UNEQUALED WORK HOLDING ACCURACY for: grinding; balancing; inspection; boring; facing; reaming; drilling; turning; shaving; hobbing and honing

<table>
<thead>
<tr>
<th>SQUARENESS</th>
<th>○ CONCENTRICITY</th>
<th>// PARALLELISM</th>
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<tr>
<td>○ ROUNDNESS</td>
<td>□ ALIGNMENT</td>
<td>© TRUE POSITION</td>
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CHUCK – Figure 1

ARBOR AND CHUCK FUNCTION
Grip arbors and chucks utilize a self-contained hydraulic system to expand or compress the sleeve within the gripping area to point within the elastic limits of the metal. The pressure is supplied through an internal piston assembly which can be actuated either manually or power assisted. The illustrations demonstrate a manual actuation to expand the arbor, or compress the chuck. Clockwise rotation of the actuator screw advances the piston which places the hydraulic system under great pressure. The chuck, Figure 1 – the compression area is limited by the position of the hydraulic seals. The arbor, Figure 2 – the expansion area is limited by the position of the hydraulic seals. There is no expansion of the gripping area beyond the hydraulic seal area. The gripping area of the arbor or chuck is under equalized pressure, with uniform expansion or compression about the geometric center, thus providing extreme accuracy in part positioning.

ARBOR – Figure 2

CHUCKING SIZE RANGE

Chuck: Minimum chucking diameter 1/16”

Arbor: Minimum chucking diameter 1/4”

Maximum chucking diameters for both arbors and chucks are limited by part and tolerance variables.
Expanding or compressing metals under hydraulic pressure is accomplished by working within the tested elastic limits of the metals being used. The general rule for expansion is .003 for the first full inch of chucking diameter and .001 for each additional inch of diameter. The following table lists typical expansion limits but these may vary somewhat due to the many variable factors for each specific application.

<table>
<thead>
<tr>
<th>CHUCKING DIAMETER</th>
<th>EXPANSION LIMIT</th>
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<tr>
<td>.250</td>
<td>.00075</td>
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<tr>
<td>.500</td>
<td>.0015</td>
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<td>.750</td>
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<tr>
<td>2.000</td>
<td>.004</td>
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<td>3.000</td>
<td>.005</td>
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**WORK HOLDING FORCE**

Hydraulically expanded arbors and chucks are custom engineered to embody the correct gripping force for each application. The gripping power may range from only a few pounds to several thousand pounds per square inch. They withstand rugged production operations - turning, hobbing, boring, grinding, etc., and handle the most delicate inspection operations over long periods.

**NEED FOR GREATER ACCURACY**

Manufacturing tolerances throughout industry have been greatly reduced in recent years. In many instances conventional work holding devices are no longer capable of functioning within required production limits. In the manufacturing of precision parts the work or tool holding device must locate the part with consistent extreme accuracy so that the machine tools have the full benefit of the part tolerance. This must be accomplished without complicating the processing of machining operations whereby many non-critical part dimensions must be held to closer than necessary limits.
POSITIVE CENTERING

Equalized holding force provides absolute centering accuracy that will conform to the part locating periphery. The arbor or chuck will assure positive holding in parts that may have in-tolerance inaccuracies such as taper, out of round or bellmouth.

When “A” is basic chuck size, “B” is made to suit part.
When “B” is basic arbor size, “A” is made to suite part.

NOTE: Basic diameter determines amount of expansion.
INVOLUTE CHUCKING

- INTERNAL
- EXTERNAL

SPUR OR HELICAL GEARS; SPLINES; SERRATIONS

INVOLUTE TOOTH FORM EXPANDED

SPLINE RETRACTED

INVOLUTE TOOTH FORM RETRACTED

SPLINE EXPANDED LOCATING ON MAJOR DIAMETER
ACTUATION

Actuation can be either manual or power assisted. The actuating screw is located in the most convenient location for the application.
POWER ACTUATED ARBOR

A power actuated hydraulic arbor can locate a transmission gear within 0.0002 T.I.R. when grinding a cone seat. A carbide coated sleeve is used for longer wear and greater gripping force.

ARBOR ACTUATED WITH HYDRAULIC PUMP

This hydraulic arbor is actuated by an outside hydraulic source. After the part is loaded on the arbor a high pressure hydraulic hose is connected to the quick change coupling, the valve is then opened and the arbor is pressurized to the required pressure. Next, the valve is closed and the hose is disconnected. The arbor is now expanded to the necessary amount required for machining. The hydraulic pressure is observed to assure that the arbor remains expanded during the machining cycle, thus avoiding part slippage.
APPLICATIONS OF HYDRAULIC TOOLING

Arbor for Multiple Parts

This hydraulic arbor is used for expanding into three different size bushings at one time. The arbor locates the bushings within 0.0002 T.I.R. for finish grinding of the outside diameter.

Chuck with Split Sleeve

This hydraulic chuck with split sleeve, gage pad and built-in hydraulic clamps is used to locate and hold a compressor spacer within 0.0002 T.I.R. while grinding the inside diameter and face on a Bryant grinder.

Milling Chuck

While locating the first and second stage spacer within 0.0002 T.I.R. and drilling and milling operations are performed by this hydraulic chuck with interchangeable split sleeves.

Arbor with Carbide Coated Split Sleeve

A hydraulic arbor with a carbide coated split sleeve is used to locate and hold a labyrinth spacer with 0.0005 T.I.R. while semi-finish turning the forward end on a Mazak 4 axis lathe.
APPLICATIONS OF HYDRAULIC TOOLING

Milling Fixture

A milling fixture with radial locator and tooling ball, used for gaging, the hydraulic arbor with split sleeves locates the part within 0.0002 true position for drilling 34 holes and milling 6 slots.

Jig Grinding Fixture

To locate and hold the bearing assembly within 0.0001 true position, while grinding the bearing diameter, a jig grinding fixture, with a hydraulic arbor and diamond locator is used.

Gear Check Arbor

A hydraulic arbor is used for locating a transmission ring gear within 0.0002 T.I.R. when checking gear runout on a motorized rolling fixture.

Squareness Gage

This squareness gage is used with a hydraulic arbor and split sleeve to expand into the shaft bores while checking the squareness of the mounting face of a marine engine gear case.
APPLICATIONS OF HYDRAULIC TOOLING

Hole Location Gage
A special hole location gage is available with four hydraulic arbors for locating the part within 0.0002 true position. Gage pins are then used to check the location.

PRECISION SPLIT SLEEVES
Precision split sleeves are used where more than one part size is required for an arbor or chuck.

End Expansion
Parallel Expansion
Center Expansion