Combination - Universal

**Horizontal / Vertical**

**Machining Center**

Machine the top and 4 sides of a workpiece in one setup.

**Travels:**
- X: 43”
- Y: 22”
- V head: 32”
- H head: 32”

Work 20” high can be placed on the rotary table and machined on 5 faces.

Front and back work on parts up to 78” long and 4 sides work on parts up to 52” square.

15 Hp. on each spindle

Available with or without the vertical head and toolchanger.

Version with twin 24 tool automatic tool changers shown without enclosure to reveal construction.
The vertical head is parked at the top of its travel.

The horizontal spindle is now the active spindle and is shown at its highest position, 32" above the table and with the quill in its extended position.

The vertical spindle has about 4 1/2" of room for a tool if the workpiece is 32" high.

In this photo the machine is equipped with the optional 20 tool automatic tool changer and moveable floor mounted console.

See the front cover picture showing twin 24 tool arm type changers giving a total of 48 tools.

In the picture the console is positioned in front of the table, as would be normal for operating a vertical machining center. On the front cover the console is behind the table, the preferred position for horizontal work.

The splash guard on the right side has a large door for easy access to the horizontal spindle.

Full enclosures are available.

The console is shown with a full PC keyboard on the table.

The table top lifts for print storage underneath.

The MPG fits in a contoured pocket mounted on the table to stabilize it for manual operation.
Presenting
The HH Roberts H / V Machining Center

The Concept

This machine is a truly unique design incorporating both horizontal and vertical spindles mounted on a single column, sharing the same slideways. The components are not unusual. Putting it all together in this way is. It is this concept that is covered by US Patent # 6,145,178.

This design allows both spindles to cover a large work envelope and machine 5 sides of workpiece in one setup. With both spindles on a common center line, the full X axis stroke is available to both spindles.

With parts mounted directly on the table, the travels available with either head are 43” wide, 32” high and 22” deep on the TW-43-HV. Much larger parts and/or fixtures can be mounted and rotated for machining on multiple faces.

Axis Naming Conventions:
CNC programming universally accepts that the Z axis is parallel to the axis of rotation of the spindle. On this machine we must pay special attention to this because when the spindle doing the cutting is changed, the Z and Y axes must change.

When using the vertical spindle the vertical head motion is the Z axis, as on vertical machining centers. The Y axis is on the saddle.

When using the horizontal head the Z axis motion is on the saddle, moving towards and away from the horizontal spindle (parallel to the spindle axis). The horizontal head moving up and down on the column becomes the Y axis. This is the standard configuration for horizontal machining centers.

Capacities: (This paragraph relates to the smallest model, the TW-43-HV)
Diagrams later in this brochure will help explain the capacities. The unique design of this machine allows the horizontal head to be parked below the plane of rotation of a workpiece, so that during rotation, the tool length is not significant and does not interfere with part rotation. Square parts up to approximately 68” diagonal or about 52” on each side, can be swung on a rotary table and worked on all 4 vertical faces. Narrow rectangular parts up to 78” on the diagonal can be rotated for working only on the front and back. Most rotary tables in the range of 14” to 20” diameter available on the international market are about 11” to 12” high. The machine was designed to give access to the top of a 20” high workpiece when mounted on a rotary table, and allow about 5 1/2” for tool length.

Productivity:
Productivity increases are huge. Not 10 or 20% but numbers like 500% and 1000% are realistic in many cases. This is especially true when using a tombstone to mount multiple parts on all 4 sides. One tool can complete, for example 16 or 20 parts, when stacked 4 or 5 high on each side. Tool changes take 12 to 15 seconds on most machines. That non-chip making time is lost only once to machine 16 or 20 parts with the one tool before it is changed.

Larger parts like gear boxes and housings are obvious winners on this machine. Being able to complete most operations on 5 sides in a single set up leads to large reductions in lost time AND much improved tolerances because the part is not re-fixtured.

When a large component is mounted on a rotary table, the size of the part that can be swung to allow machining on the front and back only can reach about 78” on the diagonal.

Application:
This machine will produce parts to general commercial tolerances of just under one thou. It is not meant to replace traditional horizontal machining centers weighing and costing 2 to 3 times these machines, producing very fine tolerances.

Under this patented design the HH Roberts H/V mills define a new standard, in affordable machining efficiency.
Capacities of the TW-43-HV

- 78" diameter work envelope to machine front and back vertical faces. Long tools may require reductions.

- 68" diameter work envelope minus tools.

- Horizontal spindle is parked below table for part rotation.

Black outline is vertical spindle envelope

Red Outline is horizontal spindle envelope

- 32 5/8"
- 32 1/2"
- 43 1/4"
- 28"
- 30"
- 32.6"
- 23.1"
The horizontal spindle is shown at its lowest position and extended. At this point its center line is just below the surface of the table.

Here the horizontal spindle is about mid-height on the column and in the extended position.

The horizontal tool changer is parked. When all the guards are fitted, the horizontal tool changer will be covered by a sliding door with an automatic pneumatic opener.

The complete horizontal tool changer slides forward on the tracks, the spindle will be retracted, and the swing arm makes the tool change.

In this view the horizontal spindle is near its highest position, 32” above the table surface.

The horizontal spindle is shown at its lowest position and extended. At this point its center line is just below the surface of the table.
A Somewhat Simplified Explanation of Vector Drive Output

It's all about heat.

Vector drives are high tech motor drives that introduce some concepts that are often mis-understood and mis-used. The power available from conventional motors is limited by the amount of current used before the windings overheat and the motor "burns out". Power is applied at 60 Hz without regard to the relative position of the rotor and field windings. Much of the power is applied "out of phase" or out of sync and produces a lot of waste heat.

The vector drives we use sense the relative position of the rotor and the fields. With this information power is directed precisely at the fields to maximize efficiency. Little power is turned into waste heat. This allows a motor to absorb more current and therefore produce more power than if it was powered directly from standard 60 Cycle power.

The result is that the motor can produce more power than it would running on non-vectored standard utility electricity at 60 cycles. These motors are still subject to some limitations of course but it is possible to get 50% more power than the nameplate value for limited times, normally 30 minutes. Peak power can be as much as 3 times the motor nameplate for a few seconds.

Japanese CNC control and motor/drive makers have been putting 30 minute ratings on their products for years. Some American machine tool makers are using double the motor nameplate rating in their catalogs and removing the data plates from the motors.

The duty cycle of the machine tool has a significant impact on the power that can be drawn from a drive before the system overheats. Drilling holes when the motor is turned on continuously, and put under intermittent load will allow considerable extra power to be drawn allowing the system to cool in the time between holes. An application that draws a lot of power and stops and starts the spindle, especially at higher speeds will generate more heat. Heavy cutting such as roughing a cavity in a mold, is a situation where extra power can be drawn continuously for some time, depending on the load, ambient shop temperature etc, but 30 minutes at a 50% increase from nameplate Hp. value is realistic. This is the value we use on our specifications. We do not remove the motor data nameplates.

<table>
<thead>
<tr>
<th>Model</th>
<th>Diameter</th>
<th>Center Height</th>
<th>Tilting</th>
<th>Max Load</th>
<th>Overall Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNC-321-RV</td>
<td>12 1/2&quot;</td>
<td>H or V fixed</td>
<td>770 lbs</td>
<td>15&quot; x 25.4&quot;</td>
<td></td>
</tr>
<tr>
<td>CNC-401-RV</td>
<td>16&quot;</td>
<td>H or V fixed</td>
<td>1100 lbs</td>
<td>18&quot; x 30&quot;</td>
<td></td>
</tr>
<tr>
<td>CNC-501-RV</td>
<td>20&quot;</td>
<td>H or V fixed</td>
<td>1320 lbs</td>
<td>33.5 x 22.5:</td>
<td></td>
</tr>
<tr>
<td>CNC-631-RV</td>
<td>25&quot;</td>
<td>H only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNCMT-321</td>
<td>12 1/2&quot;</td>
<td>manual tilt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNC-MT-401</td>
<td>16&quot;</td>
<td>manual tilt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNC-CT-201</td>
<td>8&quot;</td>
<td>CNC tilt</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CNCT-321</td>
<td>12 1/2&quot;</td>
<td>CNC tilt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CNCT-451</td>
<td>18&quot;</td>
<td>CNC tilt</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: the CNCT tables, with rotating and tilting controlled axes, require the Heidenhain 430 control.
Almost every machine tool made in Taiwan bears the stylized “M” that is the trademark of the Meehanite Metal organization.

Some grades of Meehanite are ideal for machine tools, having high tensile strength, resistance to wear, vibration dampening properties, and accept heat treating for slideways well.

The castings on these machines are GA-50 or GC-40.

At the time of preparation of this catalog, we have in our showroom a used CNC knee mill from the same frame supplier as builds this H/V frame. The cross slide ways are box style, just like those pictured below. The box style makes it very easy to use a micrometer to check wear. We invite customers to measure the wear. It is less than 1/10th of a thou. It was built in 1994 and was the only mill in the shop until the customer traded it for another of our mills - with a tool changer.

You can check the attributes of these grades at www.meehanitemetal.org.
**Standard Equipment**

- Anilam 5400 CNC, multiprocessor, 4 axis system with:
  - 4 GB hard disk
  - floppy disk drive
  - 32 MB RAM expandable to 64 MB
  - Ethernet port, RS-232 port and parallel port, flat panel LCD display
- moveable floor console housing the CNC and most electronics with desk surface and pocket for the MPG.
- offline software for use on a PC
- multifunction handheld MPG with axis select, feed rate select, coolant on/off, feed hold and E-stop
- automatic axis swapping by macro when changing between vertical head and horizontal head
- program controlled spindle speeds
- program controlled coolant system with override on the MPG
- spindle orient on both spindles
- rigid tapping on both spindles

- full enclosure with pull out chip pan / coolant tank
- 2 high intensity worklights
- automatic central lube system with low oil alarm
- telescopic steel slideway protectors on X and Y
- roll up guards on column between heads and below the horizontal head.
- box style slideways
- hardened and ground slideways with Turcite counterslides
- high precision ball screw thrust bearings on all ball screws
- class 4 precision ball screws.
- pretensioned ball screws on all axes
- gearless vector drives on spindles
- inspected with Heidenhain equipment and ball screw compensations installed

**Options**

- Anilam 5500 control for a fully controlled 5th axis i.e. rotary table.
- Anilam 6000 series controls for high speed surfacing
- additional ram up to 64 MB
- DXF file processing for offline software
- 20 tool carousel type or 24 tool arm type automatic tool changer for the vertical head.
- 24 to 60 pocket arm type automatic tool changers for the horizontal spindle
- index tables of various sizes and indexing pitches
- rotary tables under full positioning feed and control
- 1 micron linear scale feedback
- full chip enclosure
- high pressure coolant systems
- table mounted splash guards with sliding doors
  (may interfere with rotation of larger parts and/or fixtures)

- spray mist systems
- optional stop, and block delete
- additional M functions for controlling external devices like fixtures, vacuumers, etc.
- low coolant level alarm
- flashing beacons on alarm or tool change
- isolating transformers for wild leg power and/or 460 and 575 volt supplies
- additional worklights
- floor mounted CNC console with LCD display incorporated, includes a writing table with a pocket to hold the MPG, storage under the writing table for drawings etc and long cables allowing the console to be in front of the table or behind it as normal for horizontal machining.
## Specifications

<table>
<thead>
<tr>
<th></th>
<th>TW-43-HV</th>
<th>TW-50-HV</th>
<th>TW-60-HV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spindles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spindle taper, both heads</td>
<td>Cat-V or BT-40</td>
<td>Cat-V or BT-50</td>
<td></td>
</tr>
<tr>
<td>spindle power, both heads</td>
<td>15 Hp</td>
<td>30 Hp</td>
<td></td>
</tr>
<tr>
<td>spindle speeds</td>
<td>80 - 6,0000</td>
<td>40 - 4,500</td>
<td></td>
</tr>
<tr>
<td>bearings, number x ID of main sets</td>
<td>4 x 70 mm</td>
<td>4 x 85 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>table surface</td>
<td>48&quot; x 20&quot;</td>
<td>52&quot; x 24&quot;</td>
<td>72&quot; x 24&quot;</td>
</tr>
<tr>
<td>T-slots</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>maximum table load</td>
<td>2,000 lbs</td>
<td>4,000 lbs</td>
<td></td>
</tr>
<tr>
<td>table height above floor</td>
<td>34&quot;</td>
<td>35&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>Travels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>table, X axis</td>
<td>43&quot;</td>
<td>50&quot;</td>
<td>61&quot;</td>
</tr>
<tr>
<td>saddle (cross travel)</td>
<td>22&quot;</td>
<td>31&quot;</td>
<td></td>
</tr>
<tr>
<td>horizontal spindle head</td>
<td>32&quot;</td>
<td>36&quot;</td>
<td></td>
</tr>
<tr>
<td>vertical spindle head</td>
<td>32&quot;</td>
<td>36&quot;</td>
<td></td>
</tr>
<tr>
<td>quill on horizontal spindle</td>
<td>6&quot;</td>
<td>6&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>Capacities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vertical spindle C/L to face of column</td>
<td>26 3/8&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vertical head to table surface</td>
<td>4&quot; to 36 1/2&quot;</td>
<td>40&quot;</td>
<td></td>
</tr>
<tr>
<td>horizontal spindle C/L to table surface</td>
<td>32&quot;</td>
<td>36&quot;</td>
<td></td>
</tr>
<tr>
<td><strong>Tool Changers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>carousel type for vertical spindle</td>
<td>20 tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>arm type for vertical spindle</td>
<td>24 tools</td>
<td>20 tools</td>
<td></td>
</tr>
<tr>
<td>arm type for horizontal spindle</td>
<td>24 to 40 tools</td>
<td>20 to 40 tools</td>
<td></td>
</tr>
<tr>
<td>Approximate weight with 2 tool changers</td>
<td>15,000 lbs</td>
<td>16,250 lbs</td>
<td>31,000 lbs</td>
</tr>
</tbody>
</table>

The TW-43-HV is available now. The TW-50-HV will be available summer of 2002. The TW-60-HV is under development for approximately Dec 2002.
The Inspection Process

We have invested in a Heidenhain linear scale and double ball-bar system. The accuracy of these far exceeds what is required for machine tool calibration. The linear scale captures positioning data to 6 decimal places of a millimeter. That’s one thousandth of a micron, or 0.000,000,039”. We make the inspection from the table top to the spindle. This is significant because it also captures some mechanical factors that effect positioning accuracy, like saddle rock, unlike many laser systems that measure from the shop floor to the table.

The data is captured on multiple passes in each direction and inserted into correction tables in the Anilam CNC. The result is typical positioning accuracy of .0004” and repeatability better than .0002”. The final inspection after putting in the corrections gives printed reports that are according to DIN ISO 230-2.

This process is standard on all mill models except the TW-32-QE and TW-32-TRHE, and knee mills where it is an option.
Our Background

HH Roberts Machinery was founded in Toronto in the early 1930s and now has the 3rd and 4th generations of the family active. We have grown from a used machinery dealer / repair and rebuild shop to one of the major machine tool distributors in Canada. We have a modern 20,000 square foot facility just minutes from the Toronto International Airport.

We have been offering mills prepared by Topwell Machines, Taiwan for 20 years, and we have been fitting them with Anilam CNCs for more than 10 years.

There are over 30 models to choose from, including knee mills, bed mills, and bridge type graphite mills not detailed in this catalog.

We keep nearly 100 machine frames in stock, ready to be assembled on your order.

We have a complete stock of spare parts available at very reasonable cost for overnight shipping.

The dealers we sell through in the USA have demonstrated a commitment to the Anilam system and should be capable of supporting your staff and the machine in startup, training and after sales service.

Arm Type Tool Changers

This is the 24 pocket automatic tool changer for the vertical spindle.

Cutting on the horizontal spindle, extended
Material 4140 HT, 35 RC.
Cutter Carboloy 3 1/2" diam, 5 inserts
650 rpm
100 thou depth
3 inch face
22 inches per minute
6.6 cu inches per minute
15.5 Hp
Our products are continuously developing and specifications change frequently. It is suggested that you reconfirm any critical specifications at the time of order.

Vertical machining centers, open and enclosed 31” x 20” to 60” x 32”

Bridge type electrode and engraving mills with 25,000 rpm spindles.

Bed mills with gearless quill heads to 7 1/2 Hp and handwheels.

Vertical bed mills with machining center heads to 31” x 20” to 60” x 32”

Unique horizontal / vertical machining center

2 and 3 axis knee mills with tilting heads or rigid heads up to 7 1/2 Hp and 40” x 20”

CNC lathes from 15” x 30” to 20” x 80”

Precision gang tooling lathes

Precision dovetail bed lathes

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