<td>4HN14-3-Q</td>
<td>3.937&quot;</td>
<td>3.250&quot;</td>
<td>2.165&quot;</td>
<td>2.047&quot;</td>
<td>1.260&quot;</td>
<td>6.4</td>
</tr>
</tbody>
</table>

**New triple piston**

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A (inch)</th>
<th>B (inch)</th>
<th>E (inch)</th>
<th>I (inch)</th>
<th>J (inch)</th>
<th>Wgt.lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>4HN6-3-QT</td>
<td>3.937&quot;</td>
<td>3.250&quot;</td>
<td>2.165&quot;</td>
<td>2.047&quot;</td>
<td>1.260&quot;</td>
<td>6.4</td>
</tr>
<tr>
<td>6HN6-3-Q</td>
<td>5.906&quot;</td>
<td>4.920&quot;</td>
<td>2.677&quot;</td>
<td>3.150&quot;</td>
<td>2.362&quot;</td>
<td>15.7</td>
</tr>
<tr>
<td>6HN/6-3-Q</td>
<td>5.906&quot;</td>
<td>4.920&quot;</td>
<td>2.677&quot;</td>
<td>4.016&quot;</td>
<td>3.031&quot;</td>
<td>15.7</td>
</tr>
<tr>
<td>6HN/6-3-Q</td>
<td>5.906&quot;</td>
<td>4.920&quot;</td>
<td>2.677&quot;</td>
<td>4.016&quot;</td>
<td>3.031&quot;</td>
<td>15.0</td>
</tr>
</tbody>
</table>

*Note*

- 8 or 6 after NN signify the number of slots where the jaw is mounted on, i.e. the number of slots of jaw to be used with DC.
- *Triple piston:* has the equivalent repeatability to double piston type, and 1.4 times in gripping power.

**Procedure & Time required for changing chuck**

1. Remove ASA from the spindle.
2. Remove chuck from the spindle.
3. Mount new chuck to the spindle/Not tightening the bolts to full extent.
4. Secure the chuck firmly by tightening the bolts to the full extent and do centering again.
5. Install ASA into the chuck.
6. Center ASA and secure it firmly.

Normally, it will take about an hour for above operation.

Eliminate operation 5,6 of above procedure, and changeover time is reduced to 15 min. or so.

Reduce Down-Time Drastically!

**Quick change system is ideal, because of above feature, for in case the workpiece is changed time to time and require high precision.**
**Air pressure & Jaw Stroke**

![Graph showing air pressure and jaw stroke relationship]

Max. Air Pressure
- Jaw Open: 116psi
- Jaw Close: 72psi

- Stroke amount is not exactly like the graph shown above. There is always a little variation with it depending on the chuck. Stroke amount of Jaw opening side and closing side under the same air pressure is not exactly and directly proportional to each other. It is always with a little variation and difference. Take the stroke amount shown above in left graph, therefore, as the guide value.

It may affect the durability and life of diaphragm to use any higher pressure described above, breakage of diaphragm after relatively a short period of use in the worst case. Stroke, described above, was measured at 0.906” H of Jaw.

**Correlation Diagram between AP and GF**

<table>
<thead>
<tr>
<th>Jaw Height</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3” DC (0.787”)</td>
<td>[3HN8 (6)]</td>
</tr>
<tr>
<td>4” 5” 6” DC (0.906”)</td>
<td></td>
</tr>
</tbody>
</table>

**How to order std. blank jaw**

- **Chuck Size**
  - 4HN=4
  - 5HN=5
  - 6HN=6
  - 6HN=6
  - 5SW=5

- **Jaw Height**
  - e.g. 23=23mm=0.906” (4”)
  - 25=25mm=0.984” (5”, 6”, 8”)

- **Number of slit (for 6)**

- **Width of slit**
  - e.g. 0.5mm=0.02”
  - 1.0mm=0.039”
  - 1.5mm=0.059”

**Form-Machined Jaws**

- 4HN6-3 supplied w/machined jaw

**Note 1:** In case of 4/5SW6-2.2B, the last number have to be 25(std.) instead of 23 unless other special size is requested. Two bolts are used per jaw. So, it actually has to be 25-2B.

**Note 2:** Most popular size of slit being used like standard is 0.039”. Other sizes such as 0.02”, 0.059” and 0.079” are also available. Generally speaking, wider the slit, better the chips removal. If, often the chips get stuck at the slit, it will be recommendable trying 0.059” or 0.079”. If, however, the accuracy required is severe, in micron or sub-micron order, you will kindly be requested to expect the decrease of accuracy along with the increase of slit width. If the out of roundness, for example, required is like 0.0008” to 0.0012” or more, it won’t be necessary for you to be concerned about the width of slit.

**Note 3:** Pre-hardened mold alloy steel (HRC40) is used as standard. Any other material being considered feasible can be used. There’s no data showing the difference of performance among each different material. It is generally suggested to pick up any one which have enough hardness, machinability, and durability to clamp and turn the WP. FYI, soft and flex. Clamp with DC is largely because of the material of diaphragm and designing related to it.
**Outline Drawing of Std. Jaws**

**Dimensions of Std. Jaw**

<table>
<thead>
<tr>
<th></th>
<th>Jaw</th>
<th>Type A</th>
<th>Type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chucks</td>
<td></td>
<td>[(\text{Dia.}) (in)]</td>
<td>Wgt (lbs)</td>
</tr>
<tr>
<td>3SN JHN</td>
<td>1.157</td>
<td>0.806</td>
<td>1.181</td>
</tr>
<tr>
<td>4HN</td>
<td>2.647</td>
<td>0.906</td>
<td>1.181</td>
</tr>
<tr>
<td>5WZ 4/SHN</td>
<td>2.480</td>
<td>0.964</td>
<td>1.181</td>
</tr>
<tr>
<td>6HN</td>
<td>3.228</td>
<td>0.964</td>
<td>1.181</td>
</tr>
<tr>
<td>6/8HN</td>
<td>4.331</td>
<td>0.964</td>
<td>1.181</td>
</tr>
</tbody>
</table>

Other sizes available on request as option.

Type A is basically for OD clamping, and Type B is for ID clamping. The selection of A or B depends on how fast and efficiently it can be form-machined to the required shape.

**Example of Std. Jaw Selection**

For 0.197” dia. of workpiece

*Select Type A X Select Type B O*

Removal: Much
Machining time: Long

Removal: Little
Machining time: Short

For 0.984” dia. of workpiece

*Select Type A O Select Type B X*

Removal: Little
Machining time: Short

Insufficient thickness
Unstable machining

**Type of Jaw**

- 6 div.
- 8 div.
- 3 div.
- 4 div.
- Taper 6 div.
- Taper 8 div.

The merit with Taper Slit Type is 1) to avoid the chips get jammed in the slit, and 2) to increase high speed capability.

**Mounting of Jaw**

1) Mount the jaw onto the JMB. Remove the chips and dust from the surface of JMB, and from the seating surface of Jaw. Tighten the bolts not to full extent, leaving a little allowance for further final tightening. This operation should be done under no air pressure to the chuck.

When tightening bolts, use washers supplied with jaw.

2) Tighten the bolts to secure the jaw to the chuck. It is recommended to use the torque wrench by setting it to 6N-m for M4, or, 12N-m for M5 and 15N-m for M6. When tightening the bolts by torque wrench, apply 21.75psi to 29psi of closing air pressure to clamp the pilot of jaw. This operation is to remove the clearance between the pilot of jaw and the internal surface of JMB, and hence to make it possible to clamp the workpiece accurately with good concentricity.

3) After tightening bolts, release the air pressure and make sure again the tightening torque. Make sure, in other words, if the jaw is tightened with the chuck with the right torque.

4) Machine the jaw to the shape and dimensions required to clamp the workpiece. There are slits with the jaw, and therefore, the machining will have to be intermittent. It is suggested, therefore, to set the feed rate, removal rate etc. as small as possible. Enough attention need to be paid for this operation.

Diaphragm Type Air Chuck
Form-machining of Jaw Sample

1. Machine to the shape and dimension to make clamping possible
2. Machine by considering where to clamp, range for clamping, and where/how to be supported on the workpiece to achieve the accuracy required.
3. For as higher speed of operation as possible, remove as much meat as possible from the jaw to reduce the mass.

Finish-Machining

If once the Jaw is dismounted from the chuck after finished with the chuck, it will have to be off-centered. If the accuracy required is high, re-machining of jaw may have to be required when the jaw is put back to the original chuck or onto another chuck. (Occasionally, and when the required accuracy is not high, it might be used without re-machining.)

How to test cut to find most feasible air pressure for form-machining

If, for example, once the jaw is machined by 14.5psi of air pressure for opening, then, it can not be re-machined by any higher air pressure than 14.5psi. Therefore, it is suggested to use highest possible air pressure to machine the jaw at the beginning. After machining of jaw, test cut is done and the machining accuracy is measured. If the accuracy to be obtained by that air pressure is not good enough, and if lower pressure considered to be better, reduce the air pressure perhaps by 7.25psi, and then, try a test cut and measure again. If still not good enough, try further lower air pressure.

Note: Lower the air pressure is, lower the gripping force will be. So, in case the air pressure is lowered, the use of additional air pressure to move the jaw to closing side have to be considered to compensate the loss of clamping force.

Attention need to be paid when for-machining jaw

Refer to next page

1. Select most feasible air pressure to clamp WP is critical.
   Lower the air pressure, better the accuracy. If, however, the air pressure is too low, WP will be force-moved by the centrifugal force while rotating/turning. Air pressure should be needed is to make it possible to turn WP as at higher rpm as possible, and to reduce the distortion when clamped WP to the smallest degree as possible. (Refer to page 11 and 20)

2. WP should be clamped as close to the machining area as possible to get max. possible accuracy.

3. Arrange WS

Pattern 1

Clamp the support ring and semi-finishing with other machine than the one to be used for practical production. (Make sure if the jaw is tightened firmly with support ring by the bolts.) Remove the semi-finished jaw from the chuck, and support ring from the semi-finished jaw. Then, mount it onto the chuck to be used for finishing. (Support ring is no longer in use.) Secure the chuck and jaw firmly and evenly by torque wrench.

Pattern 2

Order the semi-finished jaw. (Support ring is used to avoid any deformation when shipping.) Remove the support ring, and mount the semi-finished jaw on the chuck to be used for practical production.

Pattern 3

Order the jaw finished with the chuck as a set. Jaw is already centered against the chuck. Do the centering on the chuck after installed with the machine spindle preferably within 0.00004".

Order the finish-machined jaw independently.

No matter how the jaw is finished, it will have to be off-centered when it's shipped independently and remounted to the chuck.

Therefore, it has to be re-machined with the chuck and machine to be used for practical production.
Form-machining of Jaw

**Form-Machining of Jaw for OD Clamping**
The pressure to be set at regulator A means the clamping power. In case 29~43.5psi air pressure is considered enough to hold the workpiece, machine the jaw by opening it by 29~43.5psi. If the loading accuracy or auto loading/unloading equipment is good, or, if the loading/unloading is done manually, usually 58~72.5psi air pressure to be set at regulator A is enough to get the clearance for loading/unloading.

Note: Max. air pressure can be used to open the jaw: 116psi

---

**Form-Machining of Jaw for ID Clamping**
The pressure to be set at regulator B means the clamping power. In case 14.5~29psi of air pressure is enough to hold the workpiece, machine the jaw by closing it by 43.5~58psi when loading the workpiece. If the loading accuracy of auto loader/unloader is good, and/or, if the loading/unloading is done manually, usually 43.5~58psi of air pressure is enough to get the clearance for loading/unloading.

Note: Max. air pressure can be used to close the jaw: 72.5psi

---

**Operation for OD clamping**

1. In case the air pressure used for form-machining of jaw is 43.5psi, as an example, set the air pressure at regulator B (this regulator is to control the air to open the jaw) higher than 43.5psi.

   Example: For manual loading/unloading → 50.76psi
   For auto loading/unloading → 58~72.5psi

Above pressure can be determined from the comparison chart of air pressure and stroke.

In case of 4° DC fitted with 0.906"(h) Of jaw, the displacement of stroke per 14.5psi of change of air pressure is approx. 0.004". The following is the guide to select air pressure in case of both 0.004" or lower loading clearance and between 0.008" and 0.004" loader clearance.

<table>
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<tr>
<th>In case Loading Accuracy is below 0.004&quot;</th>
<th>In case Loading Accuracy is between 0.008&quot; and 0.004&quot;</th>
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</thead>
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<tr>
<td>Air Pressure for loading Workpiece (psi)</td>
<td>116.0 101.5 87.0 72.5 58.0 43.5 29.0 116.0 101.5 87.0 72.5 58.0 43.5</td>
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</table>

2. The air pressure to be set at regulator A (this regulator is to control the air to close the jaw) will be the additional pressure for clamping WP in addition to the power to be obtained at the point where WP is clamped, where the jaw was form-machined, when releasing the air from cylinder B.

In case of O.D. Clamping, finish-machine the clamping part of jaw to approx. +0.0004" above the dimension of workpiece.

---

**Operation for ID clamping**

1. In case the air pressure used to form-machine the jaw is 29psi, set the pressure at regulator A (this regulator is to control the air pressure to close the jaw) higher than 29psi to get the clearance for loading/unloading WP.

   Example: Manual loading/unloading → 36.25psi
   Auto loading/unloading → 43.5~58psi

2. Set the pressure at regulator B (this regulator is to control the air pressure to open the jaw), in ID clamp operation, will be the additional pressure for clamping WP in addition to the power to be obtained at the point where WP is clamped, where the jaw was form-machined, when releasing the air from cylinder A.

In case of I.D. clamping, finish-machine the clamping part of jaw to approx. -0.0004" below the dimension of workpiece.
**Application Examples**

**3HN6-3**
- O.D. clamp
- Support
- Jaw
- Accuracy Required
- Repeatability required: Within 0.00004°

**4/SHN8-3**
- O.D. clamp
- Support
- Jaw
- Accuracy Required
- Cylindricity: 0.0003
- Out of roundness: 0.0002°

**4HN8-3-Q**
- O.D. clamp
- Support
- Jaw
- Accuracy Required
- Out of roundness: 0.0001°
- Cylindricity: 0.0001°
- Rectangularity: 0.0002°

**Work Example**

**Flashback!**

VHS, Beta system is no longer in the production, but when they were main stream for VTR, the key component to achieve fine image sharpness was how accurately the drum (aka. cylinder) is machined. Our diaphragm chuck made it possible to achieve all time high 0.000008°.
How Diaphragm Chuck Work

Mechanism of diaphragm movement

Air to Cylinder A → Piston Move Forward → Jaw Open

Air to Cylinder B → Piston Move Backward → Jaw Close

Work Example: External Clamping

1. Before machining of jaw
2. Open the jaw by 20 psi for form machining
3. Machine the oblique part to the dia. of workpiece
4. Release air, Jaw come back to original position

Form machining is finished, and go into practical operation for machining & production

Jaw Opening

1. Jaw Open: WP loading
2. Release AP=Clamp WP
3. Machining starts

- Open the jaw by 72.5 psi of AP
- Load the jaw w/ WP
- Release air
- Clamp WP
- Secure the clearance for loading/unloading

Original pos. of jaw
- Jaw tries to return to the original pos. by the elasticity of diaphragm material. That represent clamp power.

Clamping Power

As shown right, higher the AP to form machine the jaw, stronger the clamp power. Lower the AP to form machine the jaw, weaker the clamp power.

When the clamp power is not enough under the clamp condition of the additional air pressure for additional clamping power can be applied by feeding the air into the cylinder A.

In case of, after finished the machining, WP can be unclamped by opening the jaw to position. After that, the jaw can be moved back to the original position where it should be under no air pressure, by releasing the air from cylinder B.

The clamping power can be flexibly adjusted by air pressure to be used for both machining the Jaw and additional clamping power.
**Installation of DC**

1. Mount adapter onto the spindle nose temporarily, if not fully, leaving a little allowance for final firm tightening.
2. Center the adapter at its CO when 0.000075". Tighten the bolts firmly to secure the adapter with the spindle nose. Make sure the runout at CO is still within 0.000075". If not, and out of 0.000075", loosen the bolts a little and repeat procedure 2 until within 0.000075" of runout is obtained.
3. Check the runout of surface A and B. Runout of surface A have to be within 0.000075". Runout of 0.00004".
4. Mount DC onto the adapter by tightening 6 bolts temporarily & not fully, leaving a little allowance for final firm tightening, and do the centering at its CO. Runout at 0.197.934" away from the chuck. Centering is required to be within 0.000045".
5. After centering, tighten 6 bolts to secure DC with adapter firmly.
6. If DC is not centered within 0.000045", loosen 6 bolts a little and try centering again from procedure 5 mentioned above.
7. Torque wrench is recommended to be used for tightening bolts. Recommended torque: 3.5".5" DC < MS 12N-m. 6" < MS 15N-m.

**Maintenance & Caution**

1. **Handling**
   - If once the jaw is damaged, after finishing, from the SFJ of DC, and when it's put back onto the SFJ, usually approx. 0.0001" to 0.0004" of off-centering is caused. So, if once the jaw is damaged, carry out re-machining of jaw. As to the air pressure to be set for re-machining, refer to the aforementioned instruction.
   - Jaw is split into 8 (or 6) pieces, and all 8 parts are linked together only at the bottom of jaw. This linkage is relatively small and thin. So, it is recommended to pay enough attention to the handling of jaw to avoid deformation or damage. Jaw can get rusted. When it's in use, carry out the anti-corrosion treatment. It is also recommended to be kept with Ring which was originally supplied with the jaw.

2. **Storage**
   - When DC is not in use, apply anti-corrosion oil to it, and wrap it up by clean nylon cover etc. to avoid dust, chips etc.

3. **Maintenance**
   - **Cutting Chips**
     - When auto-operation, stop the machine periodically and check if there are any cutting chips with the clamping area of jaw. If there are, they have to be removed and cleaned.
     - To avoid cutting chips accumulated at the bottom area of jaw, set the up angle and position of nozzle for coolant and/or air blow right.
     - If cutting chips piled up, that may affect the jaw's movement, and eventually to the cutting accuracy.
     - If cutting chips are found piled up, remove them by using a wire or whatever through the slits of jaw.
   - **Coolant Nozzle**
     - It is recommended to install coolant nozzle to avoid the cutting chips stay on the clamping surface of jaw. Coolant nozzle should be arranged according to the shape of workpiece, taking efficiency into consideration. Clamp surface of jaw will be kept clean by feeding the coolant and for air through ASA, DC and nozzle.

4. **Exchange of Jaw**
   - When the jaw needs to be changed, follow the aforementioned instruction about the installation and machining.
   - It is requested not to dis-assemble DC any time.
   - The manufacturer and supplier is completely free from any responsibility on the trouble problem resulted from disassembly.

5. **Coil Mate**
   - Because of erroneous operation or whatever, when some shock is given to the jaw, and naturally to the SFJ of DC, off-centering may have to be caused on both jaw and SFJ.
   - If off-centering takes place, the machining accuracy will have to be lost.
   - If the accuracy is found went wrong after collision, and/or the deformation of jaw is found, the chuck will have to be repaired, and the jaw also will have to be newly made.

6. **Jaw care**
   - When it's worn, and when it's necessary to be re-machined, follow aforementioned instruction in Article 10.

7. **Check the Air Filter**
   - Periodically to see if there is any damage with it, or if it stuffed heavily with chips, sludge etc.
   - The chips or sludge etc. get into the air, malfunction of air chuck and/or ASA assembly is caused.

8. **Coolant**
   - Max. pressure to be used for the coolant ranges to 58psi max. Any higher pressure may harm Journal of ASA.

9. **Air Pressure**
   - Max. Air Pressure to Open The Jaw : 110psi
   - Max. Air Pressure to Close The Jaw : 72.5psi

**Spindle Start**

For the safety, set System so that the spindle can not be started when the door is open.

**Use of higher RPM than that specified in the catalog may have workpiece fly from jaws because of the depression of clamping force.** Depending on the cutting conditions etc., even the RPM specified in the catalog may occasionally not be used. When high RPM is required to be used. Contact manufacturer or local representative.

Use of any higher pressure than above will shorten the life of DC.

Notice: Water contained in the air to be used for the chuck and ASA will affect their life and performance. Dehumidification by supplying air dryer etc. is recommended.
Slide Jaw Type Air Chuck

Main Features

- Size: 2.5” to 10”
- Nbr. of Jaw: 2, 3, 4 (3 kinds)
- Repeatability: Within 0.000059"

High Accuracy, Flexibility & Performance

From the vast sales & experience, and the built up technique and know-how therewith, PIONEER deliver precision air chucks most reliable now in the market.

As a solution provider, PIONEER will offer various ideas to cope with misc. applications which are hard to be done in the precision turning/grinding.

AC Operation System (Structure & Function)

System Outline

Std. accessories for Air Chucks

1. Lubrication Oil
   This is to lubricate the slide ways among MJ, Wedge and body, and also to remove the sludge among them. Periodical lubrication is recommended for long life and accuracy. Oil is Shell Tona SSM 68. (Equivalent can be used.)

2. Mounting Bolts
   Bolts to install the chuck to the spindle/adapter.

3. Soft Top Jaw 1 set
   One (1) set of soft top jaw is supplied with any chuck as standard unless any special is requested.

4. Plug
   The one (1) to enable coolant through spindle and chuck is supplied as std.

Optional Accessories

1. Loading Pin
   To be used for form-machining of jaw (For outer clamping). This should not necessarily be purchased/used. It can be any one to fit the purpose and application. (Refer to the manual)

2. Loading Ring
   To be used for form-machining of jaw (Internal clamping). As explained above, this also should not necessarily be used. Any one to fit the purpose and application can be used. (Refer to the manual)

3. Special Plug
   One is for when the oil mist is used with the chuck and another is for when the coolant is not used. (Refer to operation manual)

4. Wrench 1pc
   Wrench to tighten the bolts

Air Set: ①Filter + ②Lubricator + ③Regulator
### Example: 100-3-2.5

![Image of a 3 Jaw Rotary Air Chuck](image)

**Dimensions**

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**Specifications**

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*Gripping force is the value when it's measured under the pressure of 101.5 psi
Q signify quick change type
2-2 2 Jaw Rotary Air Chuck

Model No./Dim./Spec

![Image of 2 Jaw Rotary Air Chuck]

**Dimension**

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<th>A</th>
<th>B</th>
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**Specifications**

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*Gripping force is the value when it's measured under the pressure of 101.5psi.

**Application Example**

- Housing for automobile

![Diagram of housing example]

2-3 4 Jaw Rotary Air Chuck

Model No./Dim./Spec

![Image of 4 Jaw Rotary Air Chuck]

**Dimension**

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<td>0.984</td>
<td>0.571</td>
<td>2.815</td>
<td>0.276</td>
<td>0.079</td>
<td>4-M6</td>
<td>12-M5</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>100-4-2.5</td>
<td>0.098</td>
<td>4</td>
<td>0.118-3.740, 0.236-3.898</td>
<td>1484</td>
<td>4,500</td>
<td>6.0</td>
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<tr>
<td>125-4-5</td>
<td>0.197</td>
<td>4</td>
<td>0.118-4.724, 0.236-4.882</td>
<td>2181</td>
<td>4,000</td>
<td>12.1</td>
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<tr>
<td>150-4-5</td>
<td>0.197</td>
<td>4</td>
<td>0.118-5.315, 0.394-5.315</td>
<td>2181</td>
<td>4,000</td>
<td>17.9</td>
</tr>
</tbody>
</table>

*Gripping force is the value when it's measured under the pressure of 101.5psi.

**Application Example**

- Suitable for not round workpiece

![Diagram of application example]
2-4 Sealed Rotary Air Chuck

Chuck is sealed to stop cutting chips and sludge penetrate inside.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>A</td>
</tr>
<tr>
<td>① 87-3-2.5G</td>
<td>3.425</td>
</tr>
<tr>
<td>② 107-3-2.5G</td>
<td>4.213</td>
</tr>
<tr>
<td>③ 157-3-2.5GT</td>
<td>6.181</td>
</tr>
<tr>
<td>④ 214-3-2.5G</td>
<td>8.425</td>
</tr>
<tr>
<td>⑤ 265-3-2.5G</td>
<td>10.403</td>
</tr>
</tbody>
</table>

2-5 High Speed Rotary Air Chuck

High Speed Type. Up to about 6,000rpm operation will be possible.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model No.</td>
<td>A</td>
</tr>
<tr>
<td>105/125-3-2.5</td>
<td>4.921</td>
</tr>
</tbody>
</table>

Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>① 87-3-2.5G</td>
<td>0.098</td>
<td>3</td>
<td>0.118-3.031</td>
<td>0.236-3.031</td>
<td>944</td>
<td>6,000</td>
</tr>
<tr>
<td>② 107-3-2.5G</td>
<td>0.098</td>
<td>3</td>
<td>0.118-3.819</td>
<td>0.236-3.819</td>
<td>1664</td>
<td>4,500</td>
</tr>
<tr>
<td>③ 157-3-2.5GT</td>
<td>0.098</td>
<td>3</td>
<td>0.118-5.591</td>
<td>0.394-5.591</td>
<td>2316</td>
<td>4,000</td>
</tr>
<tr>
<td>④ 214-3-2.5G</td>
<td>0.098</td>
<td>3</td>
<td>0.630-7.638</td>
<td>0.630-7.638</td>
<td>7194</td>
<td>3,000</td>
</tr>
<tr>
<td>⑤ 265-3-2.5G</td>
<td>0.098</td>
<td>3</td>
<td>0.630-9.646</td>
<td>0.630-9.646</td>
<td>7194</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Originally, this chuck was developed for grinding application. It’s now being used not only for grinding but also for regular turning application.

Prevent the machined powder and cutting chips from penetrating inside the chuck.

Max. rpm is a criterion, and depends on the cutting conditions, mass of workpiece and machined jaw.

Gripping force is the value when it’s measured under the pressure of 101.5psi

Max. rpm is a criterion, and depends on the cutting conditions, mass of workpiece and machined jaw.
2-6 Stationary Air Chuck

- For drilling, tapping

![](image)

- Multi-Stationary Air Chucks on Fixture Plate

---

<table>
<thead>
<tr>
<th>Model No.</th>
<th>DIA</th>
<th>Width</th>
<th>Height</th>
<th>Chuck Dia.</th>
<th>Material of Jaw</th>
<th>Type of Jaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>6435S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Aluminum</td>
<td>Std. Jaws</td>
</tr>
<tr>
<td>332S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Aluminum</td>
<td>Std. Jaws</td>
</tr>
<tr>
<td>439S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Steel</td>
<td>Std. Jaws</td>
</tr>
<tr>
<td>639S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Steel</td>
<td>Std. Jaws</td>
</tr>
</tbody>
</table>

---

3 Jaw/Form Machining

- Material is S45C. Other material is available on request.

- Type of Jaw

<table>
<thead>
<tr>
<th>Model No.</th>
<th>DIA</th>
<th>Width</th>
<th>Height</th>
<th>Chuck Dia.</th>
<th>Material of Jaw</th>
<th>Type of Jaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>1S 100</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Aluminum</td>
<td>Std. Jaws</td>
</tr>
<tr>
<td>10S 50</td>
<td>10</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Steel</td>
<td>Std. Jaws</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard Jaw</th>
<th>Pie Jaw</th>
<th>Chucks To Be Used With</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;</td>
<td>1A93—1X1</td>
<td>3A93—1</td>
<td>83—3—2.5</td>
</tr>
<tr>
<td>3A83—1X1</td>
<td>1.5X1</td>
<td>1S100—1X1</td>
<td>100—3—2.5 (1.2)</td>
</tr>
<tr>
<td>5&quot;</td>
<td>1A105—1X1</td>
<td>3A105—2</td>
<td>125—3—2.5</td>
</tr>
<tr>
<td>1S125—1X1</td>
<td>1.5X1</td>
<td>1S150—1X1</td>
<td>150—3—2.5</td>
</tr>
<tr>
<td>10S 50</td>
<td>10X1</td>
<td>1S200—2X2</td>
<td>200—3—2.5</td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>Model No.</th>
<th>DIA</th>
<th>Width</th>
<th>Height</th>
<th>Chuck Dia.</th>
<th>Material of Jaw</th>
<th>Type of Jaw</th>
</tr>
</thead>
<tbody>
<tr>
<td>6435S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Aluminum</td>
<td>Std. Jaws</td>
</tr>
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<td>332S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
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</tr>
<tr>
<td>439S</td>
<td>3</td>
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<td>0.877</td>
<td>0.937</td>
<td>Steel</td>
<td>Std. Jaws</td>
</tr>
<tr>
<td>639S</td>
<td>3</td>
<td>1.181</td>
<td>0.877</td>
<td>0.937</td>
<td>Steel</td>
<td>Std. Jaws</td>
</tr>
</tbody>
</table>

---

*Other sizes than above are available on request. Half Moon Type is available on request.*
Machining of Jaw

- Clean the mounting surface of both the top Jaws and Master Jaws.
- Set the air pressure to be used to machine the Jaw higher than that to be used for practical machining for production by 1.10231 to 2.20462 lbs.
- It is recommended to mark the S/No. of Chuck and/or the type of workpiece on the Work Jaws when they are removed from Chuck. That will ease the Work Jaws to be put back to the right Chuck when they have to be used for the same machining again. As done between the Master Jaws and Chuck Body, it is recommended to put the same Ref. No. on the Work Jaws as the No. marked on the Master Jaws. When once the Work Jaws have to be removed from Chuck, and when they have to be put back to Chuck again, this marking will help fitting both Jaws to the original setting.

O.D.Clamping

1. Install top jaw onto the MJ.
2. Open the jaw and machine where the pin for form-machining is to be placed. Put the pin to the pin as shown on the photo, and clamp it by closing the jaws.
3. In order to make sure the seating and smooth movement of top jaw, repeat open and close of jaw a few times not by rotating the chuck.
4. Close the top jaw with the pin, and form machine the jaw.
5. After machining, chamfer the corners to remove burr.
6. Open the top jaw and remove pin. Clean the surface of chuck and top jaw.

I.D.Clamping

1. Install the Top Jaw onto the MJ.
2. Close the top jaw and machine the OD of top jaw as much as needed to put the ring for form-machining over the top jaw.
3. In order to make sure the seating and smooth movement of top jaw, repeat open and close of jaw a few times not by rotating the chuck. Remove the pin for form-machining, and put the ring for form-machining over the OD of jaw, and properly up to the end.
4. Open the top jaw to clamp the ring, and form-machine the jaw.
5. After machining, remove burr by chamfering, and remove the ring afterwards.
6. Clean the chuck surface and top jaw.

Note: Loading pin should not necessarily be the one from the pins supplied as standard. Any pin, as long as it is good for the purpose, can be used.
4 Application Examples

- Automobile Parts etc.

- Sprocket

- Ring

- Piston

- Aluminum Piston

- Plate

- Case

5 Quick Change System

- Refer to page 11-12 for Mechanism & Feature
- Quick change system is available for any std. rotary air chucks.

M 1 Installation

1. Installation of Chuck Adapter

1. Clean the surface and pilot on both spindle nose and chuck adapter.

2. Make sure the surface of both adapter and spindle nose is free from the damage like scratch and dent. If found, correct them by grinding stone or anything suitable. After correcting work, clean both surface again.

3. Mount the chuck adapter onto the spindle nose. Make sure not to damage both during the operation.

4. Tighten the bolts to secure the chuck adapter to the spindle nose temporarily, not to full extent, leaving a little allowance to make it movable by plastic hammer.

5. Put the dial gauge on the front side of chuck adapter.

6. Center the chuck adapter to within 0.00008” by knocking it with plastic hammer, all around where seem to be necessary, like; Rotate the spindle by hand, hit the point where the runout was measured highest by plastic hammer. Repeat this operation until below 0.00008” of runout is obtained. If the adapter is hardly moved in other words. If the runout is hardly improved by this operation, loosen bolts a little further and start the operation again.

7. After centering is finished to within 0.00008”, tighten the bolts now firmly with the spindle nose.

8. Make sure again, if the runout is within 0.00008”. If found not, repeat the procedure (6)-(7) until 0.00008” or below is obtained.
2. Installation of Chuck

(1) Clean both surface of pilot of chuck adapter and chuck.

(2) Make sure the surface and pilot are free from the damage such as scratch and dent. If found, correct them by grinding stone or whatever suitable to get the good flat surface. Surface and pilot have to be cleaned after correction work.

(3) Put the chuck onto the chuck adapter. Caution not to damage the mounting surface is required.

(4) Tighten the bolts to secure the chuck to the chuck adapter temporarily, not to full extent, leaving a little allowance for the adjustment of runout to be accomplished later, to the extent that it’s movable when hitting lightly by plastic hammer.

(5) Put the dial gauge at the front side of chuck, as shown on the illustration below. As close to the front surface as possible, but away from some unevenness if there is at the surface area.

(6) Center the chuck to 0.00008" or below.

Procedure: Rotate the spindle (chuck) by hand and measure the runout around the chuck. Find out the point reads highest. Hit there lightly by plastic hammer. Rotate the spindle again to find out highest reading point again, and hit there lightly by plastic hammer. Repeat this procedure until 0.00008" or below runout is obtained. If the runout is hard to be improved, in other word, if it seems that the chuck is hardly moved by plastic hammer, then, loosen the bolts a little, and try above operation until within 0.00008" of runout is obtained.

(7) After finished centering to within 0.00008", tighten the bolts firmly, to the end.

(8) Once again, make sure the runout is within 0.00008". If not, repeat the procedure (6)-(7) until 0.00008" or below is obtained.
M3 Test Running

- Be sure that the Chuck is lubricated. (Refer to page 45)
  Supply Turbine oil first grade ISO VG32 (Recommended oil) to lubricator through oil port located above lubricator, to the upper limit indicated on the pot. Pay attention not to have chips or dust get into the pot when filling.
- Turn the knob of lubricator to increase the pressure. Carry out inching (Repeat ON/OFF a few times quickly) when the needle of pressure gauge reached 21.76 to 29.0psi, and then, make sure the Jaws open & close OK.
- Turn the needle of Lubricator to adjust the drip rate of oil. In general, suitable dripping rate of lubrication oil is one (1) drip per 2 to 3 times of Chuck open & close.
- Turn the pressure adjustment handle to increase the pressure up to 87.02psi, and check air leak or any malfunction. There will be some air leak with Journal of ASA, but it will not be a problem usually.
- Start rotating spindle at 100-200 rpm, and increase the rpm gradually, and see there is no vibration with Chuck or ASA Journal. If there is a vibration with the journal, check the runout of journal by referring to pages 81-54. If not centered within the designated value, retry centering, or call us or local representative.

M4 Overhaul

Due to the nature of the structure, it is inevitable for chips and sludge from penetrating inside the Slide Jaw Type Air Chucks, and from reaching to the slide ways among MJ body and wedge. Not much chip or sludge are expected getting inside, however, it keeps going a little by little all the time. Eventually, the jaw get stuck the jamming is caused, and the jaw get stuck. In order to avoid this, it is imperative to lubricate the chuck once every day to get the old oil mixed with chips and sludge out, and fill all the slide ways with new oil. In this way, the life, accuracy life of chuck will be extended.

However, even if the lubrication is done periodicaly, some small amount of chips or sludge will still remain inside. They will be accumulated and get stiff, and cause jamming eventually. In such case, Overhaul is done to clean inside and to get the smooth movement of jaw back. Disassemble the chuck, clean each component and inside, remove the jamming for example by sand paper lapping, change O rings, and reassemble. Check to see if the jaws move smooth. These are the procedure for overhaul. This operation is normally suggested to do like half a year, or once a year min. Original smooth movement will be back, however, not the repeatability. Longer the chuck is used, bigger the clearance amount the body, MJ and wedge due to the nature with the slide jaw type air chucks. As the bottom line, the frequent lubrication and periodical overhaul will be the keys for longer life.

Overhaul illustration

1. Overhaul Procedure Example

Example: 87-3-2.5G (Shield Chuck)

1. Removal of Front Cover

After dis-mounting Jaws, remove round screw (3 pcs) flat screw and 3 pcs of oil nipples, then, the cover can be dis-mounted. When it's hard to be dis-mounted because of the use of O Ring, insert a round rod through the center of Chuck, and push the cover moderately. If once O Ring located along outside of chuck come off, the cover can be removed smoothly.

2. Removal of Back Cover

Back Cover is ground together with Chuck body. So, before removing, put the check mark at the back side of jaw No.1, and at any other place than the mounting surface or at any critical part of precision so that the Back Cover can be put back to the original position after finished overhaul. Remove the bolts to release Back Cover from Chuck body. Normally, it's hard to separate Back Cover from Chuck body by hands. The easy way to do this is to install ASA with Chuck, and send air of approx. 14.5psi, then, Back Cover will come off. If not, repeat once or twice Chuck open/close by change valve, then, Back Cover and Chuck Body is separated. If still not, increase air pressure a little by little. (Do not use too high air pressure which might cause accident)

3. Dismount of Master Jaws

After removed the Back Cover, dismount the Wedge and Piston which are all tightened together by 3 bolts as one (1) unit, from Chuck Body. Then, remove the Master Jaws. Disassemble above Wedge and Piston. When doing above operation, pay enough attention not to give any scars or scratches to each component.
M 4 Overhaul

4. After Dis-assembly
1) Check sliding surface with T-slot of Master Jaws. If there is any mark of jamming or scratches, repair it. If T-slotted part and Wedge shaped T-slot are heavily worn out, then, the chuck will not be repaired and adjusted to the original accuracy.
2) Check the sliding surface of Body and Wedge. If there is any mark of jamming or scratches, repair it. If damaged or heavily worn out, correction will be impossible. (If these need to be repaired, then these parts have to be newly made.) In order to correct the mark of jamming or scratches, it is generally recommended to use a sand paper of higher grade than 10000, or a ultra-fine diamond file. If the mark of jamming or scratches is very deep, the clearance between the Wedge and Body would be bigger after correction. In this case, the original accuracy will be very hard to be obtained after correction.
3) Check inside all around.
In the long run of use, O Ring and Seal will be inevitable from de-terioration or scratch. Even though the inside is filmed with oil, because of the fluctuation of temperature, and from the air, there is always a chance to get inside moistened. There once was a problem with oil itself. Make sure if there is no rust or corrosion.

5. Cleaning
Clean every component properly.
Chips, grease and oil have to be cleaned out. Clean carefully even narrow part and gap, T-slot sliding part, air port and oil port are all not easy to be cleaned. Use air to clean these parts.

6. Re-Assembly
Re-assembly the chuck by the reverse procedure to the dis-assembly.

Note: Manufacturer will not be responsible about the result of overhaul done by customer.

M 5 Lubrication (For Slide ways) M 5

Observation of periodical lubrication is imperative to maintain the accuracy and life. For all the air chucks, except sealed type, there’s always the chance for chips, coolant and sludge penetrate inside of chuck. It is, therefore, necessary to keep ejecting those out of chuck by injecting new lubricating oil periodically, to maintain the smooth lubrication, and naturally for long life. It is recommended to observe the followings:

1. Do lubrication at three oil ports supplied with chuck.
2. Remove the plug from ports, and clean all three ports by air blow or cloth. In case of using hex wrench, pay attention not to damage the hex port of chuck side.
3. Do open/close of jaws 5-6 cycles while doing injection so that the lubrication oil can be delivered to all slide ways. (During this operation, there will be a chance for the oil splash out of the port. So, it is recommended to waste cloth at the port area to avoid that.) Not to have oil leak at the port area, before it goes into the chuck. Put the injector nozzle firmly to the port.
4. Injection of lubrication oil to the ports should be continued until the oil will come out of the clearance between the master jaws and chuck body, and to other parts other than the one being used for injection, and eventually up until the clean lubrication oil can be seen after the initial old dirty oil. (Open/cloze operation of jaws mentioned above 3 will actually have to be repeated until the clear oil will come out of the chuck.)
5. Recommended lubrication oil: Shell Tona S3M68 or equivalent to either of them.
6. Frequency of lubrication: Min. once a day (More than once a day lubrication is recommended for long life.) In case of dry cutting, as frequent as possible, more than once a day, lubrication is requested.

M 6 Caution

1. Power
Turn off power while changing chuck or ASA, or while doing inspection.

2. Bolt
Tighten all bolts firmly and evenly.

3. Lubrication
Supply lubrication oil through oil port periodically. Refer to page 45.

4. Shock
Refrain from hitting Chuck. Jaw and workpiece by hammer etc.

5. Lubricator
Keep paying attention to the volume of lubrication oil in the lubricator so that it will always be over half of pot.

6. S.R. Bushing
After centering is finished, tighten bolts evenly and firmly. Neglecting this will eventually cause jamming and damage to ASA assembly.

7. Change Valve
Do not operate Valve (Manual or Solenoid) while spindle is rotating. Operate it only after spindle is stopped.

8. Hand
Be careful with finger not to be caught by Jaws.

9. Coolant
Max. pressure to be used to feed the coolant is 58.0psi. Any higher pressure may harm Journal of ASA.

10. RPM Restin
Use of higher RPM than that specified in the catalog may have workpiece fly from Jaws because of the depressions of clamping force. Depending on the cutting conditions etc., even the RPM specified in the catalog may occasionally not be used. When high RPM is required to be used, contact manufacturer or local representative.

11. Spindle Start
For the safety, set system so that the spindle can not be started when the door is open.

12. Air Pressure
Max. air pressure: 101.5psi
Use of any higher pressure than 101.5psi will shorten the life of air chuck.
ASA (Air Supply Apparatus)

Variety of products to meet the requirement for low speed to high speed, for movable ASA, for high pressure coolant and etc. are available. Special is available on request.

How to determine ASA length

Example: JHP3 – LR
LR = LS (Spindle Length) + ※ + A (Chuck Adapter) + C (ASA Adapter) + B (S.R. Bushing) + E (Max. 0.394")
※Dimension differs depending on the type of chuck. (Refer to the page of chuck.)

Kinds of ASA & S.R. Bushing

- Dimensions
- JHP3HS / JHP3 / JHP2
- Dimensions and specification of end cap is same on all models.

- S.R. Bushing
- For JHP3HS / JHP3
- TB-001
- TB-004
- TB-003
- For JHP2
- Mainly for JHP3HS. Fine centering is possible.
- TB-001: With split & mainly for JHP3. Possible for JHP3HS. For tightening ASA and for securing with adapter

- Max. Air pressure & Coolant pressure

<table>
<thead>
<tr>
<th>Model No</th>
<th>Max. Speed</th>
<th>Max. Air/Coolant Press</th>
</tr>
</thead>
<tbody>
<tr>
<td>4L3</td>
<td>8,000rpm</td>
<td>5lbs</td>
</tr>
<tr>
<td>4L3AHPR</td>
<td>6,000rpm</td>
<td>145psi</td>
</tr>
<tr>
<td>JHP3HS</td>
<td>12,000rpm</td>
<td>5lbs</td>
</tr>
<tr>
<td>JHP3</td>
<td>8,000rpm</td>
<td>5lbs</td>
</tr>
<tr>
<td>JHP2</td>
<td>8,000rpm</td>
<td>5lbs</td>
</tr>
<tr>
<td>JHP3AHPR</td>
<td>6,000rpm</td>
<td>145psi</td>
</tr>
</tbody>
</table>
4 Layer ASA (For confirming workpiece seating)

Not only opening & closing jaws, air blow and/or coolant feed through the center bore of chuck, checking and confirming workpiece seated properly or not, is possible.

ASA for High Pressure Coolant

JHP3AHPR

Increased capability to reduce the possibility of penetration of coolant. Can be used with CNC turning machines and grinding machines.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>Capability corresponding high pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>JHP3AHPR</td>
<td>145psi</td>
</tr>
<tr>
<td>4L3AHPR</td>
<td>145psi</td>
</tr>
</tbody>
</table>
1. Installation of ASA Adapter

1. Clean the pilot and mounting surface of ASA adapter and at the rear end of spindle where ASA adapter is installed.
2. Make sure no damage, scratch, dent etc. on both surface before installation.
3. Mount the S.R. Busing to the rear end of spindle.
4. Secure the S.R. Bushing with the spindle by tightening bolts temporarily, not to full extent, to the extent that it could be movable when hitting by plastic hammer lightly. This is to leave an allowance for fine adjustment for centering.
5. Set the dial gauge at rear side (journal side) of ASA Adapter.
6. Center the ASA Adapter to below 0.00008”. Plastic hammer is recommended to use for fine adjustment. How to center: Rotate the spindle by hand, and check the runout hit where showing highest point of measure lightly, and repeat this procedure until getting below 0.00008”.
7. Secure the ASA adapter firmly with the spindle by tightening the bolts to the full extent.
8. Make sure again if below 0.00008” is still there. If not, repeat procedures (5) and (6) until getting below 0.00008”.

2. Installation of ASA Assembly

1. Make sure the chuck is supplied with the spindle properly.
2. Make sure the shaft of rotary journal is supplied with S.R. Bushing. Except TB-001, there’s a front side and backside on the S.R. Bushing. Make sure it points the right direction. There are counter-sunk bores with the Bushing, except TB-001. These holes should point to the rotary journal when installed with the shaft. Position the S.R. Bushing firmly on the shaft leaving 0.039”-0.118” to the journal surface.
3. Clean the inner bore of ASA adapter and the shaft of ASA Journal.
4. Apply grease to the end cap, to the area where it meets O Ring and MRS (metal rubber seal) inside the pilot of chuck.
5. Insert ASA Assembly through the ASA Adapter, and thence to the chuck or to the chuck adapter, until the contact between the end cap of pipe and the threads inside of pilot of chuck is made.
6. Screw ASA further into the chuck until it contacts with MRS (metal rubber seal) by rotating the S.R. Bushing by hand, clockwise. A little further press just by a little more rotation of S.R. Busing would be enough. Do not use any tool for this operation. Too much tightening might cause the short life of MRS.
7. For centering of ASA (Journal), refer to page 53,54
3. Centering of Rotary Journal

When S.R. Bushing TB-001 is used:

1. Tighten all set screws lightly.
2. Set the dial gauge at the front side of rotary journal.
3. Rotate the spindle by hand, and stop the journal where showing the highest measurement. Loosen set screw of rear side of adapter (at near side to journal), and adjust the runout to below 0.0002". After this, tighten all the other set screws firmly.
4. Set the dial gauge at the rear side of rotary journal.
5. Rotate the spindle by hand, and stop the journal where showing highest measurement, tighten the set screw at 180 deg, opposite side of ASA adapter, at the front side(spindle side), and adjust the runout to within 0.0002". After this, tighten all the other set screws firmly.
6. Set the dial gauge at the front side of rotary journal to make sure the runout is still within 0.0002". If found not, repeat the procedures (2) through (5) until 0.0002" is obtained.
7. Make sure, after the runout of rotary journal is within 0.0002" at both front and rear side, make sure all the set screws are tightened firmly. Attention not to tighten the set screws too firmly is required to avoid deviation of runout. All set screws need to be tightened firmly, but not too excessively.

When S.R. Bushing TB-004 is used:

1. Loosen set screw holding the shaft of rotary journal. Match the holes location between the S.R. Bushing and ASA Adapter, and put them together lightly.
2. Tighten the bolt which is to shrink the slit, to fix the S.R. Bushing with the shaft of rotary journal.
3. Tighten 3 bolts which are to secure S.R. Bushing with ASA adapter, temporarily to the extent that makes a little further move possible by plastic hammer when centering.
4. Set the dial gauge at the rear side of rotary journal.
5. Rotate the spindle by hand. If the runout measured is out of the value specified below, check where at the journal show highest measure, and hit there by plastic hammer for fine adjustment. Repeat this until the permissible runout is obtained.
   - For 6,000rpm or below → Below 0.0004"  
   - For over 6,000rpm → Below 0.0002"  
6. Tighten 3 bolts firmly.
7. Again, make sure if the runout is still within 0.00006". If not, loosen the bolts and repeat procedures (3) to (6).
M2 Caution for Operation & Handling

Not because of production error, defectiveness and/or malfunction of ASA assembly itself, but because of the handling and/or wrong set-up etc., often the trouble is caused with ASA. Please pay enough attention to the followings:

1. Max. rotation speed and Air pressure

<table>
<thead>
<tr>
<th>Model</th>
<th>Max. rpm</th>
<th>Coolant</th>
<th>CWS+</th>
<th>Jaw open/close</th>
</tr>
</thead>
<tbody>
<tr>
<td>JHP2</td>
<td>8,000rpm</td>
<td>58psi</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>JHP3</td>
<td>6,000rpm</td>
<td>145psi</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4L3</td>
<td>12,000rpm</td>
<td>—</td>
<td>29psi</td>
<td>116psi</td>
</tr>
<tr>
<td>JHP3AHPR</td>
<td>6,000rpm</td>
<td>145psi</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>4L3AHPR</td>
<td>6,000rpm</td>
<td>145psi</td>
<td>—</td>
<td>29psi</td>
</tr>
</tbody>
</table>

*CWS=Confirm Workpiece Seating

2. Handling of Air Hose

Inside of fitting and/or hoses have to be cleaned before installation to the Journal. Otherwise, the foreign substance may get inside, and thus, the jamming will have to be caused eventually. When installing the chuck and air supply apparatus to the machine, pay attention to the end of air hoses not to be touched to the floor to avoid it gets dirty with cutting chips, dirty oil and sludge. If the hoses are connected to the ports of Journal without cleaning the connecting part of hoses, the ASA will cause the trouble such as jamming of Journal.

3. Tubing for Drain

Arrange drain hose so that the coolant will return the tank. Do not put the hose into the coolant tank. Make sure there is no trap on drain hose.

4. Warming Up

Before start machining, carry out warm-up running in a few steps, 1000, 2000, 3000...rpm, by spending over 10min. It might cause the jamming to run the ASA quickly at top speed.

5. Air and Oil

Use Air Filter which has over 0.0002" or better filtration capacity. Maintain the cutting oil as clean as possible all the time. Old filter, low cap of filtration for cutting chips, dirty oil may cause the jamming problem with ASA.
Vibration of Hose

When there is a strong vibration with the coolant hose, supply some fixture, near by the journal, to prevent the vibration to be transferred to the journal.

Dry Cutting

If the dry-cut is done at high speed, thermal expansion is caused inside of journal, and may cause jamming between the shaft and housing. It is recommended to apply air blow through the journal, in case the coolant is not used, to reduce the heat generation inside journal.

Setting Direction of Journal

Set the Journal so that the fittings and hoses will point right at the floor.

Location of Bushing

When installed ASA with machine, make sure the SRB is holding the shaft with more than 90% of the holding surface. (Clearance of A should be within 0.394")

Installation of ASA to chuck

When installing the ASA to the chuck, make sure the metal rubber seal is in place, and tighten the ASA until the edge of ASA will reach to it. If the ASA is not tightened firmly and properly, and/or if the metal rubber seal is not in the place properly, the air leakage will have to be caused, and the chuck will malfunction eventually.

Insert ASA until the shoulder (A) of end cap hit the metal rubber seal supplied at the rear side of DC. Screw tighten ASA just a little further to create firm contact with MRS (metal rubber seal), but not too excessively not to damage MRS.

Centering when installing ASA to the machine

Make sure the runout at \( \theta \) and \( \varphi \) must be within 0.0004”/0.002” when the spindle speed is over 6,000rpm. Runout over these accuracies will affect the accuracy of turning and might cause the jamming at journal.

Tightening of Screw

After all the installation and adjustment related to the ASA adapter and Bushing, make sure all the screws are firmly tightened, not loose.
Trouble Shooting

Case 1  Jaws don’t move

[Slide Jaw Type Precision Air Chuck]

1. If this phenomenon took place right after initial operation or rather in a short period of use, air leakage might be the cause. Check the leak at the center bore of chuck.

2. If this took place after a certain long while of use, like after 1~2 or more years, jamming anywhere among MJ, Wedge and Body, is usually the cause of trouble.

Followings can be considered as the cause:
1. Damaged O Ring or MRS, or both together when installing ASA
   Solution: Change O ring and MRS for new ones
2. Jamming resulted by foreign substance got in between the shaft and housing of journal
   Solution: Whole ASA assembly need to be replaced with new one

In almost every cases, this jamming is resulted from the accumulation of chips and sludge, among MJ, Wedge and the Body, which have been progressed a little by little, farther and farther, along with months, years of use, inside the chuck. If this take place, the chuck have to be repaired. It normally takes 3 to 5 weeks.

[Diaphragm Type High Precision Air Chuck]

The followings can be considered as the cause.

1. Air Leak
   Please refer to aforementioned Case 1.

2. Diaphragm Fatigue
   Diaphragm material will normally last long, if DC in question has been in use long period, like for example a few years, this might be a cause.

3. Breakage of Diaphragm
   Breakage of diaphragm due to the collision caused by operational mistake, or whatever the reason, might be the cause. In this case, DC have to be repaired.

Case 2  Accuracy lost

[Slide Jaw Type Precision Air Chuck]

1. In case over half a year have passed after started using
   The followings can be considered as the cause when the accuracy which have been available since the beginning is lost:
   (1) Jaw damaged and/or worn
   (2) Jamming took place between the body, wedge and MJ
   If (1) is the case, change the jaw for new one, form-machine it.
   If (2) is the case, the chuck have to be repaired at our shop.
   Note: In order to avoid jamming, as frequent lubrication as possible have to be done as explained in page 48. Enforcement of lubrication will extend the life, accuracy life of chuck.

2. If it started within a few weeks of use
   (1) Damaged Jaw, (2) Air Leak, (3) Inadequately Prepared Jaw, can be considered as the cause.
   In case of (1), change jaw for new one, and form-machine it.
   In case of (2), check the leak as explained at above Case 1 and consult us with the result.
   In case of (3), if the jaw was prepared (form-machined) by the customer, please send the drawing of jaw arranged by the customer, together with the drawing of workpiece so that we will be able to talk with you for the solution.

[Diaphragm Type High Precision Air Chuck]

The followings can be considered as the cause.

1. Jaw broke
   Arrange new Jaw

2. Diaphragm of DC broke or deteriorated
   In case the cause is the breakage and/or fatigue of diaphragm material, the chuck have to be repaired. (Normally it takes 4 to 5 weeks.)

3. Wear of clamp surface
   Reform-machining is necessary. In case of OD clamp, for example, if the jaw was originally form-machined by opening it at 43.5psi air pressure, do the same now again by 29psi air pressure. The difference of Jaw stroke by two different air pressure will be the rate of material to be removed by additional reform-machining.
Case 3
Rotary Journal locked (Jammed) during the operation

- Change ASA include Rotary Journal for new one.
  Delivery of ASA is usually 3-4 days after receipt of order.

Case 4
Jaw of DC break frequently

- The followings can be considered as the cause:
  1) Form-machining not done right and properly
  2) Not feasible machining conditions

  In case of (1), If the jaw is prepared by the customer, please let us have the drawing made by customer, together with the drawing of WP for our evaluation and counter-idea to resolve the problem, and also with the following information:
  1-Material and hardness of WP
  2-Marterial of Jaw
  3-Spindle RPM
  4-Air pressure used to form-machine the jaw
  5-Additional air pressure (if it's used.)
  6-Cutting removal
  7-Cutting Feed Rate

Remarks
For whatever caused trouble in terms of the accuracy or performance, please contact us with the following information:
1. Model No. of Chuck (or ASA)
2. S/No. of above
3. Period in use
4. Condition of machining:
   1) Material of WP 2) Cutting removal 3) Spindle RPM
5. Status of Implementation re Lubrication
6. Accuracies required on the drawing
7) Operation hours per day, days per month and cycle time