Okuma America Corporation

Productivity Proposal

MA-550VB

Vertical Machining Center with 50-Taper Spindle

THERMO-FRIENDLY CONCEPT

Applicable model and versions: ● Base offering. ○ Available specification

Base offering:	MA-550VB	6,000 rpm	50 Taper BIGPLUS	30 hp	●
	MA-550VB	12,000 rpm	50 Taper BIGPLUS	30 hp	○
	MA-550VA	25,000 rpm	HSK A63	20 hp	○

Notes: 12k and 25k spindle information is covered in the Proposal Supplement

SUBJECT TO CHANGE WITHOUT NOTICE - **PROPOSAL BASED ON 17.10 STANDARD**

MA-550VB

Introduction

The MA-550V CNC is the next evolution Okuma CNC 3-axis vertical machining centers. The OKUMA MA-550V features include: Top speeds, top accuracy's all with smaller footprint.

The MA-550V features produce the most efficient and convenient vertical machining center available for milling, boring, drilling, and tapping.

A Thumbnail of the base offering:

- Travels: X: 51.18" Y: 22.0" Z: 22.0
- "Y" Axis Column feed, 10.5 feet frontage
- Table Size 51" x 22" 4 - T-slots
- CAT 50 BIGPLUS V-Flange specification
- 6,000 rpm, 30/ 15 hp VAC Spindle Motor
- 828 lbf-ft ; 2 range spindle head
- Spindle head lube system with cooling
- Spindle Jacket Cooling system w/interlocks
- Oil Air Mist spindle bearing lubrication
- Multi-guide construction with cooling
- 1,575 / 1,181 IPM Rapid Feed X, Y, / Z
- 1,181 IPM maximum feedrate
- 32 Tool ATC Magazine
- 2.4 sec. T-T; 5 sec. C-C
- Prep for chip conveyor and coolant tank.
- Prep for through the spindle coolant- 1,000 psi
- Thermo Active Stabilizer – Spindle TAS-S
- 3-color signal tower
- 1 Year warranty. See Warranty Document FM-046.

The MA-550VB continues Okuma's fundamental commitment to total system engineering of its machine tools. This means ALL Okuma design and manufacture of machine, motors, drives and controls and including the industry leading Okuma Care (24-7) support program.

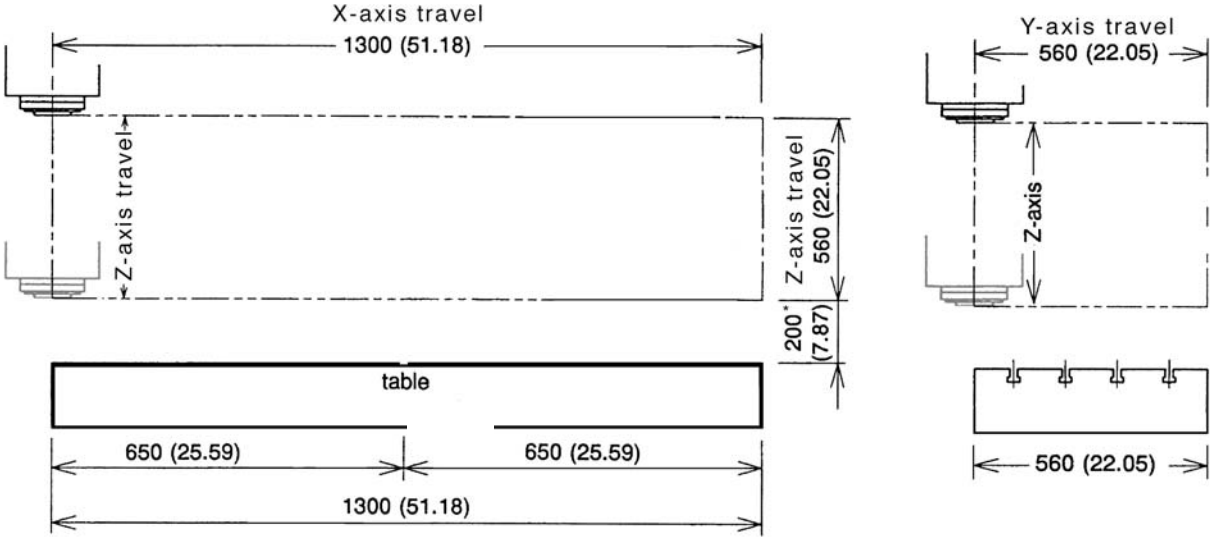
CAPACITY

Work Range

Okuma has one of the largest work envelopes in its class. This provides the flexibility to handle a wide range of work-pieces.

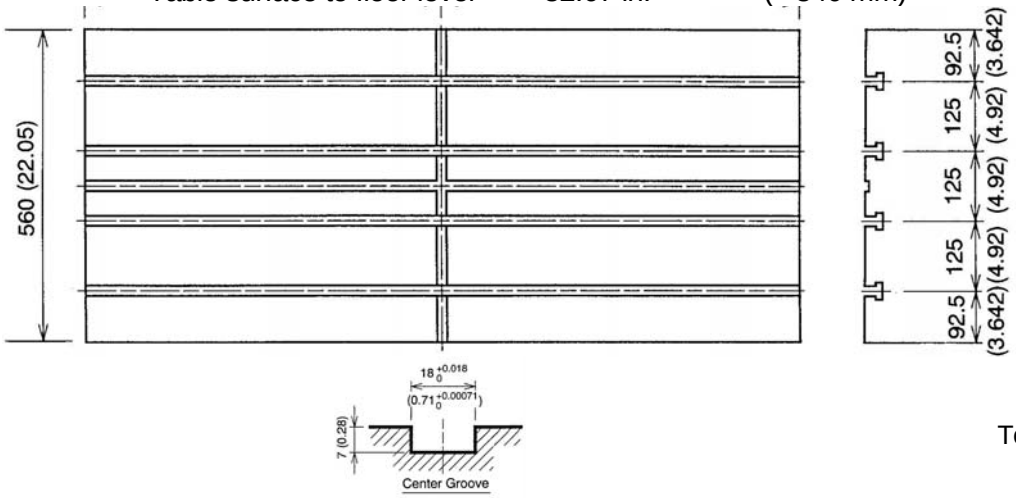
Axis Travel

X-axis (Table)	51.18 in. (1,300mm)
Y-axis (Saddle)	22.05 in. (560mm)
Z-axis (Spindle head)	22.05 in. (560mm)
Spindle end to table surface	7.87" – 29.92 in. (200 – 760mm)



Table

Table size	51.18" x 22.05 in.	(1,300 x 560mm)
Load capacity	2,200 lb.	(1,000 lbf)
Table surface to floor level	32.67 in.	(840 mm)



Tee slot 13/16 inch

CAPACITY

MAXIMIZING FLEXIBILITY AND SPEED

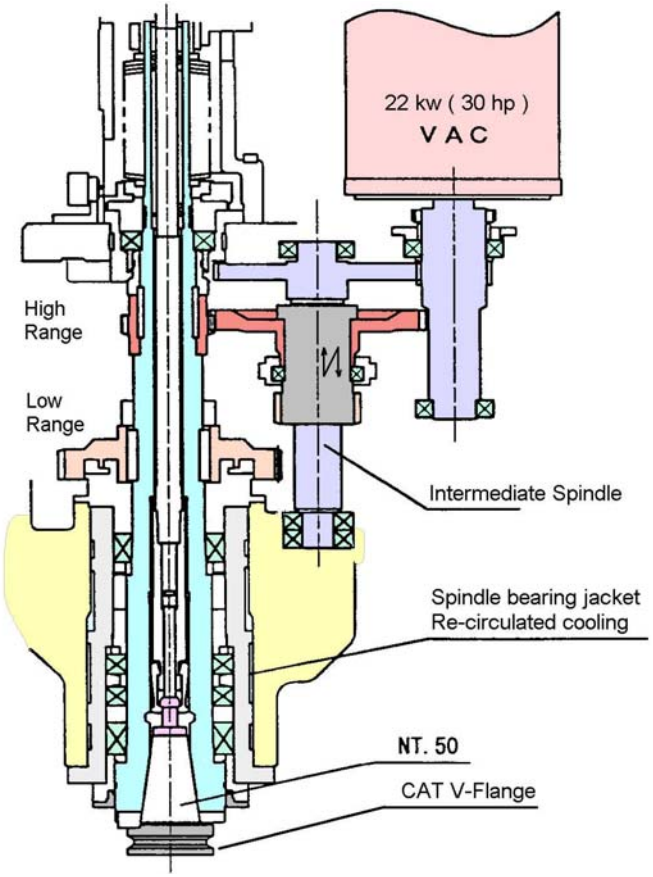
Power and Torque

Main Spindle Drive

The MA-550VB utilizes a 30 HP VAC motor-spindle drive system. The unique Okuma spindle drive accurately controls input commands and continuously monitors actual performance.

The spindle motor develops full horsepower over a speed range of 187 – 750 in low range and 1,271 – 6,000 in high range and achieves maximum speed in 3.6 sec. Constant torque of 828 foot/pounds is available from 10 to 187 RPM.

The spindle design allows the flexibility of feeds and speeds needed to cut work-pieces of steel, aluminum, stainless steel, high-temperature alloys and exotic Materials. The spindle motor design produces less vibration and power loss at the tool tip yielding excellent surface finish and impressive metal removal rates.



Axis Thrust

X, Y and Z-axis

The X, Y and Z axes are driven by Okuma brushless motors and servo drives. Ample Z-axis thrust is critical for drilling, boring and plunge milling operations especially tools with indexable inserts.

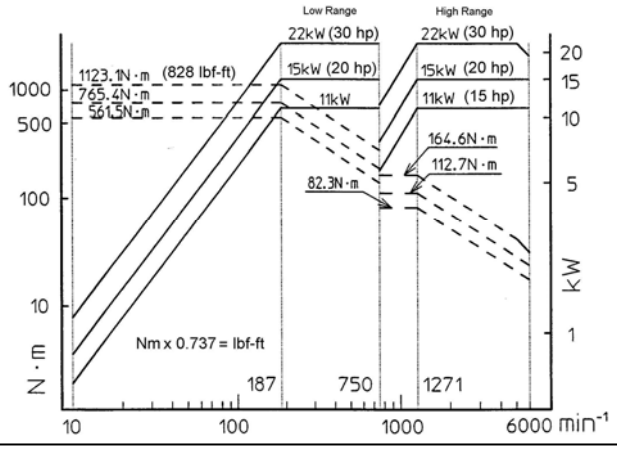
The MA-550VB has maximum thrust as follows:

1,650 lbf (750 kgf) X-axis

1,650 lbf (1,500 kgf) Y-axis

3,300 lbf (1,500 kgf) Z-axis

- Spindle Head bearing support - rigidity & finish
- Full oil jacket for bearings - thermal stability
- Oil-air mist bearing lubrication - life - stability
- Spring clamping over hydraulic release
- Prepped for through the spindle coolant

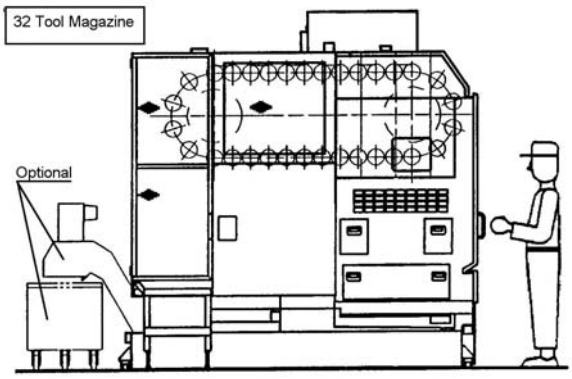


ATC and Tooling

32-Tool Magazine

The MA-550VB tool changer is simple, reliable and extremely productive. The tool changer has a capacity of 32 tools, held in a cast iron carousel magazine.

Rotation of the tool magazine is powered by an Okuma servomotor, with position monitored and controlled by an Okuma absolute encoder. This design eliminates stepping motors, clutches and complex drives. Spindle orientation for tool change is accomplished by the Okuma spindle drive and magnetic pulse generator on the spindle unit, which accurately orients and holds the spindle in position.



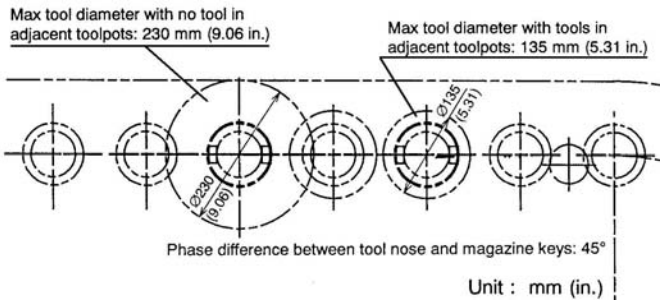
Standard 32 tool ATC magazine
Opt. 48 tool ATC available

Automatic Tool Changer

Manual spindle rotation and tool changing is available via the operation panel for convenient tool adjustment and tool tip inspection.

The simple, reliable Okuma MA-550VB tool changer provides an impressive tool change time of 2.4 seconds (tool to tool) 6.0 (chip to chip).

Using a standard CAT 50 BIGPLUS V-flange, it will handle tools weighing up to 44 pounds, 5.31 inches in diameter and up to 15.75 inches in length. Larger tools, up to 9.06 inches in diameter, can be handled if adjacent stations are open.



Tool Shank, V-Flange and Pull Stud

MA-550VB is prepped for 1.000 psi through the spindle coolant. Accordingly the tool shank and pull stud specification are for through coolant

Pull Studs

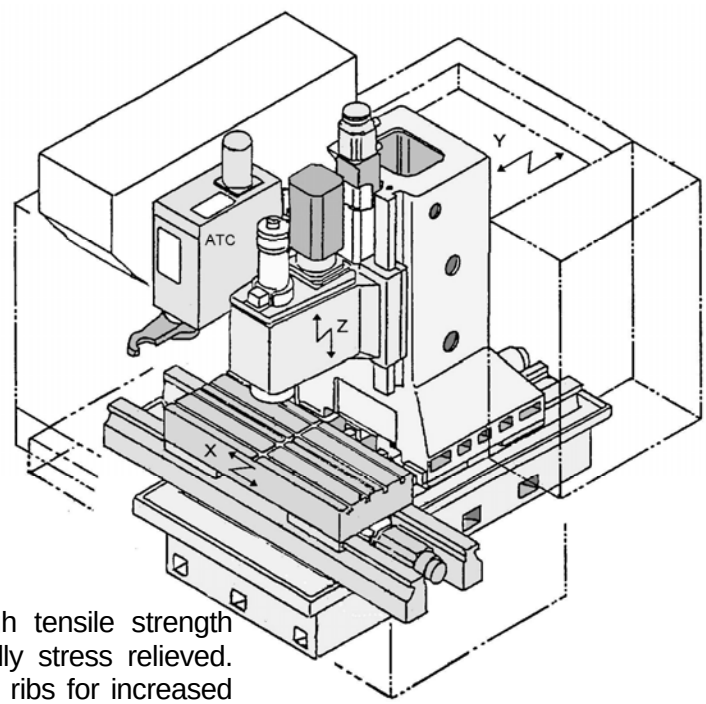
An initial quantity of 20 pull studs is included in the Base Specification. Additional quantity of pull studs made to OKUMA specification (hardened and ground) are available either through OKUMA or its Partners – Velocity Products

Construction

Design and Construction

There are six (6) main components of the MA-550VB Vertical Machining Center.

- The Spindle Head
- The Column
- The Bed
- The Saddle
- The Table
- The ATC



Materials

These components are produced from high tensile strength (40,000#) alloyed cast iron which is carefully stress relieved. The bed casting is designed with reinforcing ribs for increased stability and load carrying capacity.

The column utilizes a reinforced box construction to increase stiffness, resist vibration and minimize deflection during high thrust loads.

Saddle & Table Support

The machine saddle is designed to provide full support of the machine table/column in the Y axis movement. Good machine design and fitting allows for exact perpendicularity of the spindle head.

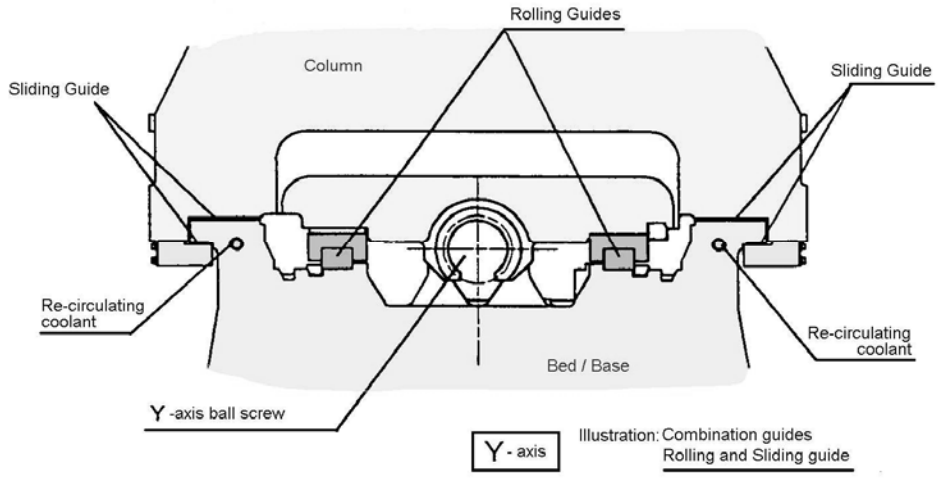
The machine table, holding the work piece, is supported by the fixed saddle and bed and is capable of supporting full table load while holding alignment accuracy in full range of X axis cross of table on the saddle.

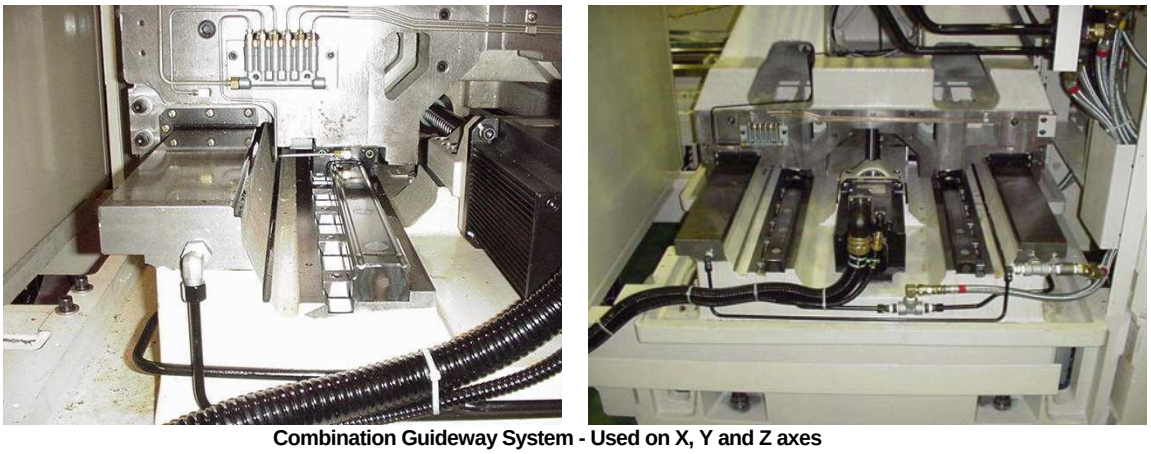
Extra width in the saddle design prevents the table from overhanging the bed. The column and bed are joined at the column flange to produce alignment MA-550VB Bed, Column, & Saddle tolerances of 0.00020” or better in full travel of the X, Y, and Z axis.

Combination slide-ways X, Y and Z axis

The combination design offers the high traverse, feed and accuracy of linear ways with the rigidity and power absorption of box way systems.

All bed, saddle and column way surfaces are hardened throughout to support the robust linear bearing packs used on the X, Y, and Z axis slides.





Combination Guideway System - Used on X, Y and Z axes

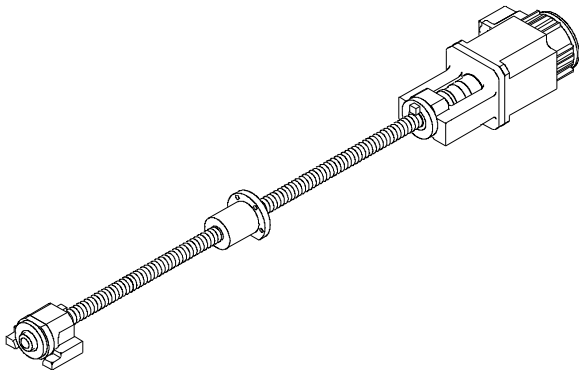
The linear bearing packs for X, Y and Z axes. The entire guide way system and ball screws are lubricated with and automatic “smart Lube" system which is sensitive to the operation of the machine and does not dispense lube unnecessarily.

Axis Drives

Ball Screws

Powerful, robust high precision ball screws generate sideway movement to all three axes of the MA-550VB. The ball screws are based on unique Okuma designs and exacting performance standards. They are directly coupled to special Okuma axis drive servomotors.

Contrary to commercial drive systems, the custom Okuma servomotors precisely match the electrical and mechanical prerequisites of the MA-550VB performance requirements. An essential element in the drive system is the unique Okuma absolute position digital feedback encoder connected directly to the shaft of each Okuma servo drive motor.



Okuma Dual-Supported Ballscrew

The Ballscrews are precision mounted on the exact center of any controlled axis and are preloaded at the end of the ball screw opposite the drive system. The precision ball screws are supported by a twin set of thrust bearings mounted in ball screw support brackets at each end of the ball screw.

Preload is set during machine construction by careful hand sizing and fitting. Once set, the preload is maintained by a twin set of ball screw mounting brackets supporting both ends of the screw.

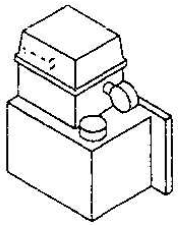
The ball screw mounting is designed for both tension and compression for thermal compensation and control of ball screw growth.

Ball Screws		X	Y	Z
Diameter	mm	50	50	50
Pitch	mm	20	20	16
Axis Thrust	lbf	1,650	1,650	3,300

FLUID SYSTEMS

Machine Lubrication

The MA-550VB is lubricated with a automatic lubrication system. All the ballscrews and all combination guides are lubricated by the system. The two lubrication manifolds are centrally located for convenience, where the entire machine can be serviced.



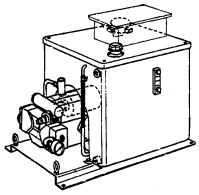
Central lubrication terminal

Chip & Coolant Control

Slanted Way Covers are provided as standard equipment. The guards provide protection and control chip flow to prevent chips from falling onto way surfaces.

Tool Coolant Nozzle system

A 0.5 hp pump provides up to 30 liters of coolant per minute to the 5 adjustable nozzles at the spindle head.

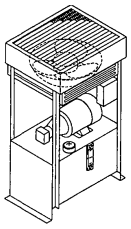


Hydraulic Unit

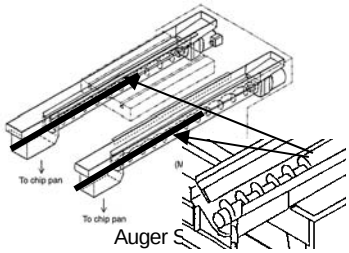
Dual Screw auger type Chip removal at the table

Dual auger screws keep the chips moving down the chip gutters to the chip bucket above the 84 gallon coolant reservoir.

The standard wrap around enclosure ensures complete containment of coolant and chips



Spindle Head Cooling Unit



Auger S

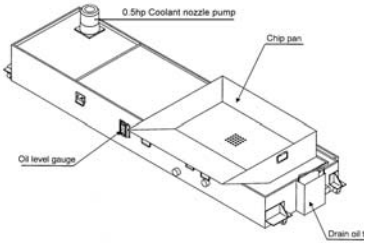
PREP for through spindle coolant 1000 psi

The machine is supplied as standard with preparation for 1,000 psi (7 bar) including hoses and rotary coupling.

Optional Coolant Tank

The standard specification includes preparation for coolant tank and chip conveyor.

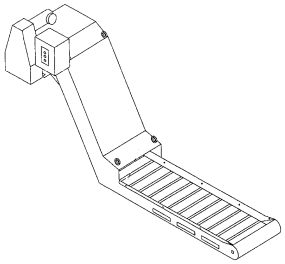
No coolant tank is supplied as standard and the appropriate tank and conveyor need to be ordered from the list of available options.



Optional coolant tank + chip pan

Optional Chip Conveyor

For machining operations where large quantities of chips are produced, a lift-up chip conveyor may be ordered which discharges from the rear of the machine. This can be ordered from OKUMA or a partner.



Opt. Lift-up Chip Conveyor

Safety Features

The MA-550VB is equipped with a variety of safety devices to prevent accidents and injuries. However, it is strongly advised that operators use the machine carefully and not rely solely on these devices. Complete safety precautions are found in the operation manual.

- Programmed soft limits are used to provide each axis with stroke end limits.
- Emergency stop push button, slide hold push button, and alarm indicator on operational panel.
- Fluid levels are interlocked
- Full enclosure guarding with standard access door interlock for complete chip and coolant containment.
- Measured 72dB level (at operator station at no load run of max spindle speed and max rapid traverse of axes. Measurement method available on request.
- ATC magazine access door interlock

MACHINE SPECIFICATIONS

TRAVEL

X-Axis (Table)	51.18" (1,300 mm)
Y-Axis (Saddle)	22.05" (560 mm)
Z-Axis (Spindle head)	22.05" (560 mm)
Spindle end to table surface	7.87" to 29.92" (200 – 760mm)

TABLE

Size	22.05" x 51.18" (1,300 x 560mm)
Load capacity	2,200 lb. (1,000 kg)
Table surface to floor level	32.68" (840 mm)

SPINDLE

Taper hole	NT No. 50 BIGPLUS
Diameter (front bearing)	3.94" OD. (100 mm)
Torque	828 / 414 lbf-ft (10min./cont.) (1,123/561 Nm)
Number of ranges	2 (by auto gear change)
Speed range	10-6,000 RPM

FEEDRATES

Rapid traverse X/Y & Z axes	1574 IPM & 1,181 IPM (40 & 30 m/min)
Feedrate X/Y/Z axes	1,181 IPM (30 m/min)

MOTORS

Main motor	30 / 20 / 15hp (10 m/ 30 m / cont.) (22/15/11 Kw)
X axis drive motor	8 hp (6.0 kW)
Y & Z axis drive motor	5.5 hp (4.1 kW)
Thrust X, Y	1,650 lb. (750 Nm)
Thrust Z	3,300 lb. (1,500 Nm)

AUTOMATIC TOOL CHANGER

Tool magazine capacity (Optional)	32 tools (Opt. 48 Tools)
Tool shank	CAT 50
Pull stud	MAS II special
Max. Tool dia. w/adjacent tools	5.31" (135 mm) CAT 50
Max. Tool dia. w/o adjacent tools (face mill)	9.05" (230 mm)
Max. Tool dia. w/o adjacent tools (boring)	11.81" (300 mm)
Max. Tool length	15.75" (400mm) CAT 50
Max. Tool weight	44 lb. (20kg)
Tool change time ≤ 12 kg (tool-to-tool)	2.4 seconds*
Tool change time ≤ 12 kg (chip to chip)	5 seconds*
Tool change speed ≥ 12kg ≤ 22 kg (tool-to-tool)	4.4 seconds*
Tool change speed ≥ 12kg ≤ 22 kg (chip to chip)	7.4 seconds

*T-T and C-C times do not include tool-/magazine preparation time

OTHER

Machine height	114" (2,900 mm)
Floor space required W x D	125" x 112"
Machine weight	25,960 lb. (32 tool ATC)
Apparent Power	34 kVA (without options)

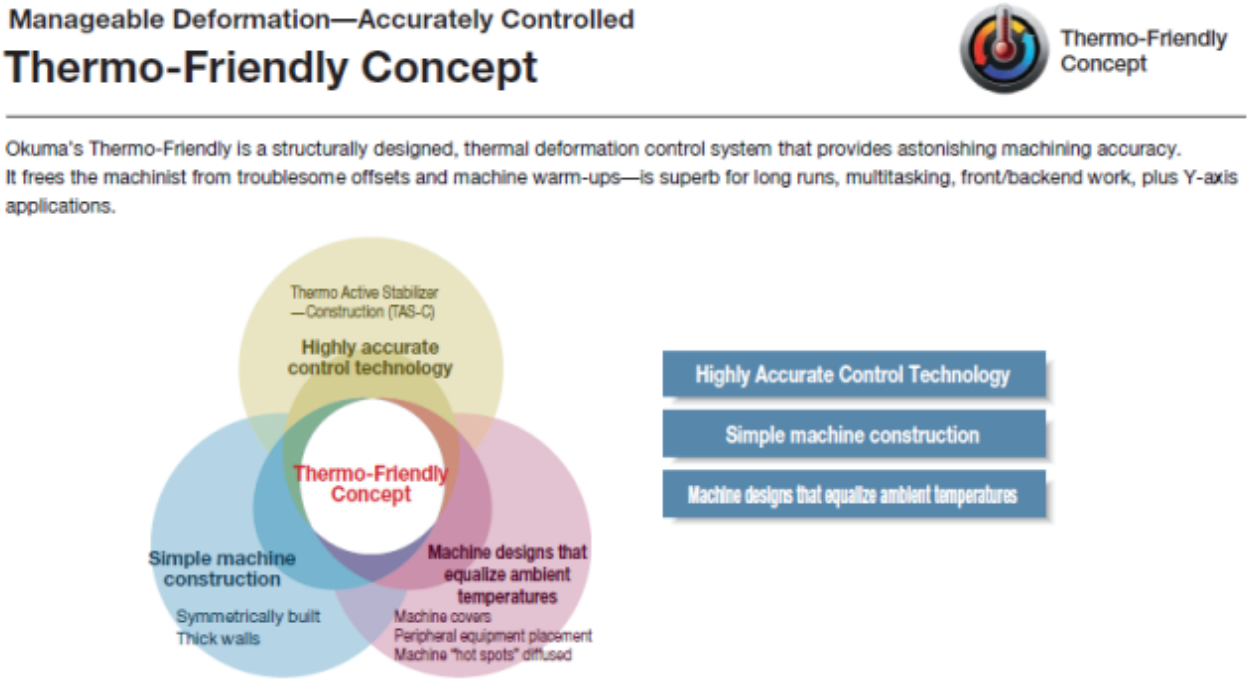
ACCURACY & REPEATABILITY

X, Y and Z axis Accuracy

The rigid machine structure coupled with a high response positioning system provides the following machine performance:

- Bidirectional positioning accuracy A - X axis 0.00070" (0.018 mm) full stroke.
- Bidirectional positioning accuracy A - Y axis 0.00047" (0.012 mm) full stroke.
- Bidirectional positioning accuracy A - Z axis 0.00047" (0.012 mm) full stroke.
- Bidirectional repeatability R - X axis 0.00039". (0.010 mm)
- Bidirectional repeatability R - Y axis 0.00027". (0.007 mm)
- Bidirectional repeatability R - Z axis 0.00027". (0.007 mm)

These positioning guarantees are based on standards ISO 230-2. ISO 10791-4:1998 and JIS B6336-4:2000.
These are part of a series of measurement that are made and recorded. They are made by laser interferometer with pitch error compensation applied, the machine leveled and a warm up performed before measurement.



Thermo Friendly Concept Functions.

To maximize the effectiveness of OKUMA Thermo Friendly Design, and maintain the highest degree of production accuracy and stability, the MA-V series are provided as standard with the following features:

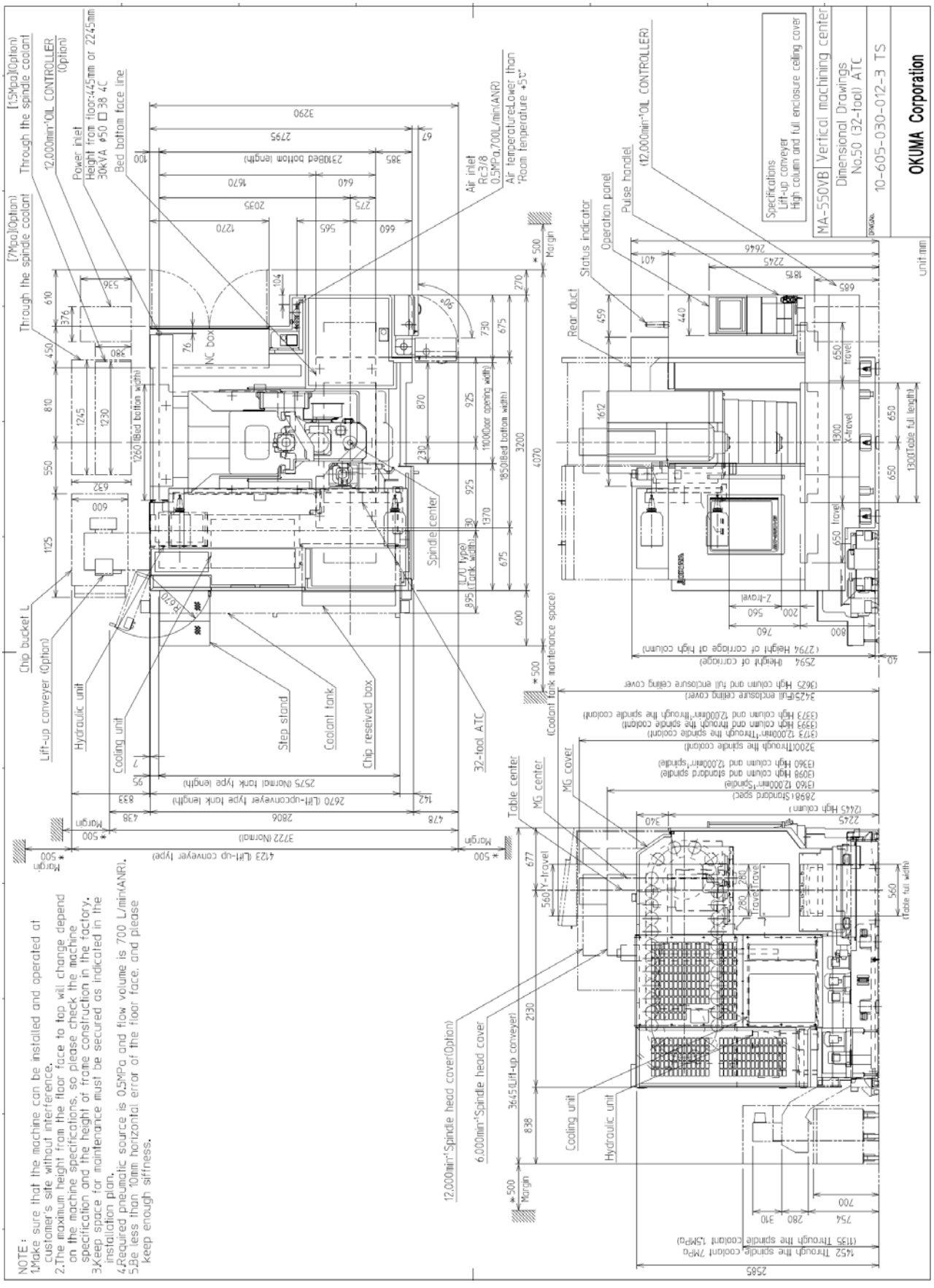
- Thermo Active Stabilizer-- Spindle (TAS-S)

Geometry Inspection

Laser alignments and positioning accuracy checks are among the over 200 quality tests performed on every machine. Lead screw and backlash compensations are measured during final inspection and maintained in the Okuma control to insure and guarantee the above stated accuracy definitions.

Inspection data sheets accompany each machine tool showing target data and actual data of 35 machine geometry inspections.

MACHINE LAYOUT



BASE MACHINE SPECIFICATION

OKUMA MA-550VB

CNC Vertical Machining Center
With OSP-P300MA Control System

MA-550VB with OSP-P300MA CNC Controller and USA standard specifications		
1	Spindle/Spindlehead cooling system (Oil controller)	1 set
2	Hydraulic unit	1 set
3	Coolant supply system	1 set
4	ATC air blower	1set
5	Chip air blower, nozzle type	1 set
6	Totally enclosed cover	1 set
7	Hand tools	1 set
8	Tool release lever	1 set
9	Spindle taper cleaning bar	1 set
10	Spindle speed (#50) 10-6,000min-1	1 set
11	Spindle motor VAC 22/15/11kw (10min/30min/cont.)	1 set
12	Tool shank standard: CAT50	1 set
13	Table size: 560mm x 1,300mm	1 set
14	Table type: Inch T-slot	1 set
15	32-Tool ATC	1 set
16	Work light, LED type	1 set
17	3-color status indicator type C (LED light)	1 set
18	Foundation washers with jack screws	1 set
19	Pull stud type: Special CAT	1 set
20	Spindle big plus	1 set
21	In-machine conveyor, screw type	1 set
22	Prep for chip conveyor, hinge type	1 set
23	Harting connector for above	1 set
24	No Coolant tank	1 set
25	Coolant nozzle, 5 flexible nozzles	1 set
26	Prep for through spindle coolant 7.0MPa (1000psi)	1 set
27	Through air blow during spindle rotation	1 set

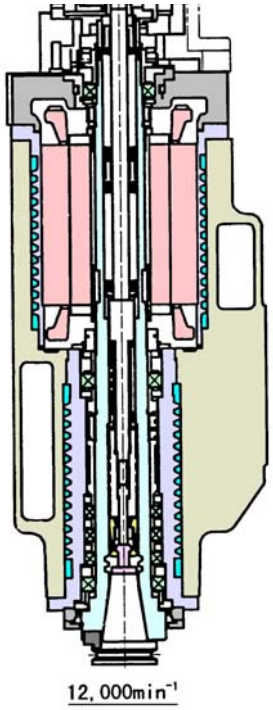
28	Coolant pump 400W	1 set
29	Through suction pump 400W	1 set
30	TAS-S	1 set
31	Totally enclosed cover w/ simple top cover	1 set
32	ATC magazine shutter	1 set
33	Chemical anchor, 4 portions	1 set
34	Pull stud bolt CAT50 Special CAT Thru type	20 pcs
35	IEC standard	1 set
36	UL prep spec	1 set
37	Door interlock	1 set
38	Multi-tap transformer 220-480V	1 set
39	Tool for machine leveling	1 set
40	Lifting hooks	1 set
41	Instruction manual, book in English	1 set
42	Instruction manual, DVD in English	1 set
43	**OSP-P300MA Base specification, See OSP-P300MA General Proposal**	1 set

Optional 12,000 rpm spindle head

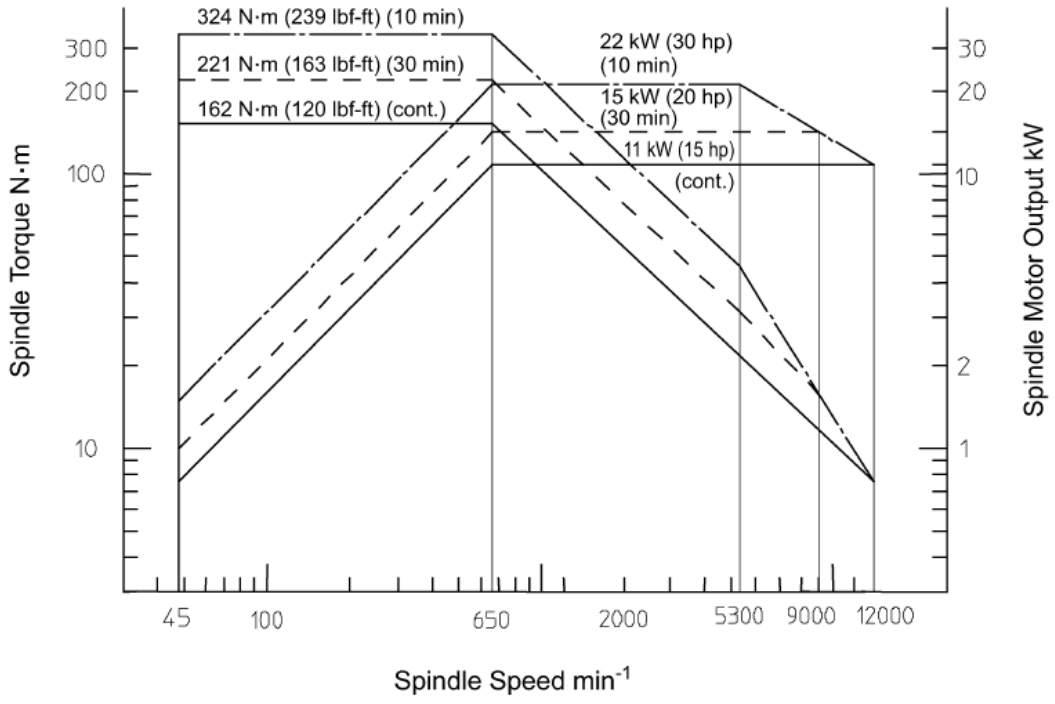
Power, Rigidity, Accuracy, Finish

Optional 12,000

- 12,000 min $^{-1}$, 30 / 20 / 15 hp (10 m / 20 m / cont.)
- 50 Taper - with CAT V-Flange BIGPLUS
- 239 lbf-ft torque, (10 min)
- Integral motor spindle - wide range
- 2 -ranges by coil winding change - stepless
- Liquid cooled motor cartridge (re-circulating)
- Liquid cooled spindle bearing cartridge
- Oil air spindle bearing lubrication
- **Prepared** for through spindle coolant



Optional spindle: 45 to 12,000 min^{-1}, 22/15/11 kW (30/20/15 hp) (10 min/30 min/cont.), NT. 50

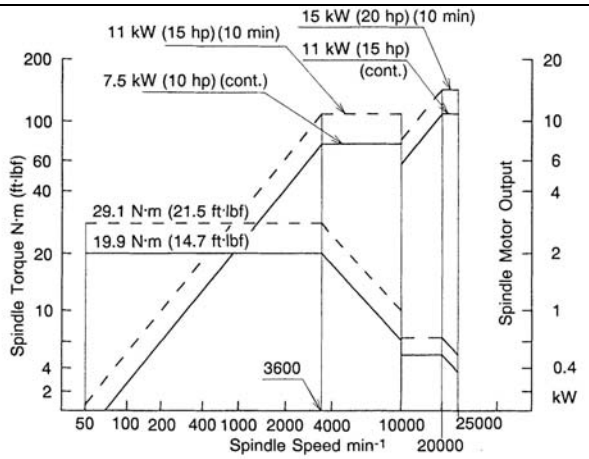


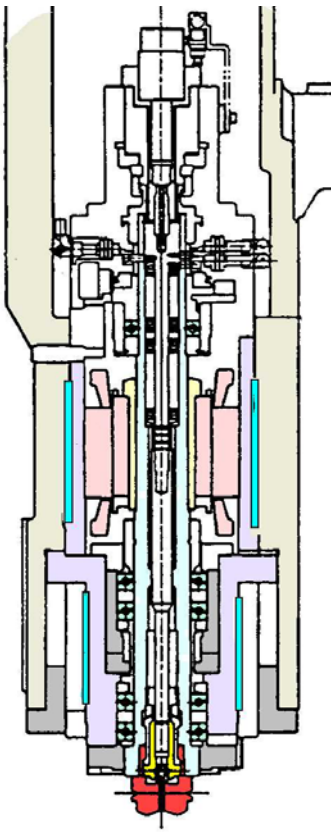
Optional High speed HSK spindle head

Power, Rigidity, Accuracy, Finish

Optional 25,000

- 25,000 min $^{-1}$, 20 /15 hp (10 m / cont.)
- HSK-A63
- 21.5 lbf-ft torque, (10 min)
- Integral motor spindle - wide range
- 2 -ranges by coil winding change - stepless
- Liquid cooled motor cartridge (re-circulating)
- Liquid cooled spindle bearing cartridge
- Oil air spindle bearing lubrication





25,000 min^{-1} HSK-A63