VC630/5AX
Simultaneous 5-axis Vertical Machining Center
High performance machining

The VC630/5AX is equipped with a high-rigid, high-speed built-in spindle. (Output : 22 kW, maximum torque 204 N·m, spindle taper No.40) Designed for a wide range of applications, from heavy cutting including difficult machining materials like titanium & inconel to high speed cutting of aluminum and other nonferrous materials. The spindle taper is a dual contact system type which is provided as a standard feature.

Spindle Speed

Built-in motor driven spindle

Built-in motor for the spindle and high grade balancing technology have virtually eliminated any vibration which deteriorates surface quality. Also the main spindle is optimally designed with 4 row precision ceramic bearing whose features, low centrifugal force and minimum heat generation, are great merits at high speed condition. The high productivity is realized by reduction of the acceleration time to the maximum speed of main spindle thanks to the minimized rotational inertia while maintaining its rigidity.

<table>
<thead>
<tr>
<th>FANUC 31i-A5</th>
<th>HEIDENHAIN iTNC530</th>
<th>Dual contact system(Big plus) std</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Spindle Speed</td>
<td>Spindle Motor Power (Short/ Cont.)</td>
<td>Max. Spindle Speed Spindle Motor Power (Short/ Cont.)</td>
</tr>
<tr>
<td>12000 r/min</td>
<td>22 / 18.5 kW</td>
<td>12000 r/min 32 / 24 kW</td>
</tr>
<tr>
<td>20000 r/min</td>
<td></td>
<td>20000 r/min</td>
</tr>
</tbody>
</table>

Taper contact

Flange contact

Machining Capacity

<table>
<thead>
<tr>
<th>SM45C</th>
<th>AL6061</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining removal rate</td>
<td>739.2 cm³/min (45.1 in³/min)</td>
</tr>
<tr>
<td>Feedrate</td>
<td>3300 mm/min (129.9 ipm)</td>
</tr>
<tr>
<td>Cutting depth</td>
<td>2.5 mm (0.1 inch)</td>
</tr>
<tr>
<td>Cutting width</td>
<td>64 mm (2.52 inch)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AL6061</th>
<th>SM45C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machining removal rate</td>
<td>2688 cm³/min (164 in³/min)</td>
</tr>
<tr>
<td>Feedrate</td>
<td>7000 mm/min (275.0 ipm)</td>
</tr>
<tr>
<td>Cutting depth</td>
<td>2.5 mm (0.1 inch)</td>
</tr>
<tr>
<td>Cutting width</td>
<td>64 mm (2.52 inch)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M42 x P4.5</th>
<th>M3 x P0.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max./ Min. Tapping</td>
<td>675 mm/min (26.6 ipm)</td>
</tr>
<tr>
<td>Feedrate</td>
<td>1800 mm/min (70.9 ipm)</td>
</tr>
</tbody>
</table>
The VC630/5AX provides high-precision machining over extended periods of operation, thanks to advanced machine design featuring extremely rigid construction and an extremely responsive drive system.

**Heat displacement Control : Doosan Heat Control Device**

Using advanced algorithms, real time compensation is applied to the machine Z axis to counter the effects of heat displacement caused by heated up spindle.

**DBB(Double Ball Bar) Accuracy Example**

Higher roundness accuracy is realized by the advanced design of machine structure and Doosan control system.

**X-Y Plane**

Set Diameter of DBB: **200 mm (7.9 inch)**
Feedrate: **1000 mm/min (39.4 ipm)**

**Work Envelope**

The VC630/5AX is designed for the wide machining area for convenient fixture and machine set up.

**Stroke Specification**

<table>
<thead>
<tr>
<th>X / Y / Z axis</th>
<th>X axis (mm)</th>
<th>Y axis (mm)</th>
<th>Z axis (mm)</th>
<th>Rapid (X / Y / Z) m/min (ipm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X axis</td>
<td>650 (25.6)</td>
<td></td>
<td></td>
<td>40/40/36 (1574.8/1574.8/1417.3)</td>
</tr>
<tr>
<td>Y axis</td>
<td></td>
<td>765 (30.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z axis</td>
<td></td>
<td></td>
<td>520 (20.5)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A / C axis</th>
<th>Table Size (mm)</th>
<th>A axis (deg)</th>
<th>C axis (deg)</th>
<th>Rapid (A / C) r/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>X / Y / Z axis</td>
<td>Ø 630 (Ø24.8)</td>
<td>+30~120</td>
<td>360</td>
<td>20 / 30</td>
</tr>
</tbody>
</table>

**Max. Workpiece Size / Weight**

Max. Size: **Ø 730 x 500 mm (Ø 28.7 x 19.7 inch)**
Max. Weight: **500 kg (130.1 lb)**
**Machine Structure**

The VC630/5AX provides high-precision machining for extremely rigid construction designed by 3D simulation and the high precision units of advanced technology.

**One Piece Construction**

The one piece bed is a rigid and heavily ribbed Meehanite casting that stays stable under the heavy cutting conditions. Fine grained Meehanite cast iron is used for its excellent vibration absorbing property. The VC630/5AX features a superior traveling column design. The table, and therefore the workpieces remain locked during machining. This design provides a uniform load to the guideways, ball screws and motors.

**Automatic Tool Changer**

Changer arm

Tool boy

Magazine

Cam box

Tool to Tool time : **1.0 s**

40 tool cam ATC (60, 80, 101, 121 tool) opt

**High-Strength Roller LMG**

- High-stiffness roller type LMG, ball screw & coupling
- Strong 45 size roller type linear guide way

**Rigid Design**

**Static Rigidity**

The static rigidity structure of the VC630/5AX has been increased by 30% through the FEM analysis.

**Dynamic Rigidity**

FEM analysis was also used to improve the frequency response and vibration damping property by 35% over the previous design.

*FEM analysis used to design a stable body. (FEM : Finite Element Method)*
## Convenience

- **Flood coolant**
- **Shower coolant**
- **Chip conveyor**

### Large capacity coolant tank with chip pan and box filter
- Coolant tank capacity: 360L (95.1 gal)

### Overhead crane can be used
- Heavy workpieces can be conveniently load / unload

## Machining Application

### Demo Item: Tire Mold
- **Workpiece size**: 400 x 400 x 150 mm (15.7 x 15.7 x 5.9 inch)
- **Material**: Wood plastic
- **Mold Package**: 332 Tuning Cycle (Heidenhain Itnc530)
- **Machining Condition**
  - Tool: ø0.8mm Ball EM
  - Spindle speed: 24000 r/min
  - Feedrate: 400 mm/min (15.7 ipm)

### Demo Item: Hinge Fitting
- **Workpiece size**: 270 x 138 x 90 mm (10.6 x 5.4 x 3.5 inch)
- **Material**: AL7075
- **Mold Package**: DSQ 1
- **Machining Condition**
  - Tool: ø12 mm Ball EM
  - Spindle speed: 12000 r/min
  - Feedrate: 1000 mm/min (39.4 ipm)

### Demo Item: Impeller
- **Workpiece size**: D290 x 153 mm (D11.4 x 6.0 inch)
- **Material**: AL7075
- **Mold Package**: DSQ 3
- **Machining Condition**
  - Tool: ø8 mm Ball EM
  - Spindle speed: 12000 r/min
  - Feedrate: 2500 mm/min (98.4 ipm)
Various options

Auto Pallet Changer

High efficiency APC is available to setup while the current workpiece machining.

High-Capacity Magazines

60 / 81 / 101 / 121 Tools - Various capacity magazines are available. The increased tool capacity will improve user convenience and efficiency.

<table>
<thead>
<tr>
<th>Specifications</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pallet Size</td>
<td>mm (inch)</td>
<td>500 x 500 (19.7 x 19.7)</td>
</tr>
<tr>
<td>Max. Workpiece Size (øD x H)</td>
<td>mm (inch)</td>
<td>ø 730 x 450 (ø 28.7 x 17.7)</td>
</tr>
<tr>
<td>Max. Workpiece Weight</td>
<td>kg (lb)</td>
<td>500 (1102.3)</td>
</tr>
<tr>
<td>APC Change Time</td>
<td>s</td>
<td>30</td>
</tr>
</tbody>
</table>
External Dimensions

Standard Type

Top View

Front View

Side View

APC Type

Top View

Front View

Side View

Unit: mm (inch)
Table Dimension

Standard Type

Tool Shank

BT40 Unit: mm

CAT40 Unit: inch

DIN40 Unit: mm
## Machine Specifications

<table>
<thead>
<tr>
<th>Features</th>
<th>Unit</th>
<th>VC 630/SAX</th>
<th>VC 630/SAX with APC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Travels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis mm (inch)</td>
<td>650 (25.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y-axis mm (inch)</td>
<td>765 (30.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z-axis mm (inch)</td>
<td>520 (20.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-axis deg.</td>
<td>150 (+30~ -120)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C-axis deg.</td>
<td>360</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distance from spindle nose to table top mm (inch)</td>
<td>210 ~ 730 (8.3 ~ 28.7)</td>
<td>160 ~ 680 (6.3 ~ 26.8)</td>
<td></td>
</tr>
<tr>
<td>Distance from spindle center to column guideway mm (inch)</td>
<td>220 (8.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Feedrate</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid traverse rate (X / Y / Z) m/min (ipm)</td>
<td>40 / 40 / 36 (1574.8 / 1574.8 / 1417.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rapid traverse rate (A / C) r/min</td>
<td>20 / 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting feedrate (X / Y / Z) m/min (ipm)</td>
<td>18000 (708.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cutting feedrate (A / C) deg/min</td>
<td>7200</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Table</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Table size mm (inch)</td>
<td>Ø 630 (24.8)</td>
<td>500 x 500 (19.7 x 19.7)</td>
<td></td>
</tr>
<tr>
<td>Table loading capacity kg (lb)</td>
<td>500 (1102.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. workpiece swing diameter x height mm (inch)</td>
<td>Ø 730 x 500 (Ø 28.7 x 19.7)</td>
<td>Ø 730 x 450 (Ø 28.7 x 17.7)</td>
<td></td>
</tr>
<tr>
<td>Minimum table indexing angle</td>
<td>-</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td><strong>Spindle</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. spindle speed r/min</td>
<td>12000 (20000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spindle taper</td>
<td>ISO40 / 7 / 24 Taper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. spindle torque N·m (ft·lb)</td>
<td>204 (150.6) [25% ED]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Automatic tool changer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of tool shank</td>
<td>MAS403 BT40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool storage capacity ea</td>
<td>40 (60 / 81 / 101 / 121)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool diameter mm (inch)</td>
<td>Ø 80 (Ø 3.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool diameter without adjacent tools mm (inch)</td>
<td>Ø 125 (Ø 4.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool length mm (inch)</td>
<td>300 (11.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. tool weight kg (lb)</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method of tool selection</td>
<td>-</td>
<td>Fixed address</td>
<td></td>
</tr>
<tr>
<td>Tool change time (tool-to-tool) s</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool change time (chip-to-chip) s</td>
<td>8.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Automatic pallet changer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of pallet ea</td>
<td>-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>-</td>
<td>Rotary shuttle</td>
<td></td>
</tr>
<tr>
<td>Pallet change time s</td>
<td>-</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spindle motor (30min./cont.) kW (Hp)</td>
<td>FANUC: 22 / 18.5 (29.5 / 24.5)</td>
<td>HEIDENHAIN: 32 / 24 (62.9 / 32.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Power source</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric power supply kVA</td>
<td>54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compressed air supply MPa</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tank capacity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coolant tank capacity L (gallon)</td>
<td>360 (95.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lubrication tank capacity L (gallon)</td>
<td>1.32 (0.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Machine Dimensions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine dimension (L x W x H) mm (inch)</td>
<td>3295 x 4585 x 3200 (129.7 x 180.5 x 125.9)</td>
<td>3295 x 6413 x 3431 (129.7 x 252.4 x 135.0)</td>
<td></td>
</tr>
<tr>
<td>Machine weight kg (lb)</td>
<td>12500 (27557.4)</td>
<td>16000 (35273.4)</td>
<td></td>
</tr>
</tbody>
</table>

### Standard Feature
- Assembly & operation tools
- Automatic power off
- Automatic tool measurement (TS27R)
- Coolant tank & chip pan
- Door interlock
- Flood coolant
- Full enclosure splash guard
- Installation parts
- Operator call lamp (yellow, red, green)
- Portable MPG
- Screw conveyor
- Spindle air curtain
- Spindle head cooling system
- Spindle thermal compensation
- Work light
- DSQ1 (AICC II_200 Block Machine condition selection function)
- Air blower
- Air dryer
- Automatic workpiece measurement
- Chip conveyor & chip bucket
- MQL (minimum quantity lubrication)
- Oil mist collector
- Oil skimmer
- Test bar
- Through spindle coolant system

### Optional Feature
- Linear scale (X, Y, Z axis)
- DSQ 2 : (AICC II + Machine condition selection function + Data server + 1GB)
- DSQ 3 : (AICC II with High speed processing + Machine condition selection function + Data server + 1GB)

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*The specifications and information above-mentioned may be changed without prior notice.
*For more details, please contact Doosan
NC Unit Specifications

Fanuc 31i-A5

AXES CONTROL
- Controlled axes: 5 (X, Y, Z, A, C)
- Simultaneous controlled axes: Positioning (G00) / Linear interpolation (G01): 5 axes
  Circular interpolation (G02, G03): 2 axes
- Emergency stop / overtravel
- Least command increment: 0.001mm/0.0001"
- Least input increment: 0.001mm/0.0001"
- Machine lock / all axes / Z axis
- Mirror image / Reverse axis movement
  (setting screen and M-function)
- Stored pitch error compensation
  Pitch error offset compensation for each axis
- High speed HRV3 function
- Rotary axis control

INTERPOLATION & FEED FUNCTION
- 2nd, 3rd, 4th reference point return: G30
- Circular interpolation: G02, G03
- Exact stop check: G09, G63 (mode)
- Feed per minute: mm / min
- Feedrate override (10% increments): 0 - 200 %
- Jog override (10% increments): 0 - 200 %
- Manual handling feed (1 unit)
- Manual handling feedrate: 0.1 / 0.01 / 0.001 mm
- Override cancel: M48 / M49
- Rapid traverse override: H0 (fine feed), 25 / 50 / 100 %
- Reference point return: G27, G28, G29
- Skip function: G31
- Helical interpolation
- DSQ 1 (AICC II + Machine condition selection function): 200 block preview
- Thread cutting, synchronous cutting
- Automatic corner deceleration
- Rapid traverse bell-shaped acceleration / deceleration
- Smooth backlash compensation
- Nano smoothing
- Position switch

SPINDLE & M-CODE FUNCTION
- Auxiliary function (M function): M 3 digits
- Spindle orientation
- Spindle speed override (10% increments): 10 - 1500%
- Spindle output switching
- Rigid tapping: G84, G74

TOOL FUNCTION
- Tool nose radius compensation: G40, G41, G42
- Number of tool offsets: 64ea
- Tool length compensation: G43, G44, G49
- Tool Function: 12 digits
- Tool life management: H/D code, Geometry/Wear memory
- Tool offset memory C

PROGRAMMING & EDITING FUNCTION
- Absolute / Incremental programming: G90/G91
- Background editing: G73, G74, G76, G80/G89, G99
- Canned cycle
- Circular interpolation by radius programming
- Custom macro B
- Custom Software Size 512 kb
- Reader Puncher Interface: RS-232C
- Increment System B: Maximum commandable value
  (±9999.9999 inch, ±999999.999 mm)
- No. of Registered programs: 5000ea
- Optional stop: M01
- Part program storage: 640(256K) m
- Program file name: 32 characters
- Sequence number: 04-digit
- Program stop / end: M00/M02, M30
- Programmable data input
  Tool offset and work offset are entered by G10, G11
- Sub program Call
  SO / EIA Automatic discrimination
- Work coordinate system: G52 - G59
- Additional work coordinate system (48 Pair): G54.1 - 48 pairs
- Coordinate system rotation: G66, G69
- Optional chamfering / corner R
- Macro executor

OTHERS FUNCTIONS (Operation, Setting & Display, etc)
- Alarm display
- Alarm history display
- Actual cutting speed display
- Clock function
- Cycle start / Feed hold
- Display of PMC alarm message
- Dry run
- Embedded Ethernet
- Graphic display
  Tool path drawing
- Help function
- Loadmeter display
- MDI / DISPLAY unit: 10.4" Color LCD, Keyboard for data input, soft-key
- Memory card interface
- Operation functions: Tape / Memory / MDI / Manual
- Operation history display
- DNC operation with memory card
- Program restart
- Run hour and part number display
- Search function: Sequence NO. / Program NO.
- Self - diagnostic function
- Servo setting display
- Single block
- Multi language display

OPTIONAL SPECIFICATIONS
- 3-dimensional coordinate conversion
- 3-dimensional tool compensation
- Addition of tool pairs for tool life management: 1024 pairs
- Additional controlled axes: max. 6 axes in total
- Additional work coordinate system: G54.3 P1 - 300 (300 pairs)
- DSQ 2 (DSQ 1+Data server [1GB])
- DSQ 3 (DSQ 2+High Speed Processing)
- Automatic corner override: G62
- Cylindrical interpolation: G07.1
- Exponential interpolation
- Interpolation type pitch error compensation
- EZ Guide (Doosan Infracore Conversational Programming Solution) with 10.4" Color TFT
- Tape format for F515
- Increment system C
- Figure copying: G72.1, G72.2
- Manual handling feed 7/3 unit
- Handle interruption
- High speed skip function
- Involute interpolation: G02.2, G03.2
- Look ahead control: G08
- Machining time stamp function
- Number of registerable program expansion: 2
- Additional block skip addition: 9 blocks
- Part program storage: 512KB (1280m) / 1MB (2560m) / 2MB (5120m) / 8MB (20480m)
- Playback function
- Polar coordinate command: G15 / G16
- Polar coordinate interpolation: G17.1 / G17.2
- Programmable mirror function: G50.1 / G51.1
- Single direction positioning: G60
- Tool load monitoring function (doosan)
### AXES CONTROL
- Controlled axes X, Y, Z, C, A 5 axes
- Simultaneously controllable axes
- Positioning / Linear interpolation 5 axes
- Circular interpolation 2 axes
- Helical interpolation 5 axes
- Feedrate override 0 - 150 %
- Least command increment 0.0001 mm (0.0001 inch)
- Least input increment 0.0001 mm (0.0001 inch)
- Maximum commandable value ±99999.999mm (±3937 inch)
- Pulse handle feed Portable manual pulse generator

#### Machine Model
VC630/5AX

#### Portable manual pulse generator
- Linear / non-linear axis error, backlash
- Reversal spikes during circular movement
- Offset, thermal expansion, stiction, sliding friction
- Reference point return

### SPINDLE FUNCTION
- Spindle orientation
- Spindle speed command 55 digits
- Spindle speed override 0 - 150 %

### TOOL FUNCTION
- 3-dimensional tool compensation
- Number of tool offsets 999 ea
- Tool length compensation
- Tool management (tool table)
  - Tool numbers and names
  - Tool length L and tool radius R
  - Tool life management & replacement tool
- Tool number command
- Tool radius compensation

### PROGRAMMING & EDITING FUNCTION
- Background editing
- Heidenhain conversational format programming
- Program memory Hard disk with 26GB for NC programs
- No limit on number of programs
- 3-D touch probe application
- Touch probe functions for compensating workpiece misalignment
- Touch probe functions for setting data

### GRAPHIC FUNCTIONS
- Graphic display
- Interactive programming graphics
- Test run graphics (3-D representation)
- Program run graphics (3-D representation)
- MDI / CRT unit 15.1" TFT color flat panel

### OPTIONAL SPECIFICATIONS
- Controlled axes Max. 12 axes in total
- Digitizing with 3-D triggering touch probe
- Digitizing with 3-D measuring touch probe
- Collision Monitoring Milling (DCM)
- Kinematics OPT