Heald Controlled-Force
Internal Grinders

Centri-Matic
Model CF90
Model CF91
Sizes 1 & 2

THE HEALD MACHINE COMPANY • WORCESTER • MASSACHUSETTS
THE INTERNAL GRINDING PRINCIPLE
THAT IS SETTING NEW STANDARDS
OF PRECISION PRODUCTION AND
CONSISTENT, UNIFORM QUALITY

In the CF grinder, the abrasive wheel
is fed into the workpiece by a con-
trolled force, rather than at a constant
feed rate.

This means that metal is always re-
moved at the same optimum rate, re-
gardless of variations in stock condi-
tions or hardness. Forces on the wheel
remain constant, so parts coming to
machine with excess stock can neither
damage wheel nor affect part accuracy
as with feed rate machines.

The machine treats each workpiece
on the basis of its own stock condi-
tions, resulting in a slight variation of
individual cycle times. The net result
is higher production rates with more
consistent accuracy.

The controlled force is generated by
precisely adjustable hydraulic pressure
which is easily set for optimum grind-
ing conditions. At end of cycle, finish
force is positively controlled, assuring
uniform size and finish.

Hydrostatic Table
The workhead, tooling and workhead
drive are mounted on the hydrostati-
cally supported table which reciproc-
cates for bore grinding or indexes for
plunge grinding operations.

Pressurized pockets of oil provide
support with no metal-to-metal contact,
no wear, and with excellent damping
of vibration. Reciprocation is con-
trolled by a rotating harmonic cam.
Rate of reciprocation is infinitely vari-
able between 50 and 250 strokes per
minute. Length of stroke is adjustable
from 0” to ¼”. Longer strokes are
available by using special cams.

The table is mounted on vee and flat
ways. Resultant grinding forces act
downward on the table so there is no
tendency to lift or shift on heavy cuts.
The fully guarded ways are longer
than the table, assuring full, uniform
support throughout the entire stroke.

Cross Slide
The cross slide is supported hydro-
statically by a round bar and flat way.
The round bar serves as a hold-down,
rigid guide way and a force cylinder.

With this unique design, the controlled
force is applied directly beneath the
wheelhead. Low forces in finish grind-
ing are positively controlled all the
way to sparkout and finish size.

Compensation for wheel wear and re-
traction following wheel change are
numerically controlled. Pre-set digital
switches control the amount of move-
ment of compensating slide. This com-
ensating slide is accurately positioned
by a pre-loaded ball screw which is
driven by a stepping motor. Compen-
sation can be as small as 50 millionths
increments.

When wheel change point is reached
the machine automatically resets the
slides to new wheel position. After
wheel change, the new wheel is auto-
matically dressed and machine auto-
matically returns to grinding cycle.

Cross slide positions for wheel change
cycle are monitored by low voltage
direct contact switches giving accurate
response with no physical pressure or
wear.

Pressurized Machine Cavities
The internal cavities are pressurized
by a blower so that the flow of filtered
air is always outward to prevent any
contaminants from entering the table
and cross slide areas.

ONLY THE CF GRINDER
OFFERS THESE ADVANTAGES

• Optimum rate of metal removal under all conditions.
• Accuracy unaffected by stock variations.
• Higher production rates with more consistent accuracy.
• Scrap losses virtually eliminated.
• Simple setups for force control.
• Hydrostatic table and cross slide ways—no wear or maintenance.
Work area of CF90, showing:
1. Fixed dresser
2. Single jet air gage
3. Magnetic backing plate

Rear view of CF90, showing:
1. Electrical control box
2. Hydraulic valve compartment
3. Air blowers and intake filter
4. Hydraulic power unit
THE CF90 AND CF91 ARE FULLY AUTOMATIC CENTRI-MATIC MACHINES FOR PRECISION GRINDING OF BORES AND GROOVES AT SUSTAINED HIGH PRODUCTION RATES

The CF90 is a Centri-Matic bore grinder, with either Size-Matic or Gage-Matic sizing. It is available in two sizes; the 1CF90 for work up to 4½" O.D., and the 2CF90 for work up to 8" O.D. (12" O.D. available).

The CF91 is a Centri-Matic groove grinder, also available with either Size-Matic or Gage-Matic sizing, and in two sizes, 1CF91 and 2CF91, for 4½" and 8" O.D. work respectively (12" O.D. also available). It can be supplied with several single or double wheel cycle combinations.

Sizing Methods
In the Size-Matic method, the wheel is trued at a predetermined point, and then advanced a precisely controlled amount to bring the work to the exact hole size desired. Compensation for wheel wear is automatic.

CF90 bore-grinding machines with Gage-Matic sizing can be supplied with automatic plug gaging, air gaging or electronic gaging.

CF91 groove grinders include skip-dress cycling as standard equipment and are available with single jet air gaging.

Workholding
In the Heald Centri-Matic method, the work is rotated on its own O.D. against locating shoes and driven by a rotating backing plate. It can be held against this plate either magnetically, by pressure clamps or by roll clamps, depending on the nature of the work.

Shoe location bridges irregularities on the O.D. and improves roundness of the ground I.D.

Various types of fixed and adjustable loading chutes can be incorporated with each clamping method.

Wheelheads
The CF machines are arranged to take the new rigid "A" frame Red Head wheelheads, with either belt drive or high frequency power. Both types of heads are mist lubricated for maximum service life. High-frequency heads require a separate power source and water jacket cooling.

Dressers
CF90 bore-grinding machines can be supplied with three different types of wheel dressers, as follows:

Rigid mounting directly on the shoe bracket. This permits minimum dress cycle time. Diamond turner is standard equipment on this arrangement.

Fixed bracket mounting permits the use of existing Centri-Matic tooling with minor modification.

Lift-up mounting, hydraulically operated with positive cam interlock. This type of dresser permits the use of shortest possible quills for grinding small bores.

CF91 groove grinders are provided with a lift-up radius dresser that is hydraulically operated eliminating cross slide index for dressing. It has plain bearings for smooth accurate dressing of formed wheels.

Lubrication
All operating parts in the entire machine are automatically lubricated, assuring trouble-free operation with minimum maintenance.
## SPECIFICATIONS

**Model CF90**

**Model CF91**

### Capacities

<table>
<thead>
<tr>
<th>Metric</th>
<th>1CF90</th>
<th>2CF90</th>
<th>1CF91</th>
<th>2CF91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum outside diameter of work</td>
<td>4½&quot;</td>
<td>8&quot;</td>
<td>4½&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>Minimum outside diameter of work</td>
<td>¾&quot;</td>
<td>4&quot;</td>
<td>¾&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>Maximum length of work</td>
<td>2&quot;</td>
<td>2½&quot;</td>
<td>2&quot;</td>
<td>2½&quot;</td>
</tr>
<tr>
<td>With special chutes</td>
<td>3½&quot;</td>
<td>3½&quot;</td>
<td>3½&quot;</td>
<td>3½&quot;</td>
</tr>
<tr>
<td>Maximum swivel of work</td>
<td>30°</td>
<td>30°</td>
<td>30°</td>
<td>30°</td>
</tr>
<tr>
<td>Center of wheel spindle from floor</td>
<td>40&quot;</td>
<td>42½&quot;</td>
<td>40&quot;</td>
<td>42½&quot;</td>
</tr>
</tbody>
</table>

### Speeds and Feeds

<table>
<thead>
<tr>
<th>Metric</th>
<th>1CF90</th>
<th>2CF90</th>
<th>1CF91</th>
<th>2CF91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table travel (total including runout)</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>5¾&quot;</td>
<td>5¾&quot;</td>
</tr>
<tr>
<td>Wheel wear compensation</td>
<td>0–0.004&quot; on dia. (0.0001&quot; increments)</td>
<td>0–0.004&quot; on dia. (0.0001&quot; increments)</td>
<td>0–0.004&quot; on dia. (0.0001&quot; increments)</td>
<td>0–0.004&quot; on dia. (0.0001&quot; increments)</td>
</tr>
<tr>
<td>High force (adjustable)</td>
<td>30-300 lbs.</td>
<td>30-300 lbs.</td>
<td>30-300 lbs.</td>
<td>30-300 lbs.</td>
</tr>
</tbody>
</table>

### Drive and Power Requirements

<table>
<thead>
<tr>
<th>Metric</th>
<th>1CF90</th>
<th>2CF90</th>
<th>1CF91</th>
<th>2CF91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backing plate motor† †</td>
<td>½ hp @ 520 rpm</td>
<td>¼ hp &amp; ½ hp</td>
<td>½ hp @ 280 rpm</td>
<td>½ hp @ 280 rpm</td>
</tr>
<tr>
<td>Wheelhead motor for belt drive</td>
<td>10 hp @ 3600 rpm</td>
<td>15 hp @ 3600 rpm</td>
<td>7½ hp @ 3600 rpm</td>
<td>10 hp @ 3600 rpm</td>
</tr>
<tr>
<td>Hydraulic pump motor</td>
<td>2 hp @ 1800 rpm</td>
<td>2 hp @ 1800 rpm</td>
<td>2 hp @ 1800 rpm</td>
<td>2 hp @ 1800 rpm</td>
</tr>
<tr>
<td>Coolant pump motors (2)</td>
<td>¾ hp &amp; ½ hp</td>
<td>¾ hp &amp; ½ hp</td>
<td>¾ hp &amp; ½ hp</td>
<td>¾ hp &amp; ½ hp</td>
</tr>
</tbody>
</table>

### General Data

<table>
<thead>
<tr>
<th>Metric</th>
<th>1CF90</th>
<th>2CF90</th>
<th>1CF91</th>
<th>2CF91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over-all height</td>
<td>95½&quot;</td>
<td>95½&quot;</td>
<td>95½&quot;</td>
<td>95½&quot;</td>
</tr>
<tr>
<td>Length and width of base on floor</td>
<td>68&quot; x 49&quot;</td>
<td>68&quot; x 49&quot;</td>
<td>68&quot; x 49&quot;</td>
<td>68&quot; x 49&quot;</td>
</tr>
<tr>
<td>Floor space (without coolant tank)</td>
<td>91&quot; x 79&quot;</td>
<td>91&quot; x 79&quot;</td>
<td>91&quot; x 79&quot;</td>
<td>91&quot; x 79&quot;</td>
</tr>
<tr>
<td>Floor space (with coolant tank)</td>
<td>109&quot; x 79&quot;</td>
<td>109&quot; x 79&quot;</td>
<td>109&quot; x 79&quot;</td>
<td>109&quot; x 79&quot;</td>
</tr>
<tr>
<td>Weight of machine, net (approx)</td>
<td>10,500 lbs.</td>
<td>11,000 lbs.</td>
<td>10,500 lbs.</td>
<td>11,000 lbs.</td>
</tr>
<tr>
<td>Gross weight crated (approx)</td>
<td>11,500 lbs.</td>
<td>12,000 lbs.</td>
<td>11,500 lbs.</td>
<td>12,000 lbs.</td>
</tr>
<tr>
<td>Gross weight boxed (approx)</td>
<td>12,500 lbs.</td>
<td>13,000 lbs.</td>
<td>12,500 lbs.</td>
<td>13,000 lbs.</td>
</tr>
</tbody>
</table>

*Larger and smaller O.D. capacities obtainable for certain work. Consult Heald for information.
†Standard work speeds determined by pulley sizes.

**15° On Plug Gagematic Machine Operating On Szematic Cycle; No Swivel On Plug Gagematic Cycles**

†† Plug Gagematic—½ hp @ 1200 rpm

Plug Gauge Speeds: 500, 650, 1000, & 1300 rpm

★ Additional Speeds With Special Sheaves

△ 1½" On Fork Gage Machines

‡ 12" Capacity Available With Hand Loading

□ 7½" On Double Wheel Double Groove Machines

Electrical equipment conforms to the essentials of all generally accepted codes.
The right is reserved to make such changes and improvements as in our opinion may be desirable.