HC 400 / 500
High Performance Horizontal Machining Center
High Performance Horizontal Machining Center

High Speed, Precision and Highly Efficient, Space Saving Machine Offers Excellent Productivity. Get precision and reliability for a wide range of automation application and machining of any material. Combined with advanced technology feature to provide exceptional values.

HC 400 / 500
The high speed 8000 r/min 40 taper spindle is a true cartridge type unit supported by four precision class P4 high speed bearings which are permanently greased and lubricated. The spindle is driven by a high torque 18.5 kW A.C. motor delivering an impressive 235.5 N.m on HC 400.

<table>
<thead>
<tr>
<th>Max. spindle speed</th>
<th>Motor (15min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8000 r/min (10000 r/min)</td>
<td>18.5 kW (26 kW)</td>
</tr>
</tbody>
</table>

**Max. spindle torque**

<table>
<thead>
<tr>
<th>HC 400 Standard 8000r/min (11/18.5kW)</th>
<th>HC 400 Option 10000r/min (22/26kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>235.5 N.m (15 min)</td>
<td>165.5 N.m (30 min)</td>
</tr>
<tr>
<td>353.4 N.m (5 min)</td>
<td>20.9 N.m (30 min)</td>
</tr>
</tbody>
</table>

**Spindle power-torque diagram**

<table>
<thead>
<tr>
<th>HC 500 Standard 8000r/min (11/18.5kW)</th>
<th>HC 500 Option 10000r/min (22/26kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>191.2 N.m (15 min)</td>
<td>165.5 N.m (30 min)</td>
</tr>
<tr>
<td>143.2 N.m (5 min)</td>
<td>100.0 N.m (30 min)</td>
</tr>
</tbody>
</table>

**Oil cooler**

A refrigerated spindle cooling system circulates cooling oil to maintain a constant temperature for high accuracy, regardless of the ambient temperature or cutting conditions.
The ATC is composed of tool magazine and change arm. The tools are selected by a fixed address method that follows the shorter path. All tools are returned to the pots from which they were originally taken so that collision problems involving large-sized tools need to be considered only once when they are first mounted.

Automatic tool changer

Tool change time

1.5 s (T-T-T)

Sophisticated mechanisms drastically reduce non-cutting time.

Tool storage capacity

40 tools

{Opt:60/120/170/262}

The ATC is composed of tool magazine and change arm. The tools are selected by a fixed address method that follows the shorter path. All tools are returned to the pots from which they were originally taken so that collision problems involving large-sized tools need to be considered only once when they are first mounted.
HC 400 and HC 500 is equipped with rotary shuttle type APC (Automatic Pallet Changer) as a standard feature. It provides high reliability and wide working area for easy setup. The pallet changer is rigidly built and operates with the opening and closing of the splash guard to accomplish pallet changes in 8.0 seconds.

**Pallet change time**

8.0 s (HC 400)  
8.5 s (HC 500)

The possibility that chips might degrade the meshing accuracy of the pallet positioning mechanism increases at higher machining speeds. On the HC 400 and HC 500 strong jets of air are discharged from the tapered cones when a pallet is changed to clean any chips from the cones and assure accurate pallet positioning.

<table>
<thead>
<tr>
<th>Pallet size</th>
<th>HC 400</th>
<th>HC 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. workpiece size</td>
<td>Ø 600× H 800mm</td>
<td>Ø 800× H 900mm</td>
</tr>
<tr>
<td>Max. workpiece weight</td>
<td>400 kg</td>
<td>500 kg</td>
</tr>
</tbody>
</table>
The machine is designed to build rigidity into a stable body. The construction of the machine was thoroughly examined from the stage of basic design to ensure consistent high-speed and high-accuracy operation. The deformation of the bed when subject to a load at the center was simulated to secure high level rigidity against bending. The HC400 and HC500 have a design with a basic structure using FEM advanced technology.

**Rigid structure bed and column**

<table>
<thead>
<tr>
<th>Travel axes (X/Y/Z)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HC 400</strong> 600/560/565 mm</td>
</tr>
<tr>
<td><strong>HC 500</strong> 850/700/750 mm</td>
</tr>
</tbody>
</table>

**Guideways and Axis Drives**

<table>
<thead>
<tr>
<th>Rapid traverse</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HC 400</strong> 40 m/mim</td>
</tr>
<tr>
<td><strong>HC 500</strong> 40 m/mim</td>
</tr>
</tbody>
</table>

The feed mechanism adopts heavy duty linear motion roller guideways that provide superior acceleration/deceleration performance to reduce non-cutting time.

HC Series with oversized AC servo drives power through the toughest cuts in the toughest metal. The high torque servos are coupled directly to the ball screws. With no gears there is no risk of backlash or servo drag.
Interface for Fixture

Fixture check list (for hydraulic/pneumatic fixtures)

**Number of Ports**
- 2\*1 × 2\*2 Line
- 2\*2 × 3\*2 Line
- 2\*2 × 4\*2 Line
- 2\*2 × 6\*2 Line
- 2\*2 × 8\*2 Line

*1: Pallet No. 1 and No. 2  
(Number of Pallet)  
*2: Number of port line

**Hydraulic power unit**
Special requirement

L/min at MPa

Contact Doosan Infracore for more information

Chip Disposal

Separate chip conveyor and coolant tank provide easy cleaning and maintenance. A telescopic cover, inclined at a 30° angle, directs chips into the chip sliding cover to keep the area around the table clean. From the sliding cover, chips are flushed onto the chip conveyor by the screw conveyors to make quick and easy work of chip removal.

<table>
<thead>
<tr>
<th>Chip conveyor (Option)</th>
<th>Steel</th>
<th>Cast</th>
<th>Aluminum and nonferrous metals</th>
<th>Compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hinge type</td>
<td>O</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Scraper type</td>
<td>X</td>
<td>O</td>
<td>△</td>
<td>O</td>
</tr>
<tr>
<td>Drum filter type</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

- O: Available  
- X: Unavailable  
- △: Asking for information

• Some types of chips may not be completely removed from the chip conveyor.
• Contact Doosan for more information.
Ergonomic and Eco-Friendly Design

Easy setup

Distance to table

<table>
<thead>
<tr>
<th>Model</th>
<th>Distance to Table (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC 400</td>
<td>380</td>
</tr>
<tr>
<td>HC 500</td>
<td>500</td>
</tr>
</tbody>
</table>

Height to table

<table>
<thead>
<tr>
<th>Model</th>
<th>Height to Table (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC 400</td>
<td>1130</td>
</tr>
<tr>
<td>HC 500</td>
<td>1160</td>
</tr>
</tbody>
</table>

Collection of waste lubrication oil

Less waste lubrication oil extends the life time of the coolant water and cut down the grime and offensive smell of the machine inside.

No coolant leakage

Rigorously designed, manufactured and tested machine covers do not permit coolant leakage in any condition. The factory always keeps our environment clean.

Oil skimmer (opt.)

Another suggestion to prolong the life time of the coolant water. A belt-driven type oil skimmer picks up and removes waste oil from the coolant tank that is easily drained.
Flexible Multi Pallet System

- High Productivity & availability
- Flexible production solutions
- High efficiency system
- Compact designed technology
- Easy to extend stations (7,9,11,13st)

**Application of multi pallet system**

<table>
<thead>
<tr>
<th>Name</th>
<th>HC 500 (2 sets)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Setup Station</td>
<td>1</td>
</tr>
<tr>
<td>Storage Capacity (500×500)</td>
<td>18 cells</td>
</tr>
</tbody>
</table>

Application technology of Multi-pallet system is the best solution for the high productivity in the machining shop.

**Tool magazine**

Numerous Variations to meet production efficiency needs.

- 60-tool (opt.)
- 120-tool (opt.)
- 170-tool (opt.)
Guarantees high-productivity and high-accuracy in a variety of machining operations

### HC 400

**Face mill** Carbon steel (SM45C)

- Ø80 Face mill (SZ)
- 3mm
- 53mm

**Drill** Gray casting (GC25)

- Ø37 Drill (2Z)
- 37mm

**Tap** Gray casting (GC25)

- Ø38.5 Drill (2Z)

**Machining rate**

- 380 cm³/min

**Feedrate**

- 210 mm/min

**Tool**

- M30 x P3.5

**Spindle speed**

- 1500 r/min

- 250 r/min

- 320 r/min

**Feedrate**

- 1200 mm/min

- 1120 mm/min

### HC 500

**Face mill** Aluminum

- Ø80 Face mill (SZ)
- 7mm
- 48mm

**Drill** Gray casting (GC25)

- Ø49 Drill (2Z)
- 60mm

**Tap** Gray casting (GC25)

**Machining rate**

- 2318 cm³/min

**Feedrate**

- 100 mm/min

**Tool**

- M30 x P3.5

**Spindle speed**

- 2390 r/min

- 125 r/min

- 320 r/min

**Feedrate**

- 6900 mm/min

- 1120 mm/min
Standard Features

- Flood coolant
- Operator call lamp (red/yellow/green)
- FANUC 21i-MB controller
- Portable MPG
- Work light
- APC operator’s panel
- Rigid tapping
- Oil cooler
- Screw conveyor
Optional Equipment

- Multi pallet system
- Linear scale feedback system
- Built-in Rotary Table (0.001")
- Chip conveyor / Bucket
- Tool monitoring system
- HSK tooling
- 120 Tools
- Automatic tool length measurement with sensor
- Automatic measuring system
- FMS
- Through the spindle coolant
- T-slot pallet
- Test bar
- Rear side chip conveyor
- Matrix Magazine (170 Tools)
- Shower coolant
- Hyd. cooling / Heating device
- Center bush
- Automatic power off
- Air gun
- Hydraulic line for fixture
Easy Operating System

**Standard Features**

- High compact CNC is realized through LCD display with integrated CNC and a flash memory card interface is standard features.
- Provides many support functions for set-ups, such as tool measurement, workpiece measurement at the original point, and workpiece measurement inside the machine.
- Uses one display screen to perform all operations including programming, checking by animation, and real machining.
- User-Friendly Operation: Soft key Selection of Comprehensive Cycle Library

**Guide for machining preparation**

In preparation for machining, simple instructions on a selected screen allow to measure the setting error of workpiece and tool offset value for automated adjustment.
Tool Monitoring System (Opt.)

Tool Monitoring System is one of safety functions to protect Tool and Spindle against a possible damage of abnormal load caused by tool wear and breakage or others. This system monitors the tool status during machine operation by detecting the abnormal load of each axis and spindle.

- The screen shows a tool and pallet No., load meter of each axis and spindle limit load.
- This function consists of tool pre-check function, substitute tool selection with tool life management and different tool & port number command function.

Easy operation system

One single screen provides handy operation guidance for programming through machine operation.

- For machining center, turning center and compound machine with milling and turning.
- Solid modeling provides high speed animation (TFT-LCD Color Only)
- Icon menu soft-keys provide convenient programming for sophisticated milling and turning.
- Measurement cycles provide automatic offset measurement of workpiece (Available for machining center and for compound machine).

Machining condition selecting function

One single screen provides convenient operation & parameter setting for high speed and high precision machining instructions.

- Registration of parameter sets for high speed machining and/or for high precision machining with machine configurations.
- Instruction of precision level for desired machining selects appropriate parameters automatically.
- Precision level can be instructed through NC program.
**Pallet Dimensions**

**HC 400**

24-M16x2 TAP, DP30

**HC 500**

24-M16x2 TAP, DP30

**Tool Shank**

**Std : BT40**

72/4 TAPER

M16 x 2.0 TAP

**Opt. : DIN 40**

7/24 TAPER

TAPER GAGE LINE

**Opt. : CAT 40**

7/24 TAPER

TAPER GAGE LINE

---

unit : mm

---

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## Machine Specifications

### Descriptions

<table>
<thead>
<tr>
<th>Description</th>
<th>HC 400</th>
<th>HC 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-axis (column longitudinal)</td>
<td>mm</td>
<td>600</td>
</tr>
<tr>
<td>Y-axis (head vertical)</td>
<td>mm</td>
<td>560</td>
</tr>
<tr>
<td>Z-axis (pallet table cross)</td>
<td>mm</td>
<td>565</td>
</tr>
<tr>
<td>Distance from spindle center to pallet top</td>
<td>mm</td>
<td>50 ~ 610</td>
</tr>
<tr>
<td>Distance from spindle nose to table center</td>
<td>mm</td>
<td>150 ~ 715</td>
</tr>
<tr>
<td>Pallet size</td>
<td>mm</td>
<td>400 x 400</td>
</tr>
<tr>
<td>Pallet loading capacity</td>
<td>kg</td>
<td>400</td>
</tr>
<tr>
<td>Pallet surface</td>
<td></td>
<td>24 - M16 x P2.0</td>
</tr>
<tr>
<td>Pallet index degree</td>
<td></td>
<td>1° [0.001&quot;]</td>
</tr>
<tr>
<td>Max. spindle speed</td>
<td>r/min</td>
<td>8000 (10000)</td>
</tr>
<tr>
<td>Spindle taper</td>
<td></td>
<td>ISO #40, 7/24 Taper</td>
</tr>
<tr>
<td>Max. spindle torque</td>
<td>N·m</td>
<td>235.5 (165.5)</td>
</tr>
<tr>
<td>Rapid traverse rate (X/Y/Z)</td>
<td>m/min</td>
<td>40/40/40</td>
</tr>
<tr>
<td>Cutting feedrate</td>
<td>mm/min</td>
<td>20000</td>
</tr>
<tr>
<td>Type of tool shank</td>
<td></td>
<td>MAS403 BT40</td>
</tr>
<tr>
<td>Tool storage capacity</td>
<td></td>
<td>40 (60/120/170/262)</td>
</tr>
<tr>
<td>Max. tool diameter</td>
<td>mm</td>
<td>φ75</td>
</tr>
<tr>
<td>Max. tool diameter without adjacent tools</td>
<td>mm</td>
<td>φ140</td>
</tr>
<tr>
<td>Max. tool length</td>
<td>mm</td>
<td>500</td>
</tr>
<tr>
<td>Max. tool weight</td>
<td>kg</td>
<td>10</td>
</tr>
<tr>
<td>Method of tool selection</td>
<td></td>
<td>Fixed address</td>
</tr>
<tr>
<td>Tool change time (tool-to-tool)</td>
<td>s</td>
<td>1.5</td>
</tr>
<tr>
<td>Tool change time (chip-to-chip)</td>
<td>s</td>
<td>4</td>
</tr>
<tr>
<td>Number of pallet</td>
<td>ca</td>
<td>2</td>
</tr>
<tr>
<td>Type</td>
<td></td>
<td>Rotary Type</td>
</tr>
<tr>
<td>Pallet change time</td>
<td>s</td>
<td>8</td>
</tr>
<tr>
<td>Pallet rotation in loading station</td>
<td>deg</td>
<td>90</td>
</tr>
<tr>
<td>Spindle motor (15 min)</td>
<td>kW</td>
<td>18.5 [26]</td>
</tr>
<tr>
<td>Feed motor (X/Y/Z/B)</td>
<td>kW</td>
<td>4.0/4.0/4.0/1.6</td>
</tr>
<tr>
<td>Electric power supply (Rated capacity)</td>
<td>kVA</td>
<td>48.7</td>
</tr>
<tr>
<td>Compressed air supply</td>
<td>MPa</td>
<td>0.54</td>
</tr>
<tr>
<td>Coolant tank capacity</td>
<td>L</td>
<td>550</td>
</tr>
<tr>
<td>Lubrication tank capacity</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Machine height</td>
<td>mm</td>
<td>2830</td>
</tr>
<tr>
<td>Machine dimension (L x W)</td>
<td>mm</td>
<td>4560 x 2250</td>
</tr>
<tr>
<td>Machine weight</td>
<td>kg</td>
<td>11000</td>
</tr>
</tbody>
</table>

**Note:** { } are optional

## Standard Feature

- Assembly & Operation tools
- Coolant tank, flood coolant
- Door interlock for safety
- FANUC 32i-A controller
- Full enclosure splash guard
- Installation parts
- Oil cooler & Spindle head cooling system
- Operator call lamp (red, yellow, green)
- Rigid tapping
- Screw conveyor
- Work light

*Design and specifications are subject to change without notice.*
*Doosan is not responsible for difference between the information in the catalogue and the actual machine.*
NC Unit Specifications (Fanuc 32i-A)

AXIS CONTROL
- Controlled axes 4 (X, Y, Z, B)
- Simultaneously controllable axes 4 axes
- Positioning(G00) Linear interpolation(G01) 3 axes
  Circular interpolation(G02, G03) 2 axes
- Backlash compensation
- Emergency stop / override
- Follow up
- Least count 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
  - Stored stroke check 1 Overtravel controlled by software

INTERPOLATION & FEED FUNCTION
- Positioning G00
- Linear interpolation G01
- Circular interpolation G02, G03
- Dwel G04
- Exact stop check G09, G01 (model)
- Skip function G51
- Reference point return G27
- Reference point return G28
- 2nd reference point return G29
- Feed per minute mm / min
- Rapid traverse override F0 (fine feed), 25 / 50 / 100 %
- Feedrate override (10% increments) 0 - 200 %
- Jog override (10% increments) 0 - 200 %
- Override cancel M30, M40
- Manual handle feed (1 unit)
- Manual handle feedrate 0.1 / 0.01 / 0.001 mm
- Automatic acceleration/deceleration
- Helical interpolation
  - AT CONTOUR II 80 block preview
- Machine condition selection function
- Thread cutting, noncontinuous cutting
- Program restart
- Automatic contour deacceleration (Specify AI Contour control ID)
- Feedrate clamp by circular acceleration
- Linear MCC-DEC before interpolation (Specify AI Contour control ID)
- Linear MCC-XO after interpolation
- Control axis detach
- Rapid traverse bell-shaped acceleration/deceleration
- Smooth backlash compensation

SPindle & M-CODE FUNCTION
- M - code function M 5 digits
- Spindle orientation
- Spindle serial output
- Spindle speed command 95 digits
- Spindle speed override (10% increments) 10 - 150 %
- Spindle output switching
- Interpolation for rapid tapping
- Rapid tapping G84, G74

TOOl FUNCTION
- Tool nose radius compensation G40, G41, G42
- Number of tool offsets 200 ea
- Tool length compensation G43, G44, G49
- Tool number command T5 digits
- Tool life management
- Tool offset memory C H/D code, Geometry / Wear memory
- Tool length measurement

PROGRAMMING & EDITING FUNCTION
- Absolute / Incremental programming G90 / G91
- Auto Coordinate system setting
- Background editing
- canned cycle G75, G74, G70, G80 - G89, G99
- Circular interpolation by radius programming
- Plane selection G17, G18, G19
- Custom macro B
- Custom software size 512K
- Extended P-code Variables size 512K
- Addition of custom macro common variables \#100 - \#199, \#500 - \#599
- Decimal point input
- Reader/puncher interface RS - 232C
- Inch / metric conversion G20 / G21
- Label skip
- Local / Machine coordinate system G52 / G53
- Maximum commandable value \#999999.9999 mm / \#9999.9999 inch
- Part program storage size 504m (2560m)

No. of Registered programs 500 ea
- Optional block skip 1
- Optional stop M01
- Program file name 32 characters
- Sequence number N 8-digit
- Program protect
- Program stop / end M00 / M02, M30
- Programmable data input Tool offset and work offset are entered by G40, G41
- sub program call Up to 10 nesting
- Tape code ISO / EIA Automatic discrimination
- Work coordinate system G54 - G59
- Additional work coordinate system (40 Pairs) G54.1 - G54.49
- Coordinate system rotation G68, G69
- Extended part program editing
- Optional chamfering corner R
- Macro execution

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 Message display when PMC, alarm occurred
- Dry run G00
- Ethernet function (Embedded)
- Graphic display Tool path drawing
- Help function
- Coordinate display
- DISPLAY / MDI unit 31 color TFT LCD / Keyboard for data input, soft-keys
- Memory card interface
- Operation functions Tape / Memory / MDI / Manual
- Operation history display
- UCN, operation with memory card
- Program restart
- Run hour and part number display
- Search function
- Sequence NO. / Program NO.
- self - diagnostic function
- Servo setting screen
- Single block
- External data input
- Multi language display

OPTIONAL SPECIFICATIONS
- 3-dimensional coordinate conversion
- Addition of tool pairs for tool life management 32 pairs
- Additional controlled axes Max. 6 axes per path
- Automatic contour override G62
- Chipping function G84.1
- Cylindrical interpolation G90 / G91
- Data server
- Dynamic graphic display Machining profile drawing
- Dynamic graphic display When the EZ Guide i is used, the Dynamic graphic display cannot application
- EZ Guide (Doosan infracore Conversational Programming Solution)
- EZ Guide Tape format for F515
- Increment system U / 10
- Figure copying G72.1, G72.2
- Manual handle feed 2 / 5 unit
- Handle interruption
- High speed skin function
- Machining time clamp function
- Machining time clamp function
- Machining time clamp function
- Full program storage 512KB (1280m)
- Max. 256,000 (1MB)
- Playback function
- Polar coordinate command G15 / G16
- Polar coordinate interpolation G121 / G131
- Programmable mirror image G50.1 / G51.1
- Remote buffer G50, G51
- Scaling G60, G61
- Single direction positioning G60
- Set / unr reference return
- Stored stroke check G2 / A
- Tool load monitoring function (Doosan)
- Tool load monitoring function (Doosan)
- Tool offset package 1
- Tool offset G45 - G48
- Position switch
- Optional angle chamfering / corner R

* Prior consultation is required.