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.

Machining Capacity

Machining removal rate

SM45C
Machining removal rate 739.2 cm³/min (45.1 in³/min)
Feedrate 3300 mm/min (129.9 ipm)
Cutting depth 2.5 mm (0.1 inch)
Cutting width 64 mm (2.52 inch)

AL6061
Machining removal rate 2688 cm³/min (164 in³/min)
Feedrate 7000 mm/min (275.0 ipm)
Cutting depth 2.5 mm (0.1 inch)
Cutting width 64 mm (2.52 inch)

AL6061
Min. Tool M3 x P0.5
Feedrate 1800 mm/min (70.9 ipm)

Max./ Min. Tapping

SM45C
Max. Tool M42 x P4.5
Min. Tool M3 x P0.5
Accuracy

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 heatedup spindle.

![Graph showing heat displacement control](image)

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)

![Graph showing DBB accuracy example](image)

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>Axis</th>
<th>X / Y / Z axis</th>
<th>A / C axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>X axis</td>
<td>650 (25.6) mm (inch)</td>
<td>630 (ø24.8) mm (inch)</td>
</tr>
<tr>
<td>Y axis</td>
<td>765 (30.1) mm (inch)</td>
<td>A axis (deg) +30~120</td>
</tr>
<tr>
<td>Z axis</td>
<td>520 (20.5) mm (inch)</td>
<td>C axis (deg) 360</td>
</tr>
<tr>
<td>Rapid (X / Y / Z)</td>
<td>40/40/36 (1574.8/1574.8/1417.3) m/min (ipm)</td>
<td>Rapid (A / C) r/min 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)

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.
Convenience

Flood coolant

Shower coolant opt

Chip conveyor opt

Large capacity coolant tank with chip pan and box filter

Coolant tank capacity 360L (95.1 gal)

Easy to discard chips piled up

Machining Application

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 | Finish
Cutting | Finish
Tool | ø12 mm Ball EM
Spindle speed | 12000 r/min
Feedrate | 1000 mm/min (39.4 ipm)

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 | Finish
Cutting | Finish
Tool | ø0.8mm Ball EM
Spindle speed | 24000 r/min
Feedrate | 400 mm/min (15.7 ipm)

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

Automatic retractable top door

Overhead crane can be used - Heavy workpieces can be conveniently load / unloaded

Internal screw conveyor

Drum filter type

Chip conveyor

Overhead crane can be used - Heavy workpieces can be conveniently load / unloaded

Chip conveyor opt

Hinge type Scraper type Drum filter type

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Easy to discard chips piled up

Machining Application
Various options

Auto Pallet Changer

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

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pallet Size</td>
<td>500 x 500 (19.7 x 19.7)</td>
</tr>
<tr>
<td>Max. Workpiece Size (ØD x H) mm (inch)</td>
<td>Ø 730 x 450 (Ø 28.7 x 17.7)</td>
</tr>
<tr>
<td>Max. Workpiece Weight kg (lb)</td>
<td>500 (1102.3)</td>
</tr>
<tr>
<td>APC Change Time s</td>
<td>30</td>
</tr>
</tbody>
</table>

High-Capacity Magazines

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

Standard Type

Top View

Front View

Side View

APC Type

Top View

Front View

Side View
**Table Dimension**

**Standard Type**

- Unit: inch
- BT40
- CAT40
- DIN40

**APC Type**

- Unit: mm
- BT40
- CAT40
- DIN40

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

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)
- 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

* The specifications and information above-mentioned may be changed without prior notice.
* For more details, please contact Doosan.
AXES CONTROL
- Controlled axes: 5 (X, Y, Z, A, C)
- Simultaneous controlled axes: 5 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
- Stored pitch error compensation
- Stored stroke check: 1, 2, 3
- Overtravel controlled by software
- 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, G65 (mode)
- Feeds per minute: mm / min
- Feedrate override: 0 - 200 %
- Jog override: 0 - 200 %
- Manual handle feed: 1 unit
- Manual handle feedrate: 0.1 / 0.01 / 0.001 mm
- Override cancel: M48 / M49
- Rapid traverse override: F0 (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 - 150%
- Spindle output switching
- Rigid tapping: G84, G74

TOOL FUNCTION
- Tool nose radius compensation: G40, G41, G42
- Number of tool offsets: 64 ea
- 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: (+9999,99999 inch, +99999,9999 mm)
- No. of Registered programs: 500ea
- Optional stop: M01
- Part program storage: 640(256k) m
- Program file name: 32 characters
- Sequence number: 04-digit

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 memory
- 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: G65
- Cylindrical interpolation: G07.1
- Exponential interpolation
- Interpolation type pitch error compensation
- EZ Guide i (Doosan Infracore Conversational Programming Solution) with 10.4" Color TFT
- Tape format for FS15
- Increment system C
- Figure copying: G72.3, G72.2
- Manual handle feed: 2/3 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
- Optional block skip addition: 9 blocks
- Part program storage: 512KB(1280m)/1MB(2560m)/2MB(5120m)/8MB(20480m)
- Playback function
- Polar coordinate common: G15 / G16
- Polar coordinate interpolation: G11.1 / G13.1
- Programmable mirror image: G50.1 / G51.1
- Single direction positioning: G60
- Tool load monitoring function (doosan)
Heidenhain iTNC 530

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 management (tool table) Tool numbers and names
- Tool management (tool table) Tool length L and tool radius R
- Tool management (tool table) 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 programos
- 3-D touch probe application
- Touch probe functions for compensating workpiece misalignment
- Touch probe functions for setting data
- Touch probe functions for automatic workpiece measurement
- Block processing time 0.5 m [s]
- Contour elements
- Straight line, chamfer, circular arc,
  circle center, circle radius
- Corner rounding, tangentially connecting circle, B spline
- Coordinate transformation
- Coordinate shift, coordinate rotation
- Mirror image, scaling
- Tilting the working plane
- Data interface RS - 232C / Ethernet (100Base T)
- Fixed cycle (canned cycle)
- Machine Model : VC630/5AX
- Drilling cycle
  (drilling, pecking, reaming, boring, tapping, rigid tapping)
- Milling, finishing rectangular, circular pockets
- Linear and circular hole patterns
- Linear and circular hole patterns
- Milling pockets and islands
- Cylindrical surface interpolation
- FK free contour programming
- Mathematical functions
  +, -, x, ÷, √, sin, cos, tan, arcsin, arccos, arctan
- Logical comparison (=, ≠, <, >, ≤, ≥)
- Program jumps Subprograms, program section repeats
- Programming support
- Functions for approaching / departing the contour
- On- screen pocket calculator, structuring of programs

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