FH500J: Machine Overview

FANUC 31iMB CNC Machine Control

CAT40 and CAT50 Taper Options Available on the Same Machine Platform

FCD450 Cast Iron Base and Column for Unsurpassed Vibration Dampening

Solid-Core Ball Screws with Active Thermal Compensation Software

Three Point Machine Leveling for Long Lasting Machine Geometry

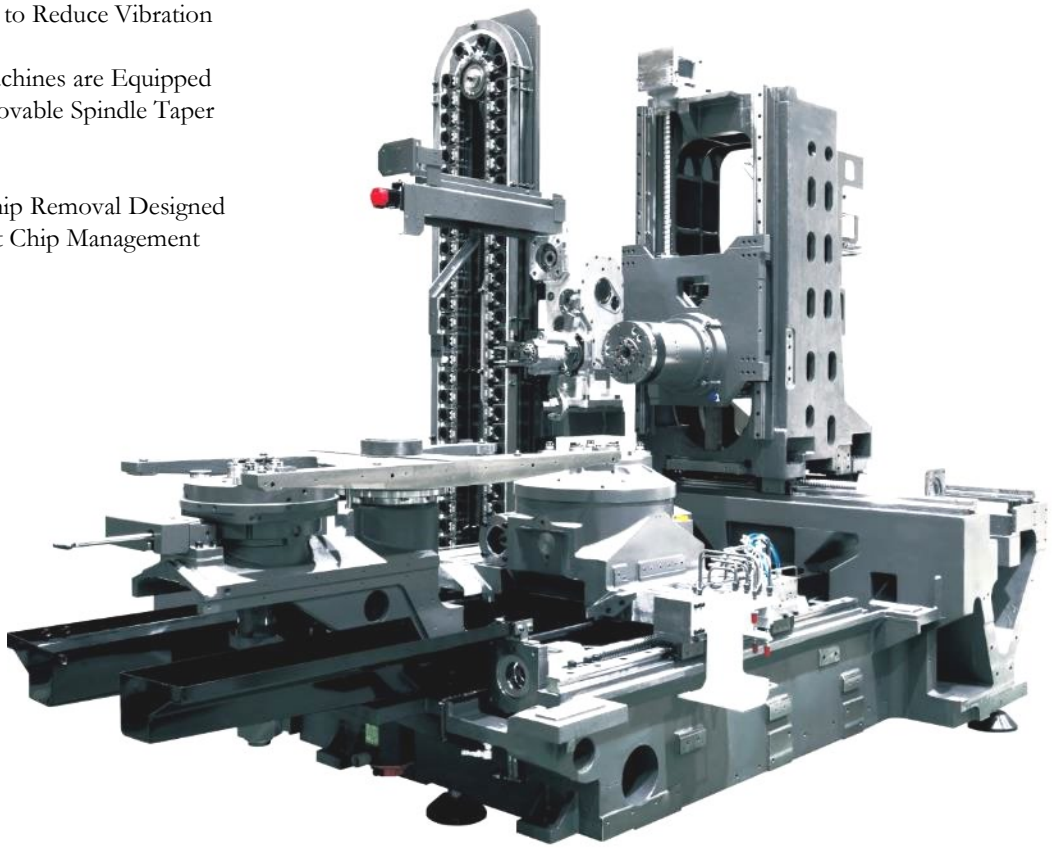
Designed with a Full Four Front Bearing Spindle Bearing Configuration

Variable Hydraulic Preload Spindle Technology for Increased Spindle Stability

Machine Weight of 29,700lbs Engineered with FEM Analysis to Reduce Vibration

Toyoda J-Series Machines are Equipped with Patented Removable Spindle Taper Technology

Center Through Chip Removal Designed for Highly Efficient Chip Management



Toyoda Machine Casting

Machine Envelope and Travels

Column Cross Travel (X Axis)	28.74” (730 mm)
Spindle Head Vertical Travel (Y Axis)	28.74” (730 mm)
Work Table Travel (Z Axis)	33.46” (850 mm)
Max Workpiece Swing	ø 31.5" X 39.4" (ø 800 X 1,000 mm)
Rapid Traverses (X, Y and Z Axes)	2,362 ipm (60 M / min)
Spindle Nose to Rotary Table Center	3.94" ~ 37.40" (100 ~ 950 mm)
Spindle Center to Top Face of Pallet	1.97" ~ 30.70" (50 ~ 780 mm)

Machine Pallet

Pallet Size	19.68" x 19.68" (500 x 500 mm)
NC Table (4th Axis)	360,000 Positions
Maximum Work Load on the Pallet	1,540 lbs. (700 kg)
Pallet Height from Floor	43.31" (1,100 mm)

Spindle Specifications

Spindle Speed	50 ~ 15,000 RPM
Spindle Drive Motor	30/25 HP
Optional High Torque Spindle	50/30 HP
Spindle Cooling	Oil-Air Mist

Tooling and Magazine

Spindle Nose Taper	CAT 40 / CAT 50
Standard Tool Storage Capacity	Sixty (60)
Maximum Tool Size (Diameter x Length) 40 Taper	ø2.95" x 18.5" (ø75mm x 470mm)
Maximum Tool Size (Diameter x Length) 50 Taper	ø4.72” x 18.5” (ø120mm x 470mm)
Maximum Diameter w/ Adjacent Empty	5.51” (140mm) / 9.84” (250mm)
Maximum Tool Weight	17.6 lbs. (8kg) / 58.5 lbs. (27kg)
Tool to Tool Change Cycle Time	0.9 sec / 2.4 sec
Chip to Chip Change Cycle Time	2.7 sec / 3.6 sec
Tool Selection	Random

Machine Accuracy

Linear Position Accuracy (w/out scales)	± .00012" (.003 mm) full stroke
Linear Repeatability (w/out scales)	± .00008" (.002 mm)
Rotary Table Index Accuracy (w/out scales)	± 7 arc Seconds, ± 3.5 arc Seconds Repeatability

Machine Dimensions and Requirements

Power Capacity (208V)	34 kVA
Standard Floor Space	91.73" x 178.35" (2,330 x 4,530 mm)
Standard Net Weight	29,700 lbs. (13,500 kg)

Standard Spindle Features

15,000 RPM – 30HP Direct Drive Spindle

15,000 RPM – 50HP Direct Drive Spindle

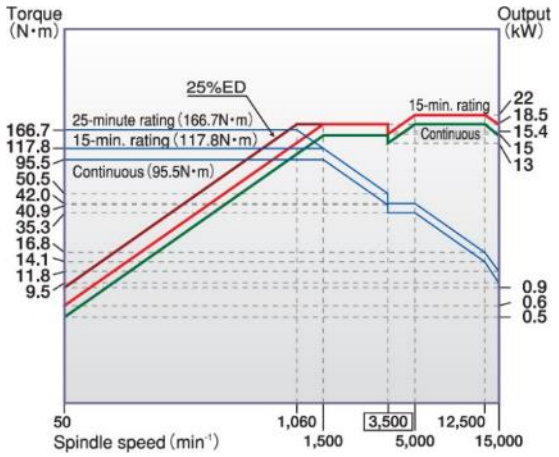
Toyoda Removable Spindle Taper Design

Big Plus Modification

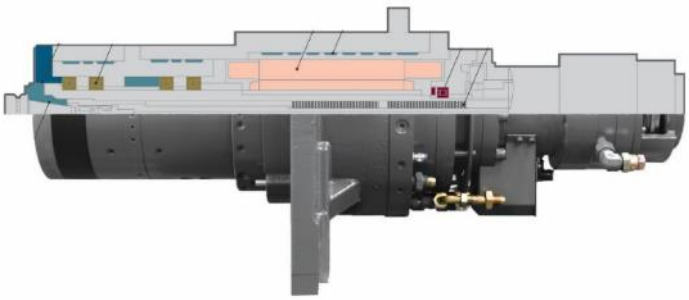
Spindle Options

HSKA63 Spindle Interface

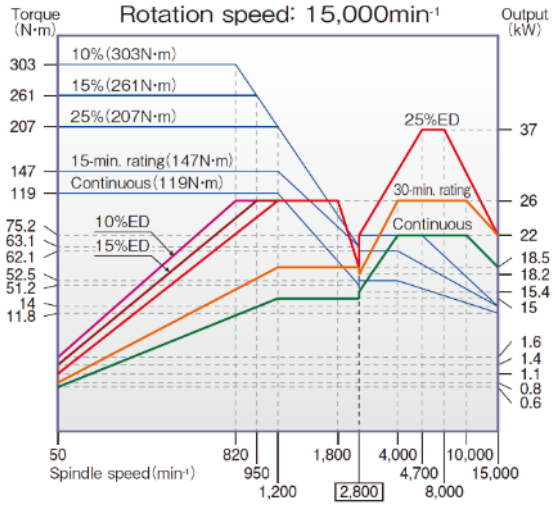
HSKA100 Spindle Interface

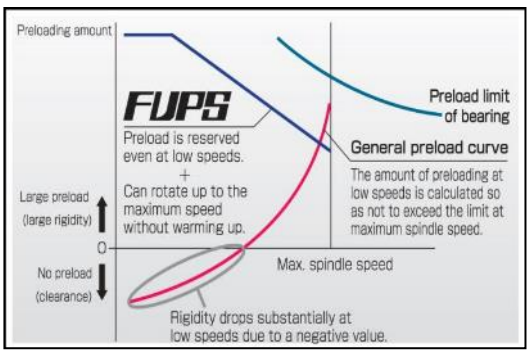


Toyoda 15,000RPM 50HP High Speed Spindle



- 4 Rows of Ceramic Front Bearings
- Variable Hydraulic Preload
- Oil-Air Mist Spindle Lubrication
- Removable Spindle Taper Design





JTEKT Patented Hydraulic Preload System

- Dynamically varies hydraulic pressure with changes in RPM
- Consistent bearing pressure from low speed to high speed
- Rigidity is achieved even at low speeds without spindle warm up
- Heat generation is suppressed for increased spindle service life

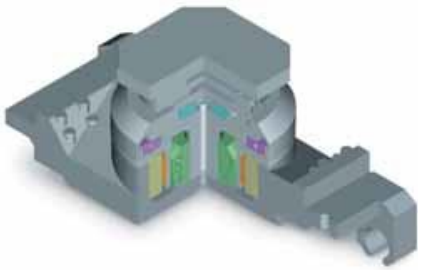
Table & Pallet Options

Toyoda Direct Drive Table

One (1) Spare Bolt Hole Pattern Pallet

Toyoda Direct Drive Table

- .5 Sec 90 Degree Index
- Increased Table Clamp Force
- Decreased Cycle Times
- Reduction in Moving Parts



Tool Storage and Retrieval

Sixty (60) Tool Chain Type Storage Magazine (40 Taper)

119 Chain Type Tool Storage Magazine w/ Factory Order (40 Taper)

119 Chain Type Tool Storage Magazine Field Retrofit (40 Taper)

Three Hundred and Three (303) Compact Matrix Style Storage (40 Taper)

120 Chain Type Tool Storage Magazine (50 Taper)

Tool ID System with Read / Write for Matrix Magazine (Requires OP20T)

Tool ID System with Read / Write for Chain Style Magazine (Requires OP20T)

303 Position Tool Matrix Magazine

Matrix Rack Tool Storage

Coolant System STD Features

Machine Coolant Tank and Chip Conveyor: (120) Gallon Isolated Recirculating Coolant Supply Unit with Scraper Lift Up Chip Conveyor and Drum Filtration Unit.

Coolant-Thru-Spindle System: 435 PSI Pump at 9 GPM. Machine Prep for High Pressure up to 1000PSI Capable.

Hand Held Splash Gun at APC Door

Overhead Coolant Shower

Coolant System Options

High Pressure Coolant-Thru-Spindle (Up To 1,000 PSI) Chip-Blaster J-30 System

Hand Held Splash Gun at Operator Door

Customized High Volume Chip Removal

Air Blow by Nozzle – 125 PSI Max

Probing Options

Renishaw OMP60:

OMP60 Kit, Probe and Styli w/ Inspection Plus Software

Renishaw RMP60:

RMP60 Kit, Probe and Styli w/ Inspection Plus Software

Renishaw TRS2 Laser Broken Tool Detection

BK Micro In Magazine Broken Tool Detection

Toyoda Gap Elimination / Broken Tool Detection

Renishaw NC4 Laser System

Automatic Measurement of Tool Length, Diameter, and Broken Tool Detection Probe Head Mounted in the Lower Right Hand Corner of Work Envelope. Some Axis Stroke is Effected with this Option.

Multi Step Skip Function

Required when more than one of the following; Toyoda Conductive System, Spindle Probe, Tool Measure System Installations is Ordered

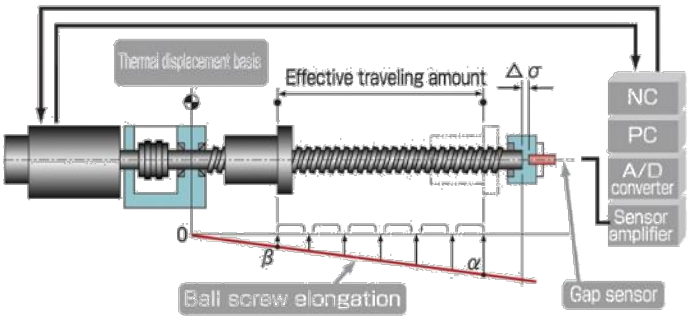
Standard Features

Encoder Linear Positioning Accuracy with BTS System (± 00012”)

Encoder Linear Repeatability with BTS System (± 00006”)

High Accuracy Options

Linear Scale Feedback for X, Y and Z Axes (± 00006” Accuracy, ± .00004” Repeatability)

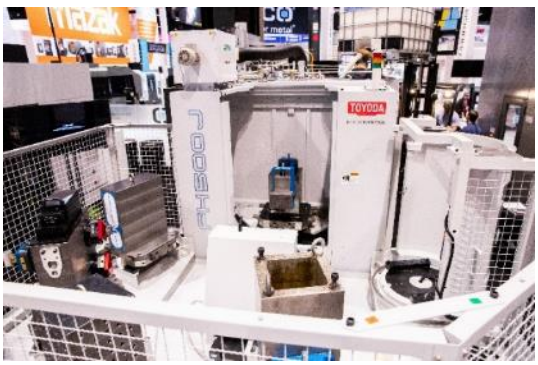


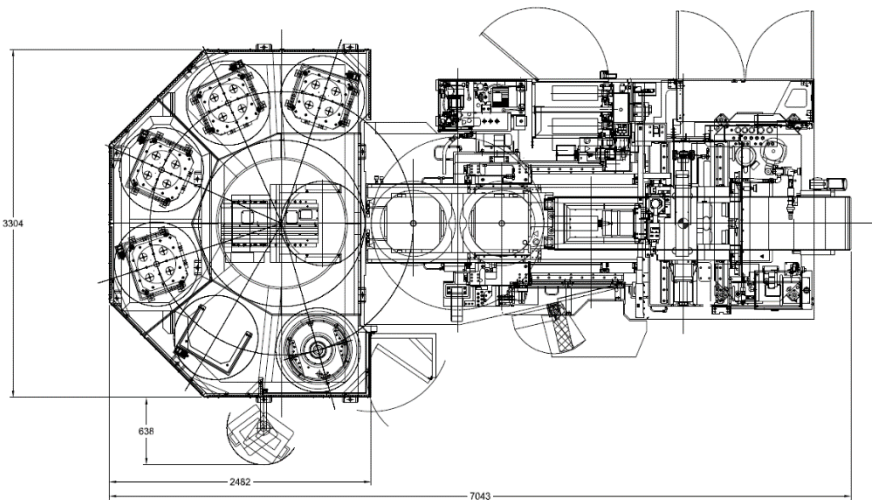
Toyoda BTS - Ball Screw Thermal Stabilizer

A heat displacement sensor is placed on the X, Y, and Z axis ball screws that measures any growth and sends the information back to the control for automatic compensation. This always active system allows for the stabilization of each axis and eliminates the need for internal cooling mechanisms that compromise the structural integrity of the ball screw.

Six Position Pallet Pool

Toyoda Six (6) Position Pallet Pool (includes machine front end modifications) $133,000





Toyoda Metalcutting Cells

Automating the metal cutting process can bring production to a whole new level of efficiency and profitability. Run multiple machines from a central PC to automate production scheduling, slash set-up times, reduce labor costs and improve throughput. Depending on your production requirements, numerous combinations of loading stations, machining centers and pallet storage styles are possible. Toyoda software and hardware can easily be upgraded or expanded at any time.

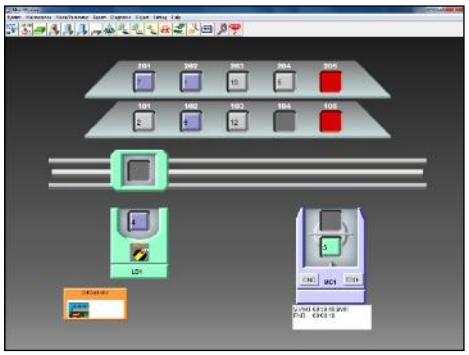
Toyoda Flexible Pallet Automation

Multi Level Flexible Pallet Automation (FPA)

This modular design has the same features as FMS (above) with either two or three levels to add more pallet storage in the same floor space. A two-level FPA can even be expanded to three levels should future production volumes require it. The welded construction, linear guideways and high-speed RGV support high rates of acceleration.

Modular, Expandable, Upgradeable

Using pre-engineered, modular components, an initial cell installation can be modest–even a single machine–so you can profit from increased production right away. As production grows, so can the system with more machines and greater handling capacity.



Toyoda FPA Software Status Screen

Powerful Cell Management

The basic function of a cell controller is to select and execute the part program, then return the pallet and finished workpiece back to the operator's loading station or storage rack. Toyoda's Mach-III Cell Controller goes beyond these basics to make the system both user-friendly and extremely powerful. Mach-III has DNC capabilities, tool management, production monitoring, production scheduling, performance diagnostics, maintenance support, and more.

Toyoda Single Machine Cell

Standard Training Provided with Machine Purchase

Basic Programmer Training

Basic Programming Training Class which is intended for the first time programmer with basic machining knowledge. Teaching of the machine axes, all codes, block format and program composition are covered by writing sample programs.

Per Machine:	Two (2) Persons Included per Machine
Class Length:	Five (5) Days / Eight (8) Hours per Day

Maintenance Training

Toyoda Maintenance Training Classes offer the maintenance man intensive instruction of theory of operation, troubleshooting, and preventive maintenance.

Per Machine:	Two (2) Persons Included per Machine
Class Length:	Four (4) Days / Eight (8) Hours per Day

Special Options Training

Toyoda Options Class offering specific instruction on OP Supporter, Adaptive Control, Auto Tool Length Measurement, Rigid Tap and 8-Digit Tool Code.

Per Machine:	Two (2) Persons Included per Machine
Class Length:	One (1) to Two (2) Days / Eight (8) Hours per Day

Standard Documentation Provided with Machine Purchase

MANUAL NAME	MEDIA	QTY
Maintenance	TMU - CD	1
Programming	TMU - CD	1
Tooling	TMU - CD	1
Operation	TMU - CD	1
Hydraulic / Pneumatic	TMU - CD	1
Parts	TMU - CD	1
Touch Sensor (If Option Purchased)	TMU - CD	1
Fanuc Operation and Programming	GE INFOLINK - CD	1
Parameters	GE INFOLINK - CD	1
Spindle Manual	GE INFOLINK - CD	1
Digital AC Servo Maintenance	GE INFOLINK - CD	1
Conveyor Operation	TMU - CD	1
Electrical Drawings	TMU - CD & Hard Copy	1
31i Ladder	TMU - CD & Hard Copy	1

FANUC Control Options

Part Program Storage Options

Standard - Part Program Storage Capacity 64Kbyte
Part Program Storage Capacity 2,048 Kbyte (Includes 1000 Registerable Programs)
Part Program Storage Capacity 4,096 Kbyte (Includes 1000 Registerable Programs)
Part Program Storage Capacity 8,192 Kbyte (Includes 1000 Registerable Programs)

Tool Offsets and Management

Standard Tool Offset Pairs – 99 Sets
Tool Offset Pairs – 200 Sets
Tool Offset Pairs – 400 Sets
Tool Offset Pairs – 499 Sets
Tool Offset Pairs – 999 Sets
Tool Offset Pairs – 2,000 Sets
Tool Life Management - 128 Sets
Tool Life Management - 512 Sets
3-Dimensional Tool Compensation
Operation Supporter – OP20T
(See OP Supporter Supplement for Additional Options)
Operation Supporter – OP20A
(See OP Supporter Supplement for Additional Options)

Workpiece Coordinate Systems

Rotary Dynamic Fixture Offsets
Workpiece Coordinate System – 48 Sets
Workpiece Coordinate System – 300 Sets

High Speed Machining Options

AI Precision Control II
(Reduces Block Processing Time to 2ms, Increases Buffer to 200 blocks)
High Speed Processor - Requires AI Precision Control II.
(Reduces Block Processing Time to .4ms, Increases Buffer to 600 blocks)
1,000 Block Look-Ahead Upgrade
Requires AI Precision Contour Control II with High Speed Processor
Nano Smoothing
Smooth Interpolation
NURBS Interpolation

FANUC Control Options

I/O Devices

- 2GB Data Server
- Data Server Buffer Mode (Requires Data Server)
- High Speed Serial Bus (Requires Customer Supplied PC)
- High Speed Serial Bus (Includes PC and Industrial Enclosure)
- Remote Buffer with Serial Board
- External Reader/ Puncher Connection / 25 Pin RS232 Port

Interpolation Options

- Cylindrical Interpolation
- Involute Interpolation
- Conical / Spiral Interpolation
- Polar Coordinate Interpolation
- Hypothetical Axis Interpolation

Operation Support Functions

- Manual Handle Interruption
- Machining Time Stamp
- Optional Block Skip Addition by Push Button Switch (2 - 9 by Push Button)
- Sequence Number Comparison and Stop
- Graphic Display

Programming Support Functions

- Automatic Corner Override
- Chamfering Corner R
- Polar Coordinate Command
- Programmable Mirror Image
- F1 - Digit Feedrate
- Scaling Via G50 / G51
- Single Direction Positioning
- Inverse Time Feed
- Inclination Compensation
- Adaptive Control Function (Macro, not a Function of OP Supporter)
- Adaptive Control Function (Requires OP20T)
- Adaptive Control Function with Condition Management (Requires OP20T)

FANUC 31i CNC Standard CONTROL FEATURES

160m / 64k (Memory)
2nd Reference Position Return
63 Registerable Programs
Absolute / Incremental Programming
Actual Cutting Feedrate Display
Alarm Display
Automatic Acceleration / Deceleration
Automatic Coordinate System Setting
Automatic Operation (Memory)
Automatic Tape Code EIA / ISO Recognition
Auxiliary Function Lock
Axes Names (X, Y, Z, U, V, W, A, B, C)
Backlash Compensation
Backlash Compensation for Each Rapid Traverse and Cutting Feed
Basic Function
Buffer Register
Circular Interpolation
Circular Interpolation by R Programming
Clock Function
Control In / Control Out
Coordinate System Setting
Current Position Display
Cutting Feedrate Clamp
Cutting Mode
Data Protection Key
Decimal point programming / Calculator Type Decimal Point Programming
Diameter / Radius Programming
Digital Servo Function
Display of Hardware and Software Configuration
DNC Operation by Memory Card
Dry Run
Dwell
Emergency Stop
Erase CRT Screen Display
Exact Stop
Exact Stop Mode
Expanded Axes Name
Extended Part Program Editing
External Key Input
External Work Piece Number Search
Failure Diagnosis
Feed for Reference Position Setting
Feed Per Minute
Feedrate Override
Flexible Feed Gear
Follow-Up
Help Function
High Speed M / S / T Interface
HRV Control
Incremental Feed
Input Unit 10 Time Multiply
Integrated Ethernet
Interlock
Jog Feed
Jog Override
Label Skip
Least Input Increment
Linear Acceleration / Deceleration after Cutting Feeding Interpolation
Linear Interpolation
Machine Condition Selection Function (Selection 1-10 of Precision Settings)
Machine Lock
Maintenance Information Screen
Manual Absolute On and Off
Manual Intervention and Return
Manual Reference Position Return
Maximum Programmable Dimension (+/- 9 digit, R, J, K: +/- 12 digit)
MDI Operation
MDI Unit
Memory Card Input / Output
Multiple Command of Auxiliary Function
Operating Monitor Display
Operation History Display
Optional Block Skip 1
Over Travel
Override Cancel
Parameter Setting and Display
Parameter Setting Support Display
Parity Check
Part Program Editing
Periodic Maintenance Screen
Plane Selection
PMC Function
Positioning
Program Display
Program File Name (32 Letters)
Program Number Search
Program Protect
Programmable Data Input
Programmable Parameter Input
Rapid Traverse Override
Rapid Traverse Rate (Least Input Increment B)
Reference Position Return (G28)
Reference Position Return Check (G27)
Reference Position Setting without Dog
Reference Position Shift
Rotary Axis Designation
Rotary Axis Roll-over
Screen Hard Copy
Self-diagnosis Function
Semi Automatic Tool Length Measurement
Sequence Number
Sequence Number Search
Servo Information Display
Servo Off / Mechanical Handle Feed
Servo Waveform Display
Single Block
Spindle Speed Function
Status Display
Status Output Signal
Stored Stroke Check 1
Sub Program Call
Tangential Speed Constant Control
Tool Function (T8-Digit): Limited to Max. Pocket #
Tool Length Compensation
Torque Limit Skip
Touch Panel Control
Waiting Function
Wrong Operation Prevention Function

FANUC 31i CNC Additional Toyoda Packaged CONTROL FEATURES

10.4" Color LCD with Touch Panel
250 Registerable Programs
3rd / 4th Reference Position Return
99 Tool Offsets
Addition of Custom Macro Common Variables (#100 – #199, #500 – #900)
AI Contour Control I
Automatic Corner Deceleration
Bell-Shaped Acceleration / Deceleration After Cutting Feed Interpolation
Bell-Shaped Acceleration / Deceleration Look Ahead Interpolation
Bidirectional Pitch Error Compensation
C Language Executer Additional SRAM
C Language Executor
Canned Cycle For Drilling
Control Axis Detach
Controlled Axes Expansion
Coordinate System Rotation
Custom Macro
Custom Software Capacity 2MB
Direct Input of Work Piece Origin Offset Value Measured
External Data Input
Feedrate Clamp Based on Arc Radius
Helical Interpolation
High-Speed HRV Function
Inch / Metric Conversion
Manual Handle Feed
Multi-Language Display (English)
Part Program Storage Capacity (Total of all Paths) 128 Kbyte
Position Switch
Power-mate CNC Manager
PROFIBUS
Program Restart
Reader / Puncher Interface
Rigid Tapping
Run Hour and Parts Count Display
Simultaneously Controlled Axes Expansion
Spindle Orientation
Spindle Output Switching Function
Spindle Serial Output
Stored Pitch Error Compensation
Stroke Limit Check Before Move
Tandem Control
Tape Format for FS 15
Tool Offset Memory C
Work Piece Coordinate System (G52 – G59)
Work Piece Coordinate System Preset