



VERTICAL MACHINING CENTER
Compact, Durable, Powerful,
Strong and Accurate



MEGA
TERA
SERIES

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Micro Dynamics® Vertical Machining Center Line opens a new era in multi-purpose and versatile machining centers. Compact, durable, powerful, strong and accurate, the **MEGA/TERA Series** starts a revolution in the market: the smallest C-frame machines provide powerful and precise results for manufacturers of dies and molds, aerospace, automotive, semi-conductor, job shops and general machine sectors.

The **MEGA/TERA Series** has been designed with the latest in technology being utilized throughout the machine with productivity in mind. From its EtherNet/IP architecture for easy automation and integration into systems and cells, to its Motion Control for fast and smooth operations used in all industries, the **MEGA/TERA Series** has quickly become one of the industries leading machine tool lines of Vertical Machining Centers.

POWERFUL integrated Micro Dynamics® Spindle.

THERMAL COMPENSATION DYPEC® Dynamic Predictive Error Compensation.

COMPACT design with small footprint.

RIGID TAP up to 6,000 rpm.

FAST Mitsubishi CNC M830W.

PC BASED HMI allows user friendly functions.

STRONG FC300 Meehanite® casting.

15" TOUCHSCREEN ergonomically friendly.

RELIABLE highest quality mechanical and electrical components.

INTEGRATED AUTOMATION EtherNet/IP networked I/O.

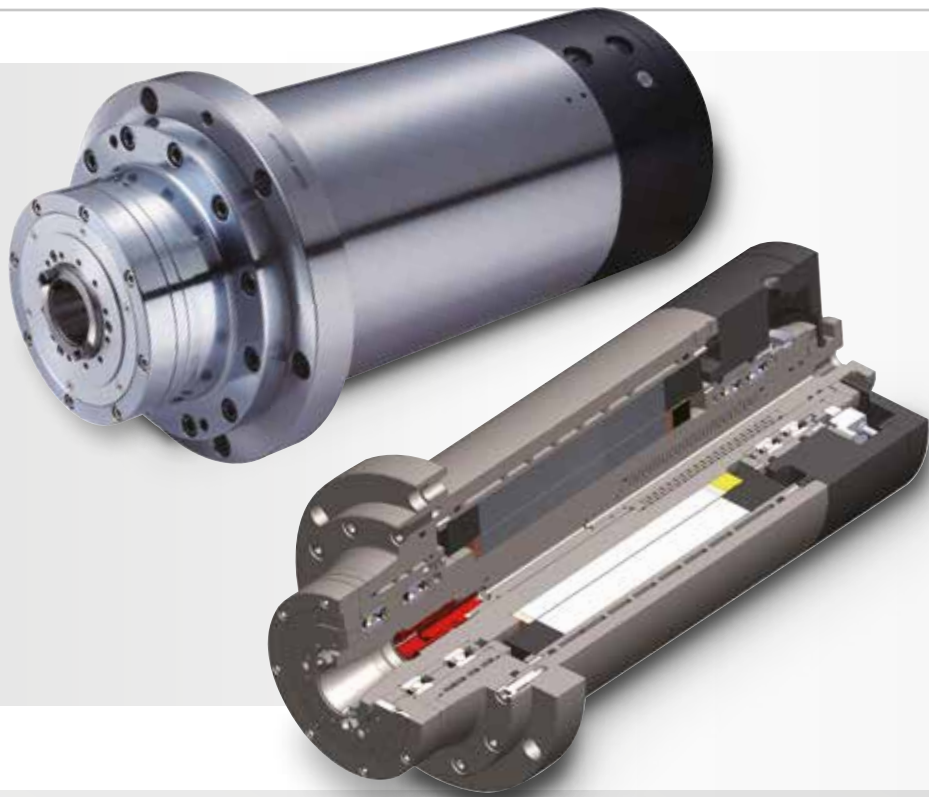
*Peak based on 25% Duty Cycle.

SPINDLE

MOLD & DIE

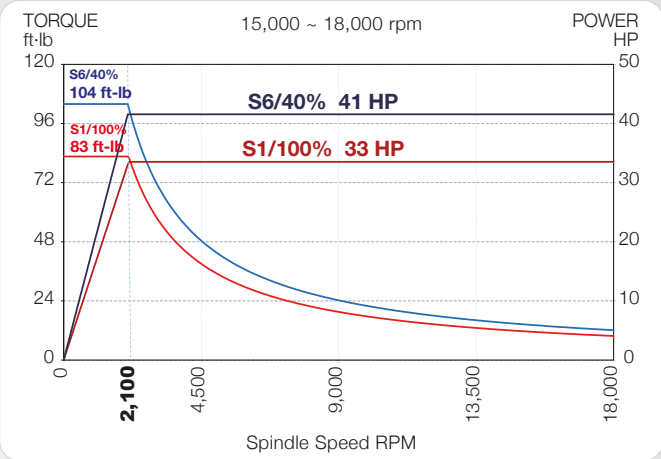
- 15,000 ~ 18,000 / 20,000 rpm Speed
- 41 HP / 47 HP* Power
- 104 ft-lb / 88 ft-lb* Torque
- 2,645 lbf Clamping Force
- 1.5 sec Acc. 0 – 12K
- 1.8 sec Dec. 12K – 0

* With Optional 20,000 rpm Spindle



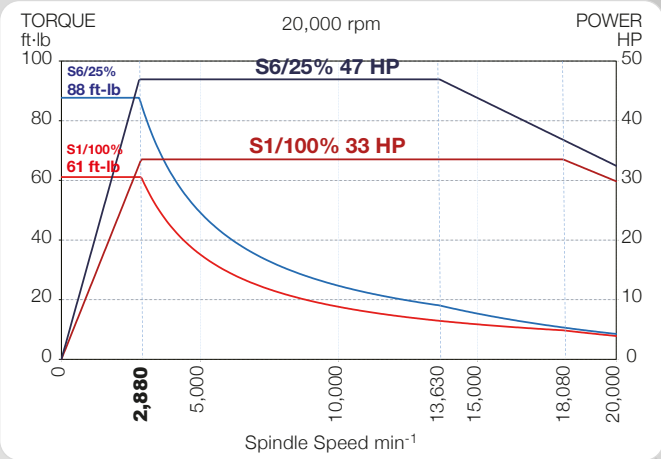
- Powerful integrated 40 taper dual contact spindle.
- Maintenance free 15,000 ~ 18,000 rpm spindle requires no added oil or grease.
- ATE® motor integrated with hybrid ceramic angular contact bearings.
- Micro Dynamics® drawbar has been rigorously tested to sustain more than 2 million cycles.
- For all applications, from heavy duty to high speed machining.
- Highest productivity under any conditions and complexities.
- CTS (Coolant Through Spindle) designed to sustain up to 100 bar (1,500 psi).*

* CTS preparation is standard equipment, CTS system is optional.



**40 Taper Dual Contact
15,000 ~ 18,000 rpm Spindle**

All Micro Dynamics® spindles are built with all shelf standard bearings which can be replaced without removing the rotor. This makes all machines simple and fast to maintain. Rebuild costs are very low due to the availability of the parts and the short service time.



**40 Taper Dual Contact
20,000 rpm Spindle**

Micro Dynamics® optional 20,000 rpm spindle, available on all models, delivers 47 HP of power and 88 ft-lb of torque. This allows for fine finishes while still achieving high material removal rates in a wide range of material types.

- The **MEGA/TERA Series** has been refined through years of research and development of new technologies that greatly enhance the machines for the rigors of the Mold and Die industry.
- Advanced Motion Control technology that benefits the production of Mold and Die components.
 - Highest quality components to ensure fast and smooth cutting strategies.
 - 4G SSS (G05P20000) Motion Control processing speed of up to 270,000 blocks per minute.
 - DYPEC® Thermal Compensation. Real time thermal growth compensation, monitoring every few milliseconds, with 0.1 microns compensations to ensure accuracies during long cycle times.

AUTOMATIC TOOL CHANGER

The **MEGA/TERA Series** is equipped with a high-speed double arm tool changer with a 40-tool magazine*. The magazine is integrated on the machine with an isolated structure, eliminating vibrations to the column, thus improving accuracy and finishes. The dual speed double arm allows the operator to adjust the speed of the tool changes for oversized, heavy tools and probes, to ensure accuracy and reliability. The ATC recovery function in HMI is a standard feature that assists the operator in recovering the position of the arm and the tool.

ATC SPEED:

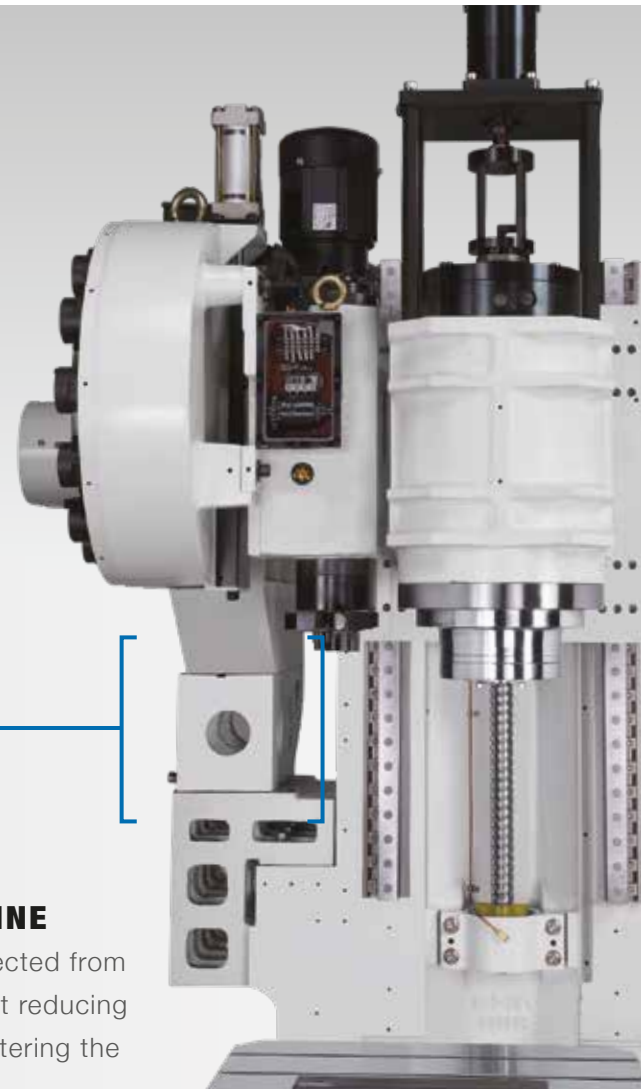
1.9 sec Tool to Tool

3.2 sec Chip to Chip

ISOLATED STRUCTURE

FULL COVER MAGAZINE

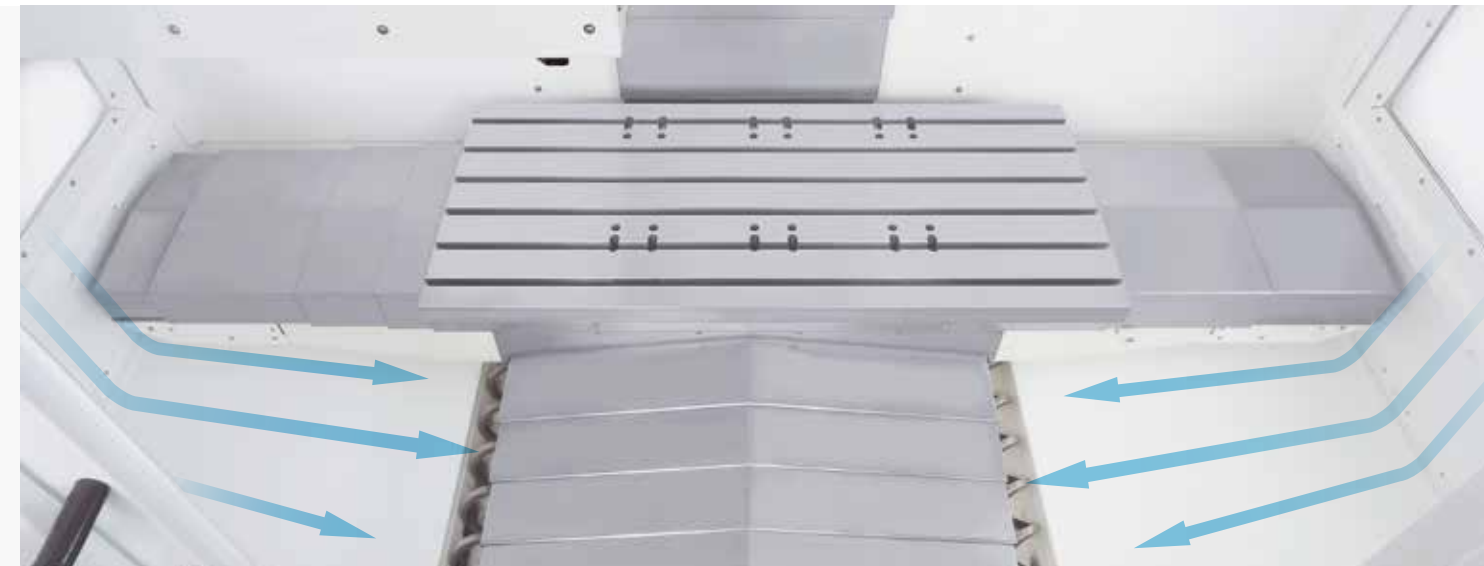
The tool magazine is protected from the machining environment reducing chips and coolant from entering the magazine area.



ATC REAR OPERATION PANEL* and door allow access for loading, unloading and inspection of tools while the machine is in operation. Tools can be called up either by tool number or by pocket number. During manual operation the machine will continue the cycle without interruption until ATC door is closed and the key is switched to automatic.

* Except MEGA 30V and TERA 40V.

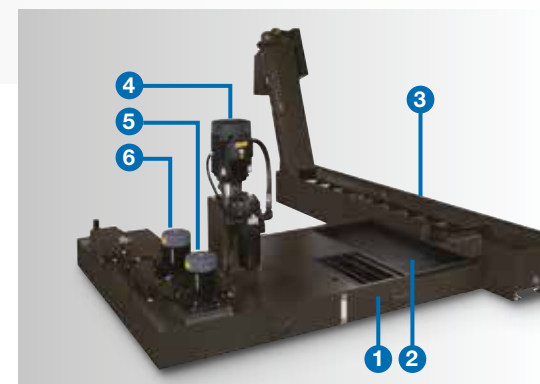
CHIP MANAGEMENT SYSTEM



The chip management system includes base wash, dual augers and chip conveyor, virtually eliminating chip build-up. Coolant falls along the inside perimeter flushing chips down to the dual augers which evacuate chips to the front conveyor. All mounting hardware is bolted from the outside leaving a clean surface for chip evacuation.



Triple protection on linear guides which helps keeps chips and contaminants away from critical areas and ball screws: bottom cover, top cover and telescopic cover.



MODULAR COOLANT/CHIP SYSTEM

1. Filter Chip Basket
2. Filter Chip Pan
3. Chip Conveyor
4. CTS Pump Option
5. Base Wash Pump
6. Coolant Pump

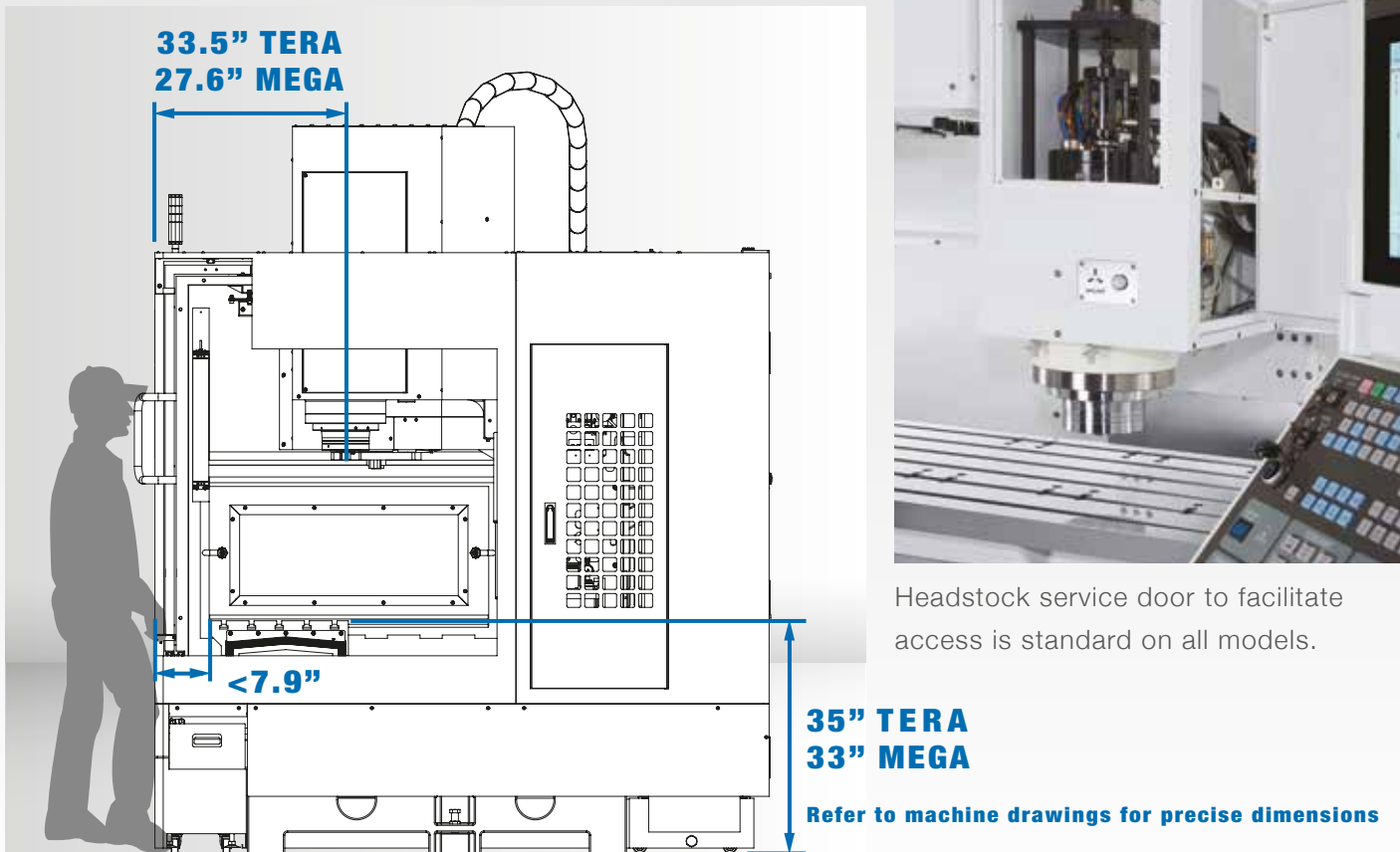


REVERSIBLE CONVEYOR

standard in all MEGA/TERA Series. Rear chip conveyor available under request.

ERGONOMICS

MEGA/TERA Series is ergonomically designed for operator and maintenance convenience. The large wide front door can be opened with one hand. There are three LED lights, two in the sides and one over the work area.



The distance from the door to the table is less than 7.9" for easy setup and part loading. The reach for operator access to the spindle is greatly reduced.

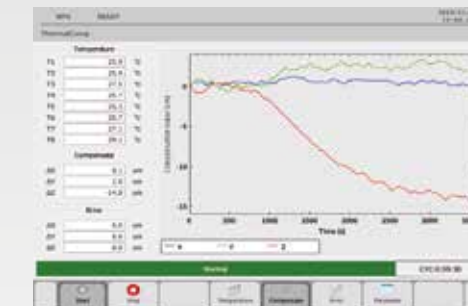
Two axes motion operator panel offers flat, tilting and swivel control.



Headstock service door to facilitate access is standard on all models.

DYPEC[®] THERMAL COMPENSATION

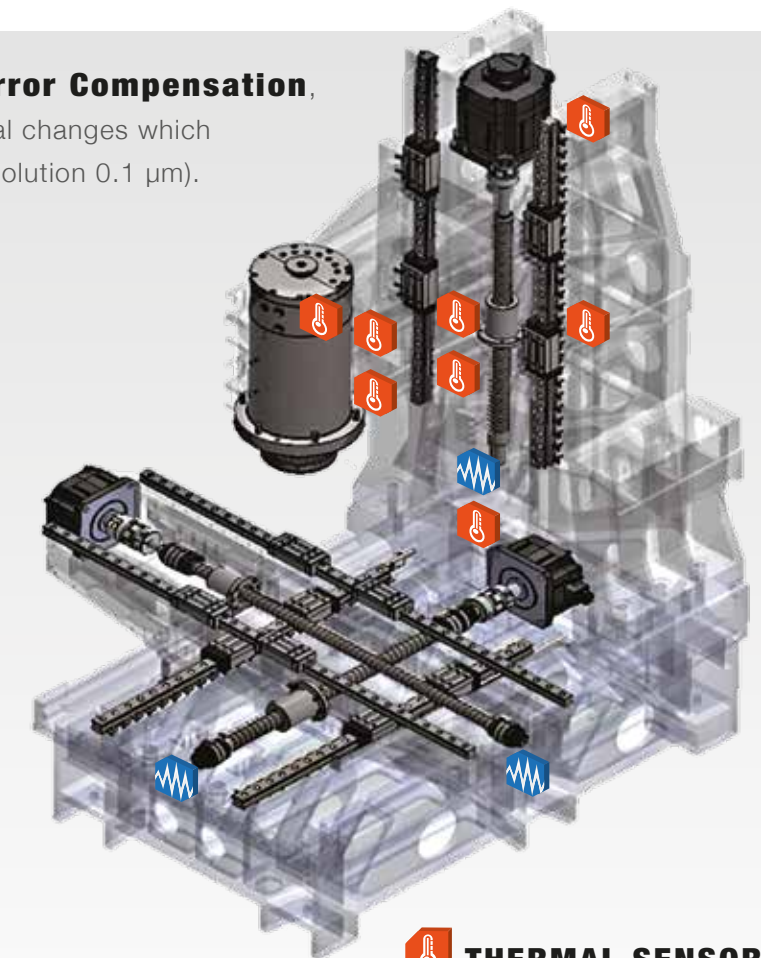
DYPEC[®], Dynamic Predictive Error Compensation, corrects position error caused by thermal changes which improves accuracy and part finishes (resolution 0.1 μm).



DYPEC[®] software chart in HMI

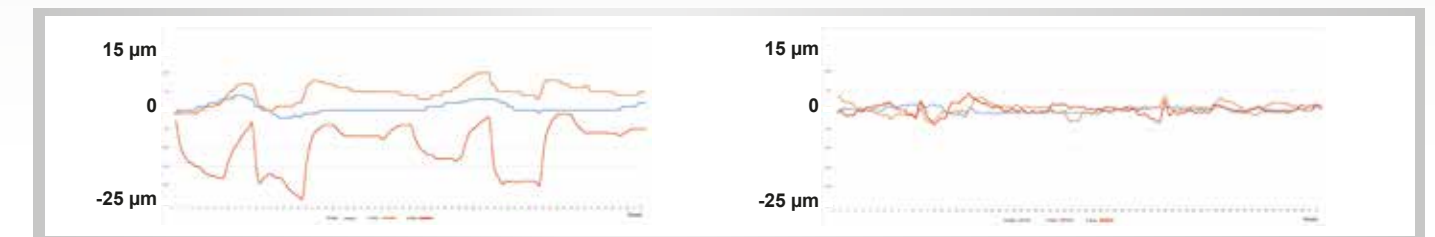


DYPEC[®] mirror milling with ball end mill

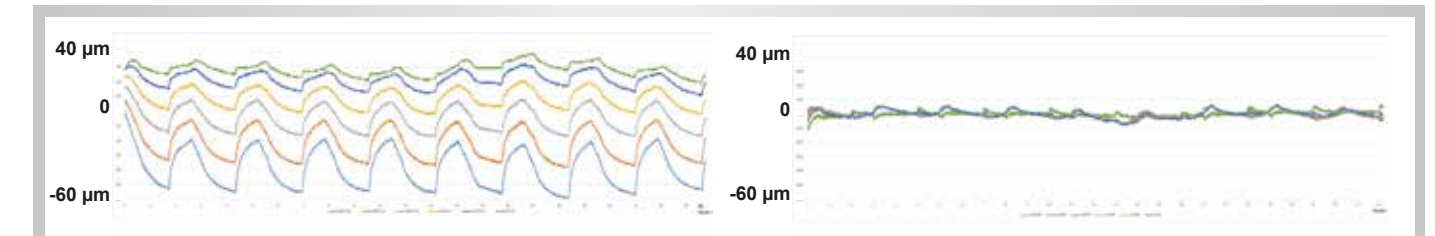


THERMAL SENSOR
DISPLACEMENT SENSOR*

* Optional



Static error before and after DYPEC[®] compensation (48 hours test).



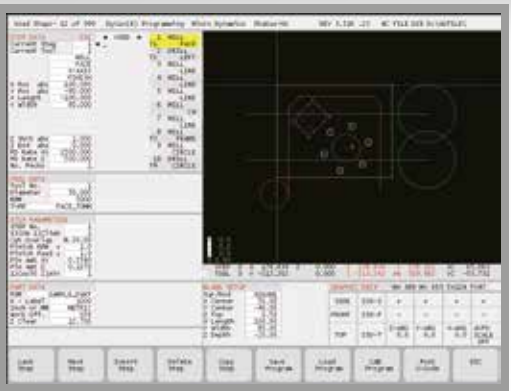
Dynamic axis error before and after DYPEC[®] compensation (36 hours test).

MICRO DYNAMICS HMI

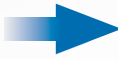
The Windows embedded HMI CNC gives the user the ability to create or add apps to make it flexible to operate and automate the machine. Operator can load, run or edit any program from any device: internal HMI memory, PC hard drive or external USB device.

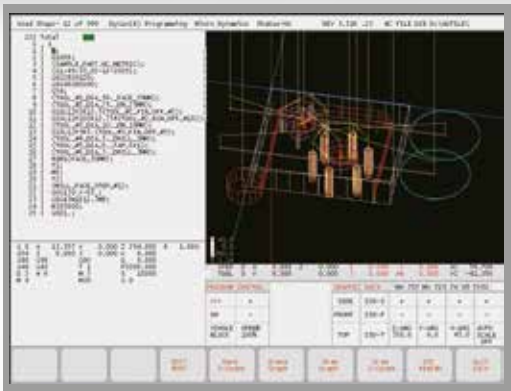
The **MEGA/TERA Series** features Mitsubishi CNC M800 Control which is well suited to high-speed, high-accuracy machining and multi-axis, multi-part system control. Mitsubishi's tool path graphics verification makes it easier for end users to check G-Code program before machining.





G-Code
automatically
generated





DYCON® Dynamic Conversational Program is a new software for the operator to generate G-Code very fast by answering menu questions and getting graphical tool path verification.




MICRO MILL® is an interface that allows any operator to easily perform milling and drilling operations without using G-Code.



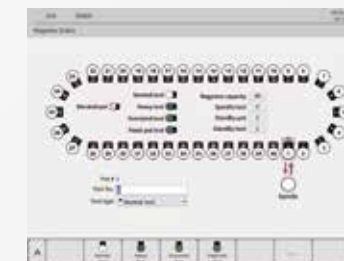
PART SETUP



TOOL SETUP



PART/TOOL PROBE



MAGAZINE MONITOR



ATC Recovery function allows the operator to recover the tool changer.



APC Recovery function allows the operator to recover the pallet changer.

Micro Dynamics® features:

- | | | | | | |
|-------------------------------------|----------------------------------|--|--|--|--|
| ■ Mitsubishi CNC M800 series. | ■ DXF import. | ■ Main and subprograms can be edited and run as one file. | ■ Helical interpolation. | ■ 4G SSS Control (Super Smooth Surface). | ■ Workpiece position offset for rotary axis. |
| ■ 15" Touchscreen display. | ■ 54 Sets work offsets. | ■ Programs can be run from the front side USB or the hard drive. | ■ NURBS interpolation. (*) | ■ Tolerance control. | ■ Inverse time feed. |
| ■ 2,700 Block Look Ahead. | ■ 400 Sets tool life management. | ■ 3D circular interpolation. | ■ Programmable in-position check. | ■ Spiral/conical interpolation. | ■ Polar coordinate command. |
| ■ 20 GB Data Server. | ■ 700 Sets macro variable. | ■ G-Code guidance. | ■ Scaling. | ■ Tool Center Point Control. | ■ Upgradable to 5 axes simultaneous control. (*) |
| ■ 1,000 Programs in editing memory. | ■ 64 Bit microprocessor. | | ■ Simple programming (NAVI mill conversational programming). | ■ 3D tool radius compensation. | |
| ■ 999 Sets in tool compensation. | ■ 2,048 KB Program memory. | | | | |

(*) Optional for U.S. market only.

MEGA 20VAPC



SERVO DRIVEN PALLET CHANGER

Dual pallet changer MEGA 20VAPC is designed for high production. The servo driven pallet changer switches tables in 8.5 sec. With the APC recovery function in the HMI the operator can easily perform maintenance of the pallet changer.



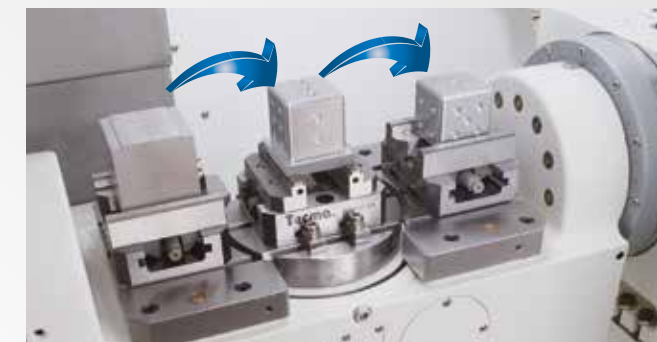
Pressurized cones



MEGA 30VT / TERA 50VT

The MEGA 30VT and TERA 50VT are Micro Dynamics's five-axis trunnion (4+1) table machines with hydraulic brakes. The design allows the user to load three vises or can be used as a 20" x 11.8" work table with a 8.7" diameter face plate* in MEGA 30VT and 28.3" x 15.8" work table with a 12.6" diameter face plate* in TERA 50VT.

For automation the through hole of the rotary table allows for the plumbing of hydraulics, pneumatics or other devices. A true five-axis simultaneous version is available as an option.

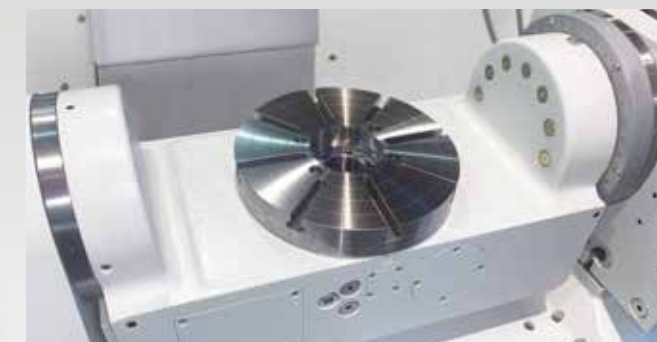


MACHINE 6 SIDES IN ONE LOAD

Left vise: cut dove tail.
Central vise: 5-side machining.
Right vise: finish dove tail.



Tilting axis and Rotary axis motion ranges.



* 11.8" and 13.8" diameter face table available for MEGA 30VT.
* 20" diameter face table available for TERA 50VT.

MACHINING CAPACITY



FACE MILL

- MATERIAL REMOVAL:

50 cu in/min
- SPINDLE LOAD:

87%
- Tool:

2.5" Face Mill
- Material:

1050 Steel
- Cut:

2.00" x 0.25"
- Feedrate:

100 ipm
- Spindle Speed:

2,200 rpm



END MILL

- MATERIAL REMOVAL:

22.5 cu in/min
- SPINDLE LOAD:

47%
- Tool:

1.25" End Mill
- Material:

1050 Steel
- Cut:

1.25" x 0.20"
- Feedrate:

90 ipm
- Spindle Speed:

3,800 rpm



DRILL

- MATERIAL REMOVAL:

53 cu in/min
- SPINDLE LOAD:

87%
- Tool:

1.75" Drill
- Material:

1050 Steel
- Diameter Cut:

1.75"
- Cutting Depth:

1.40"
- Feedrate:

22 ipm
- Spindle Speed:

2,400 rpm



TAP

- SPINDLE LOAD:

46%
- Tool:

1.25" x 7" Tap
- Material:

1050 Steel
- Feedrate:

18.28 ipm
- Spindle Speed:

128 rpm

FACTORY TEST

Micro Dynamics standard factory tests for all models includes the circle, diamond, square cutting test, as well as milling, drilling, tapping and the heavy milling test based on below parameters:

- Tool:

2" End Mill
- Material:

1050 Steel
- Cutting Width:

0.9"
- Cutting Depth:

0.3"
- Feedrate:

55 ipm
- Spindle Speed:

1,100 rpm
- Load:

40%



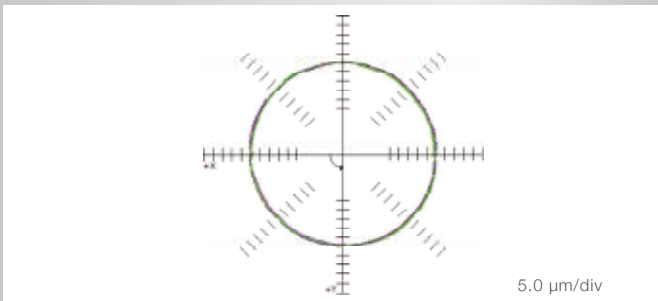
Factory Conditions

ACCURACY

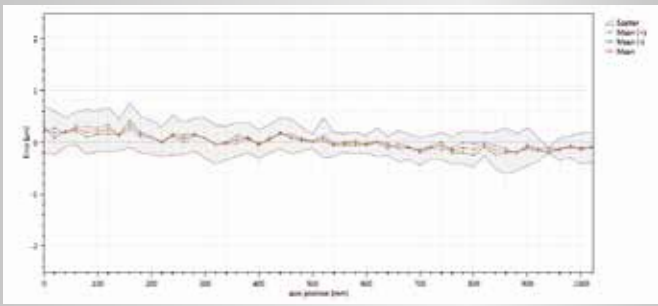


Micro Dynamics circle, diamond, square cutting test is done on all machines prior to shipment at 80 ipm with a maximum tolerance under 5 microns.

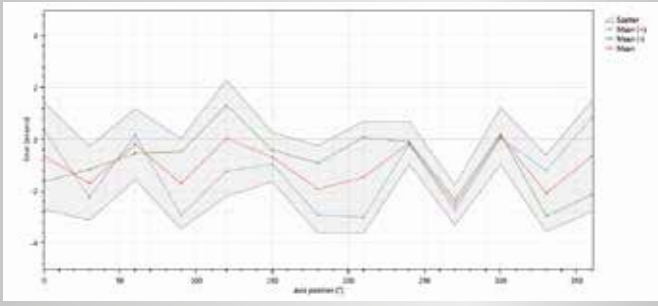
- XY, XZ and YZ Double Ball Bar Test Results at 80 ipm under 5 microns.
- X, Y and Z Axis Laser Compensation under 5 microns.
- 4th and 5th Axis Laser Compensation under 10 arcsecs.



E.g. XY Double Ball Bar Test Results under 5 microns.



E.g. X Axis Laser Compensation under 5 microns.



E.g. 5th Axis Laser Compensation under 10 arcsecs.

16% Squareness	6.3 µm/m
16% Backlash X	← -0.3 µm → 0.9 µm
13% Reversal spikes X	← -0.8 µm → -0.4 µm
12% Cyclic error Y	↑ 0.8 µm ↓ 0.7 µm
10% Lateral play X	← 0.8 µm → 0.4 µm
Circularity	2.7 µm

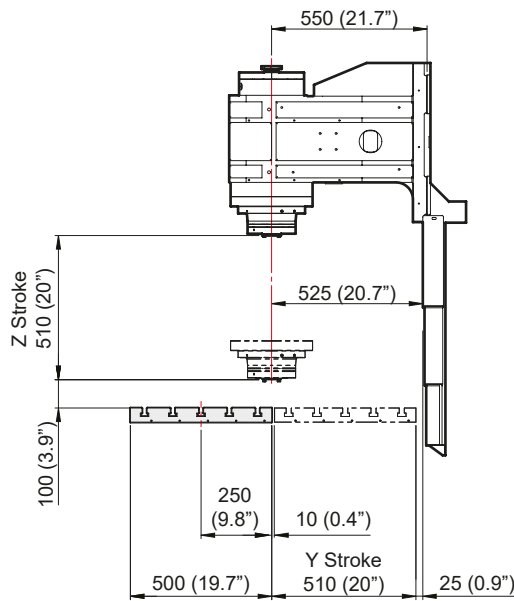
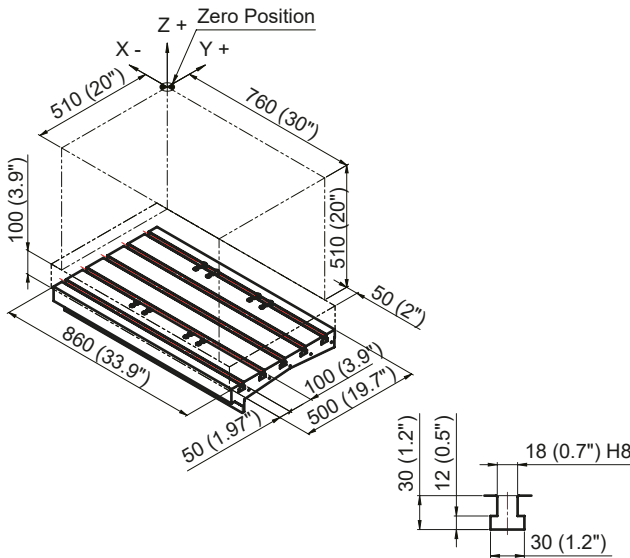
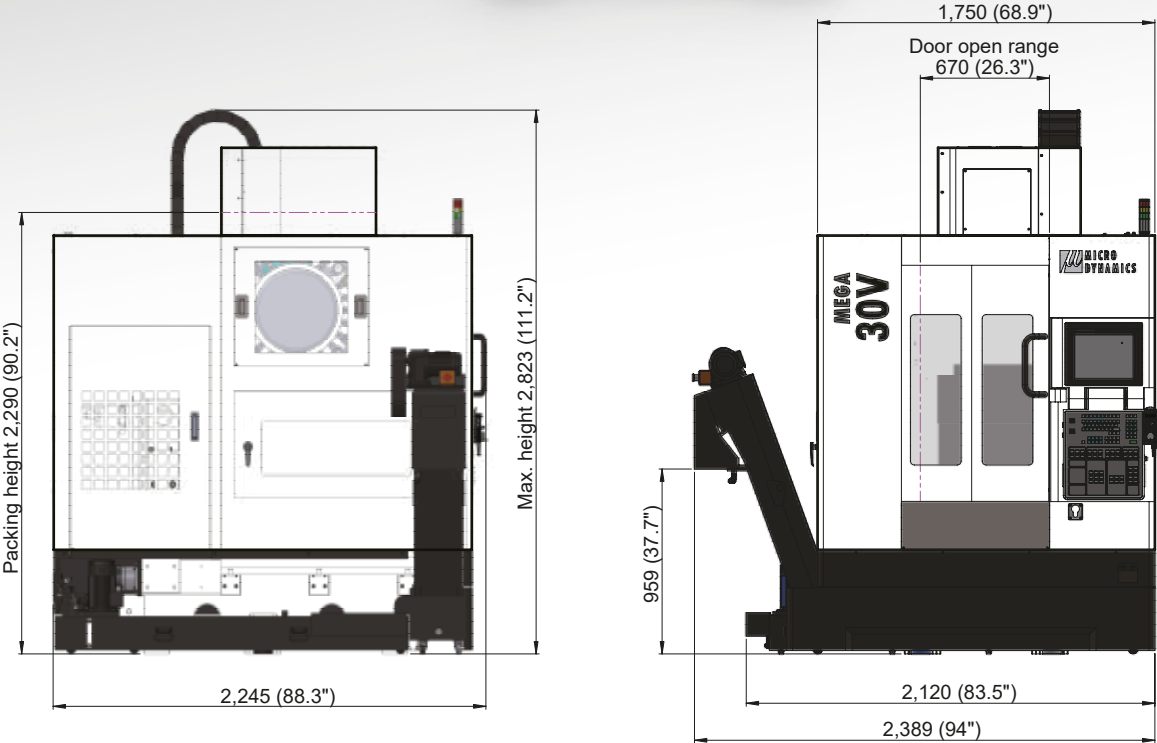
Linear X - Analysis features VDI 3441	
Name	Value (µm)
Maximum reversal (U max)	0.2
Maximum scatter (Ps max)	0.8
Positional uncertainty (P)	1.4
Positional deviation (Pa)	0.5
Mean reversal	0.1
Mean scatter (Ps mean)	0.5

Angular C - Analysis features VDI 3441	
Name	Value (arcsecs)
Maximum reversal (U max)	3.1
Maximum scatter (Ps max)	2.1
Positional uncertainty (P)	5.9
Positional deviation (Pa)	2.7
Mean reversal	1.5
Mean scatter (Ps mean)	1.5

MEGA 30V



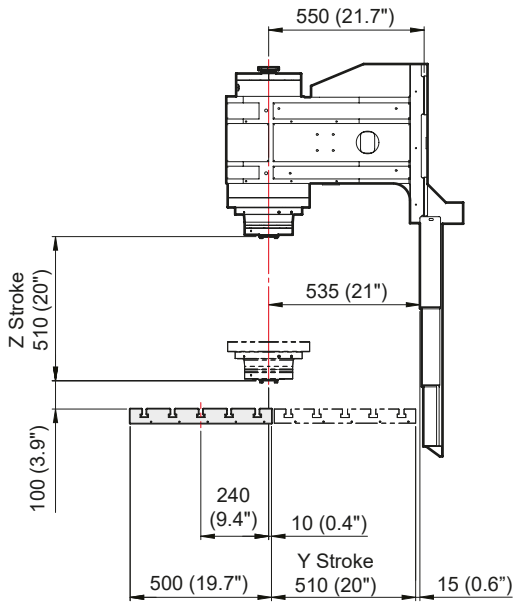
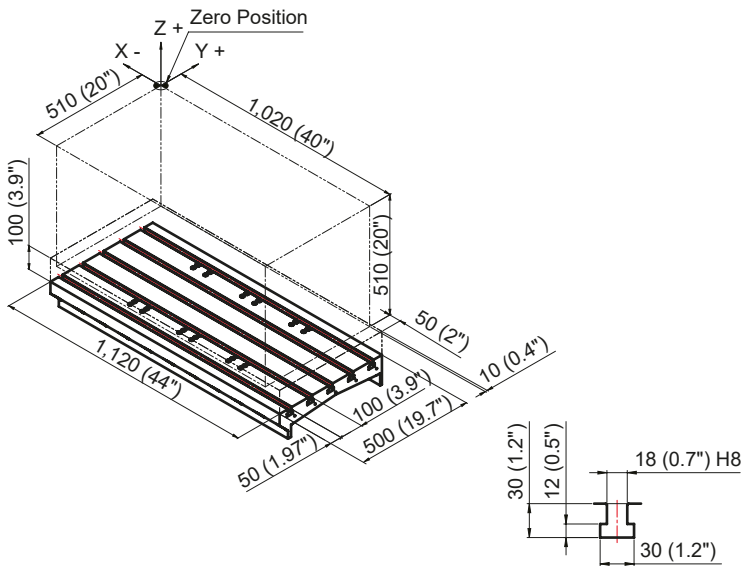
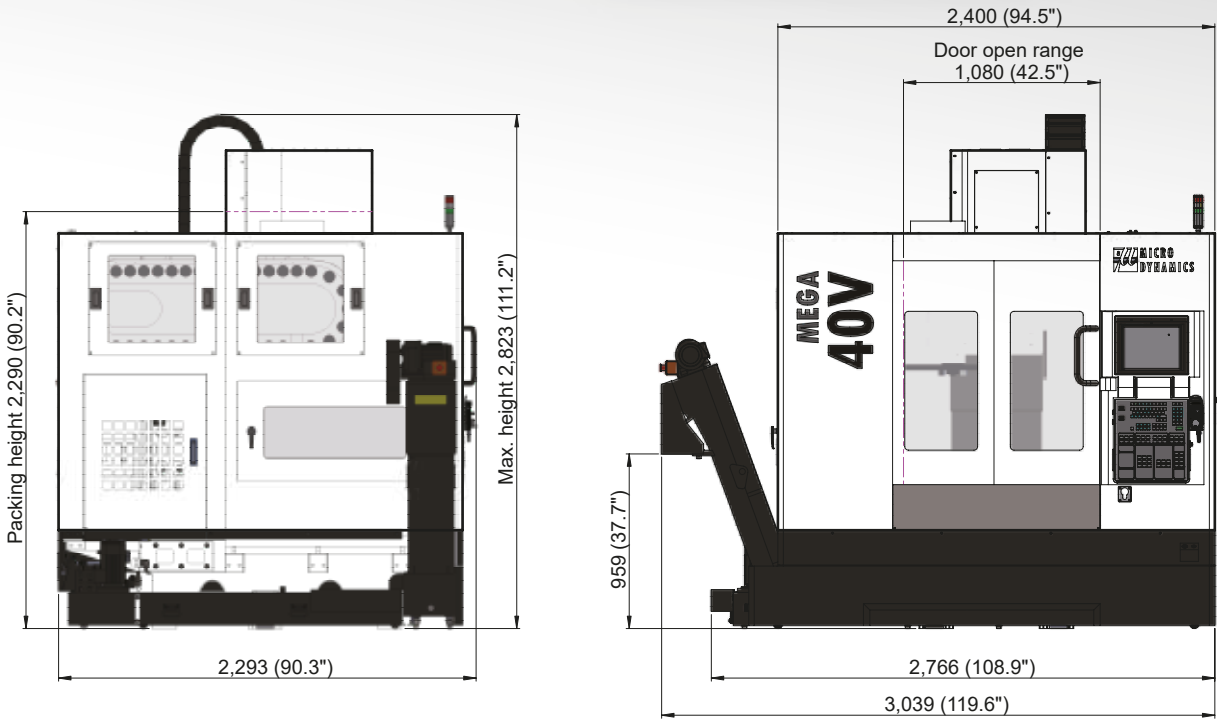
MACHINE DIMENSIONS



MEGA 40V



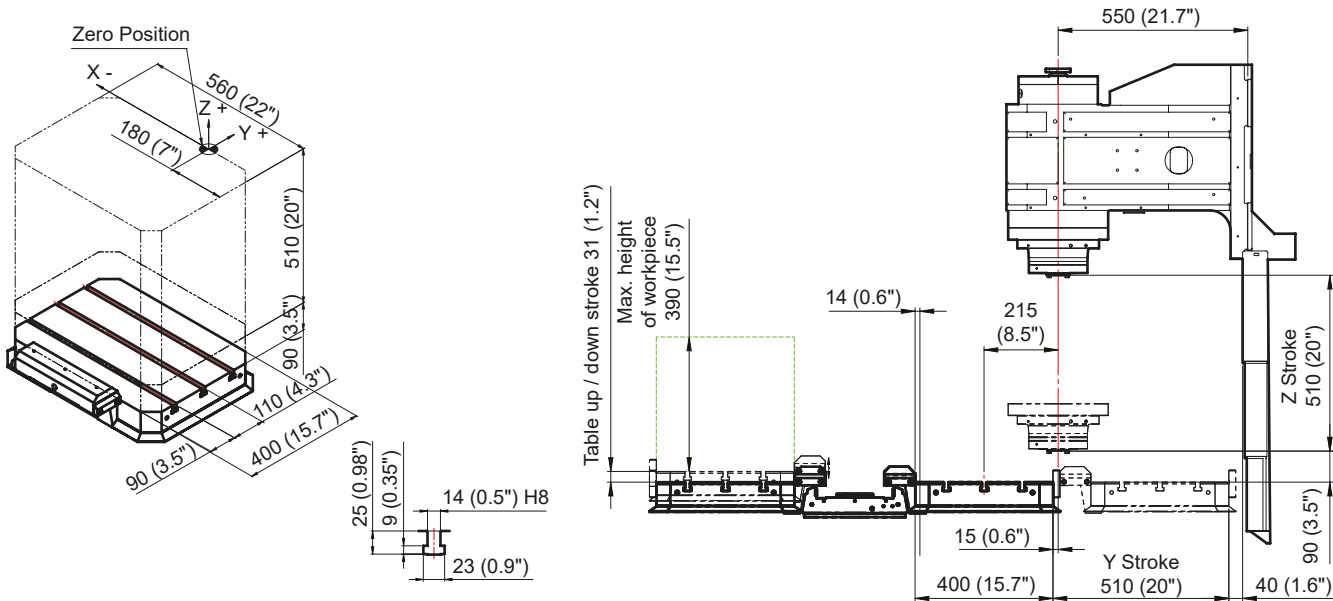
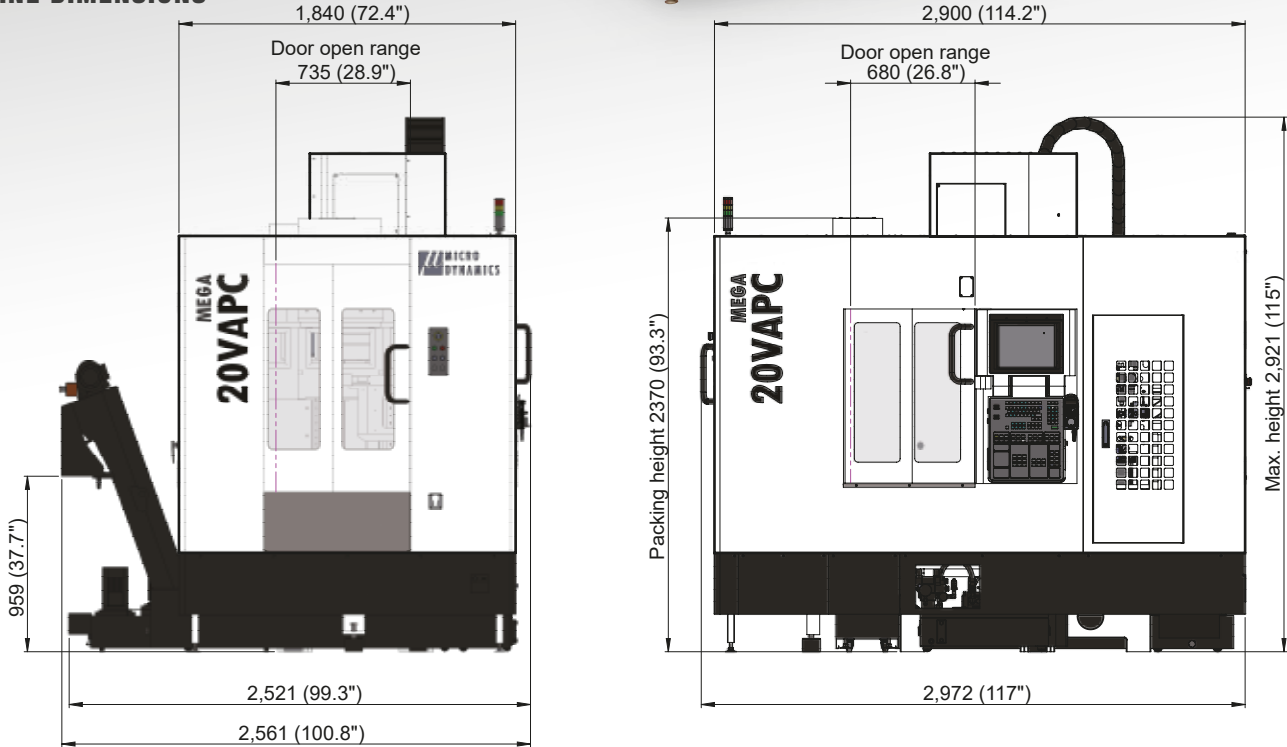
MACHINE DIMENSIONS



MEGA 20VAPC



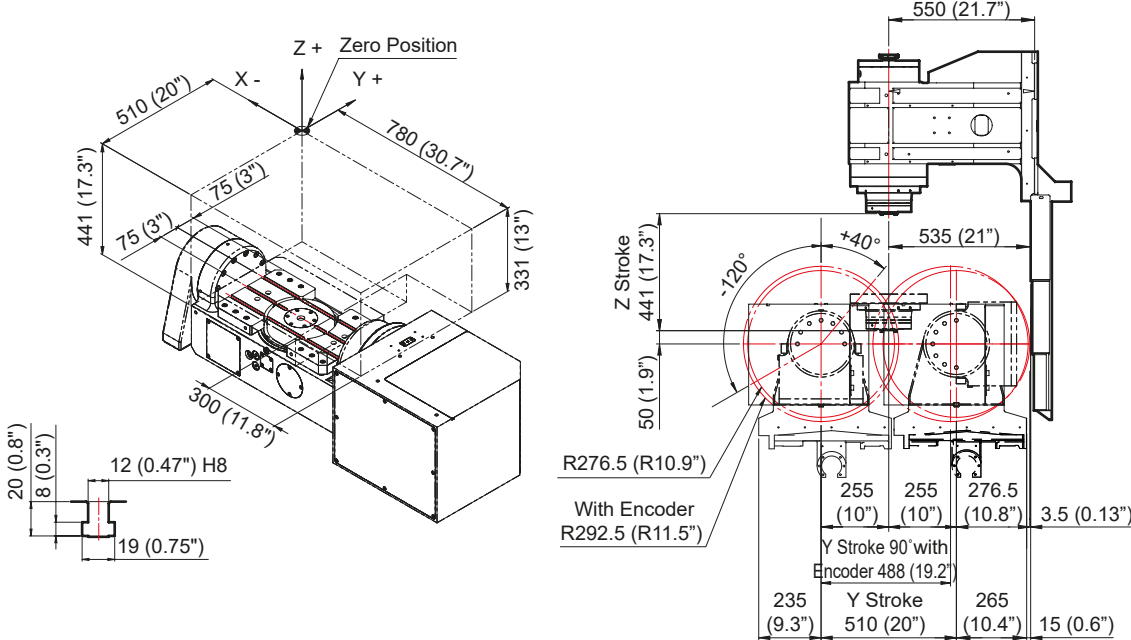
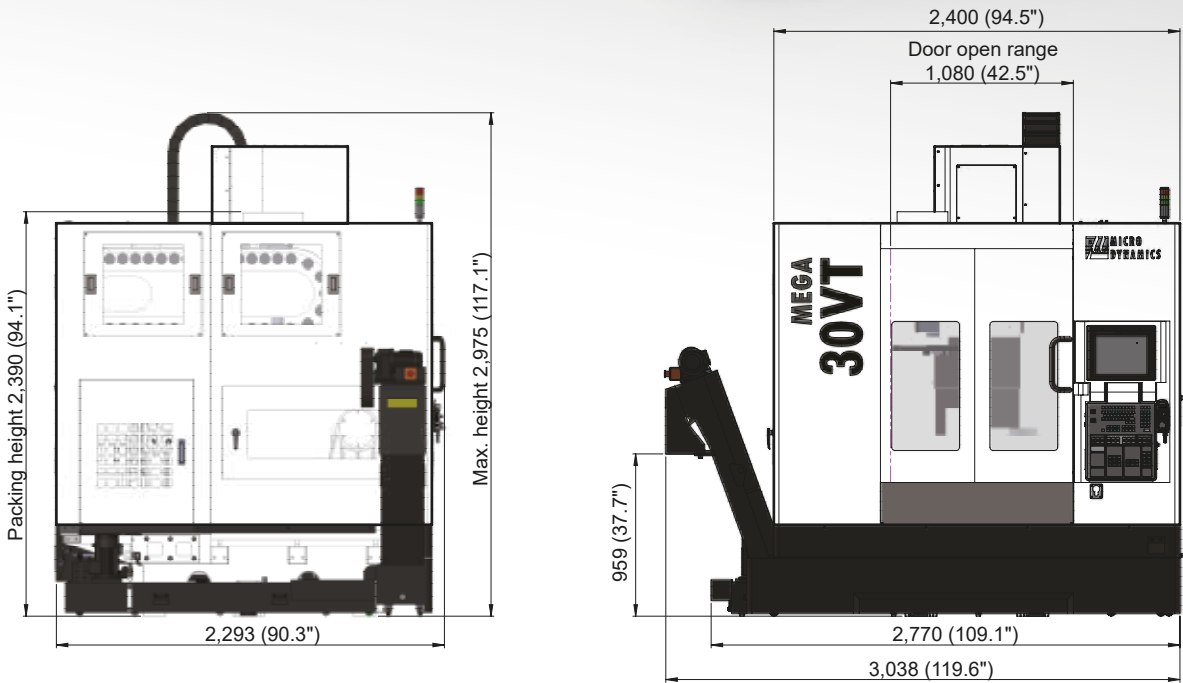
MACHINE DIMENSIONS



MEGA 30VT



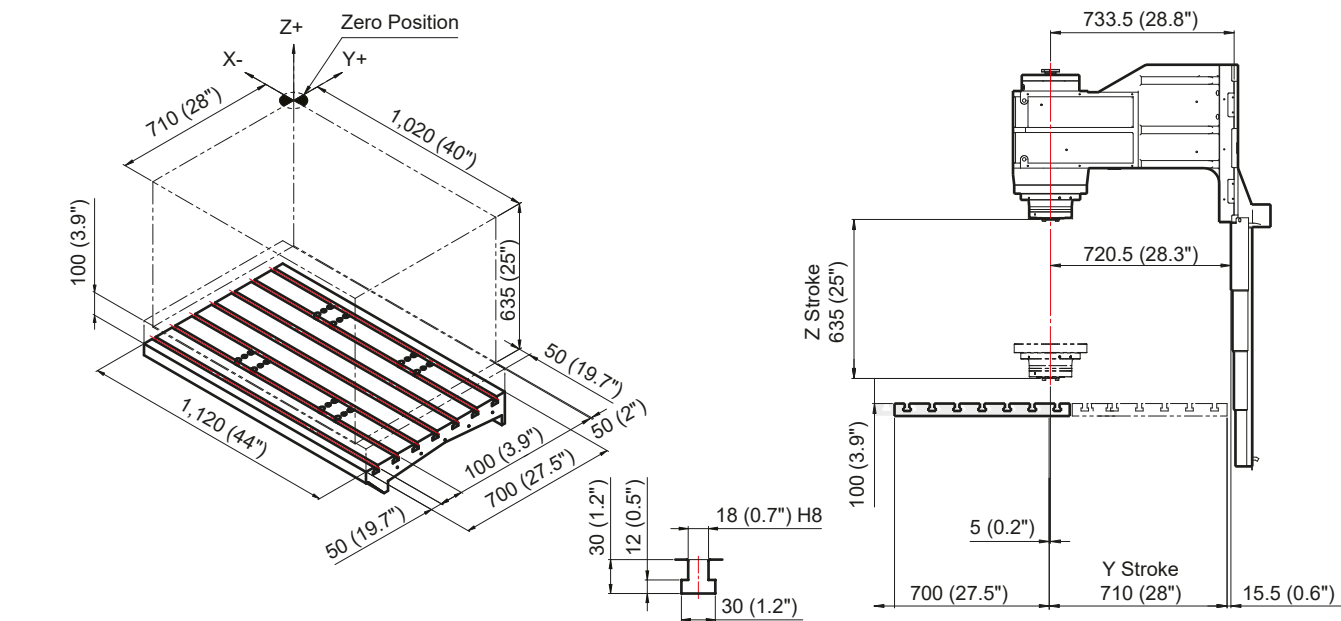
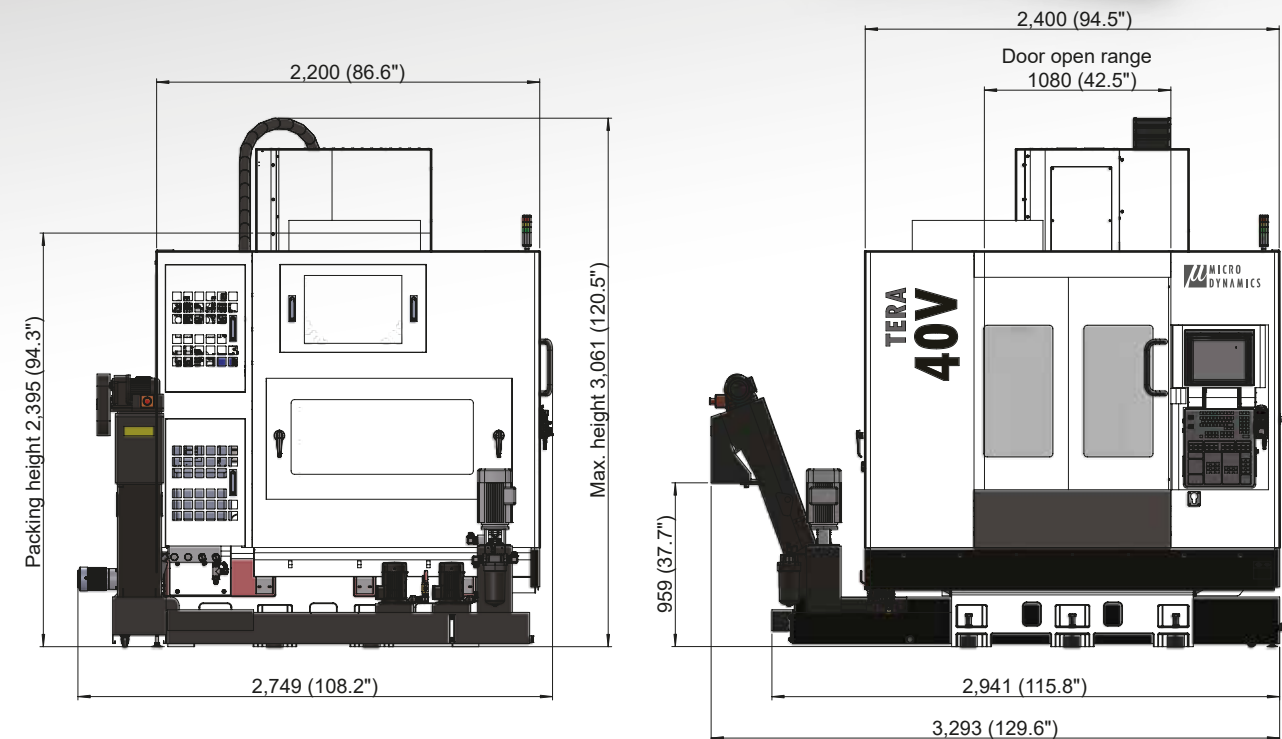
MACHINE DIMENSIONS



TERA 40V



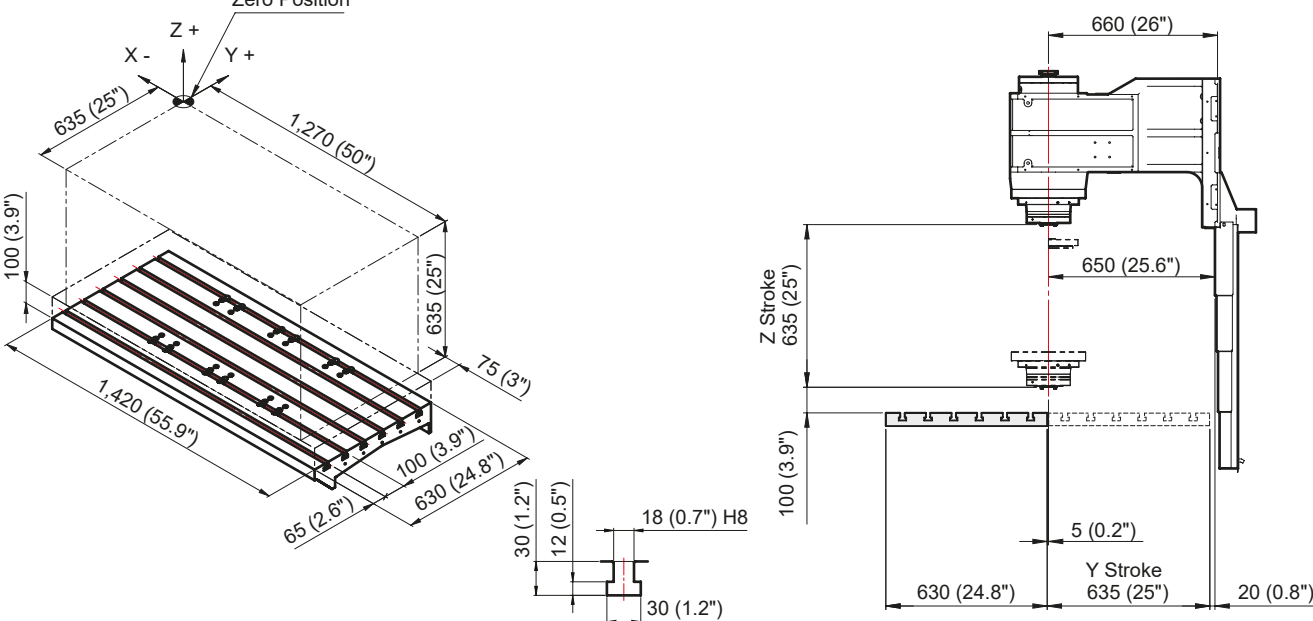
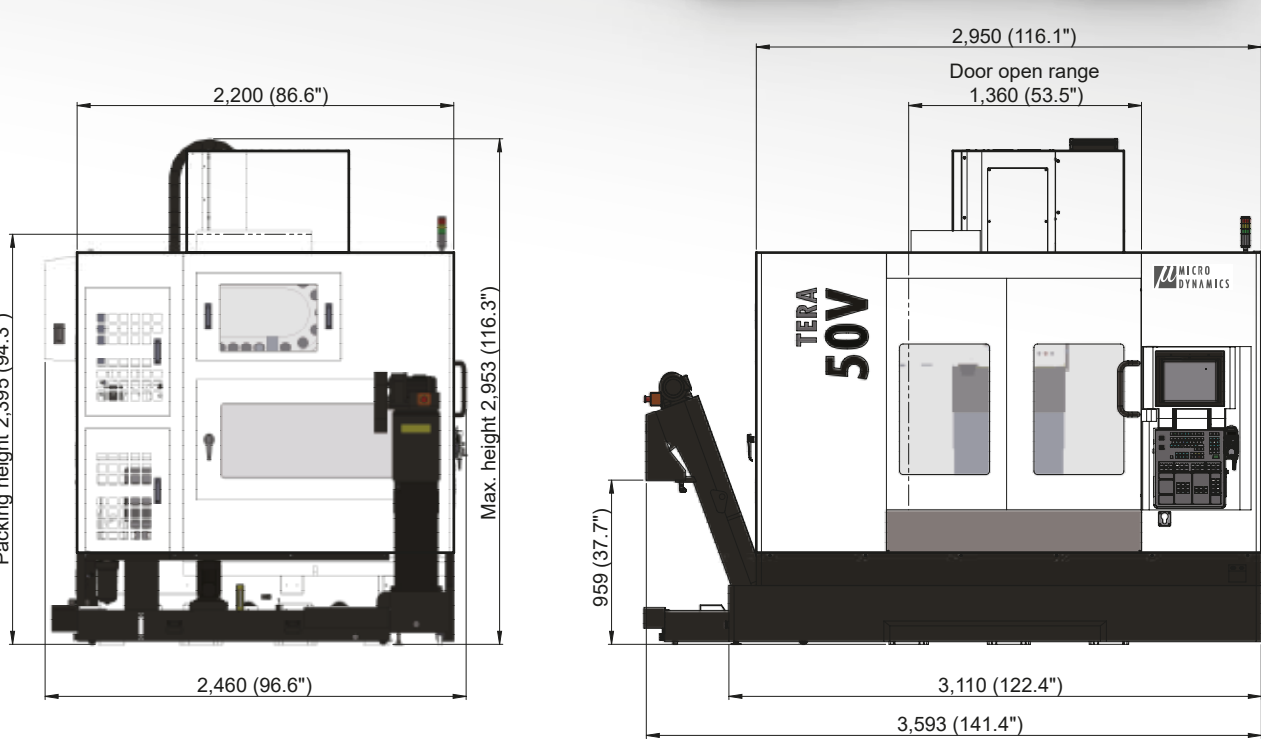
MACHINE DIMENSIONS



TERA 50V



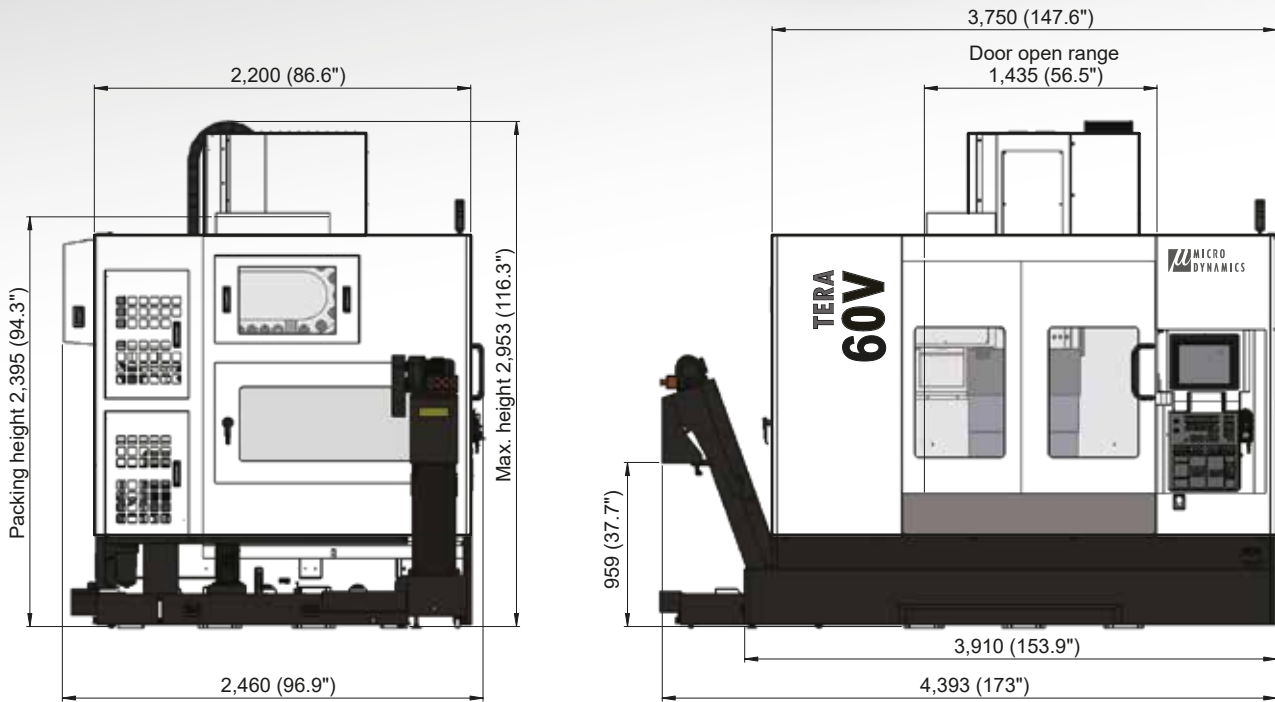
MACHINE DIMENSIONS



TERA 60V



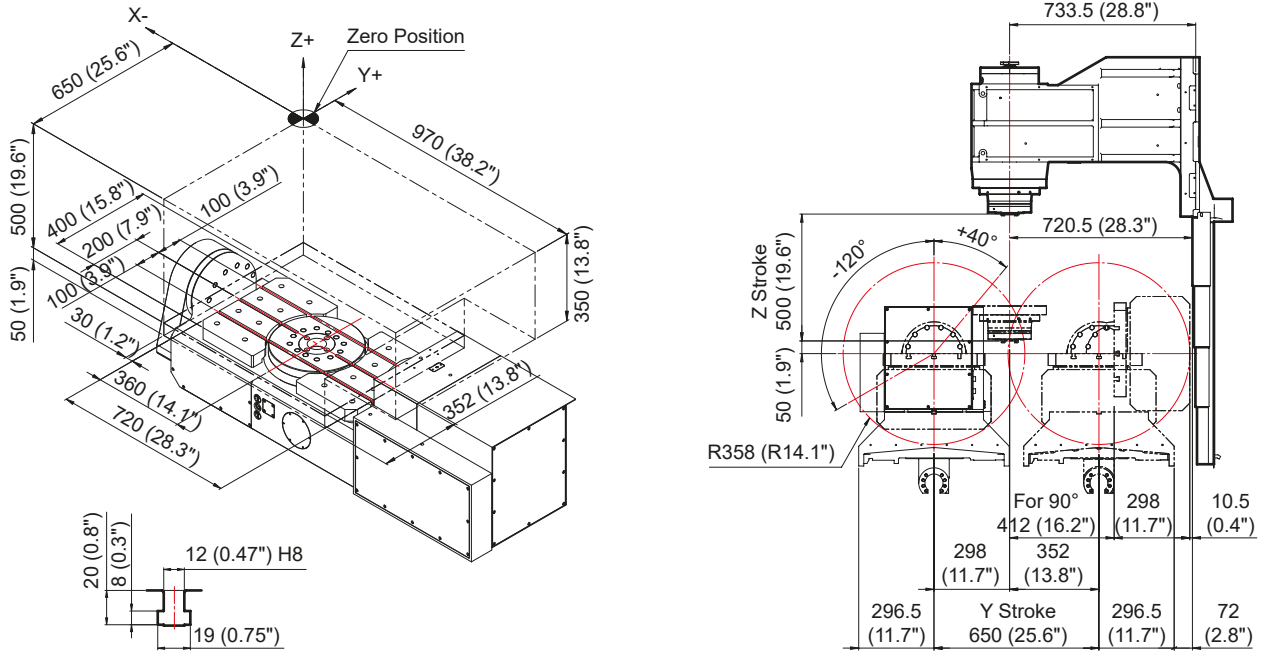
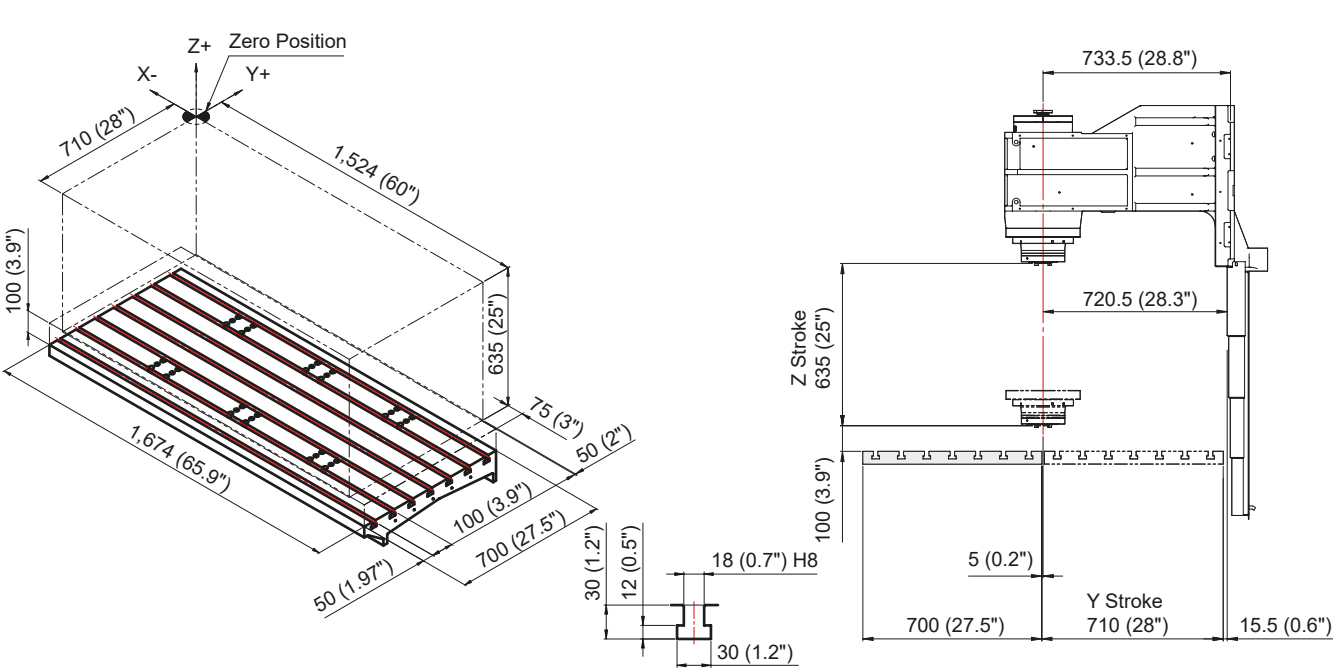
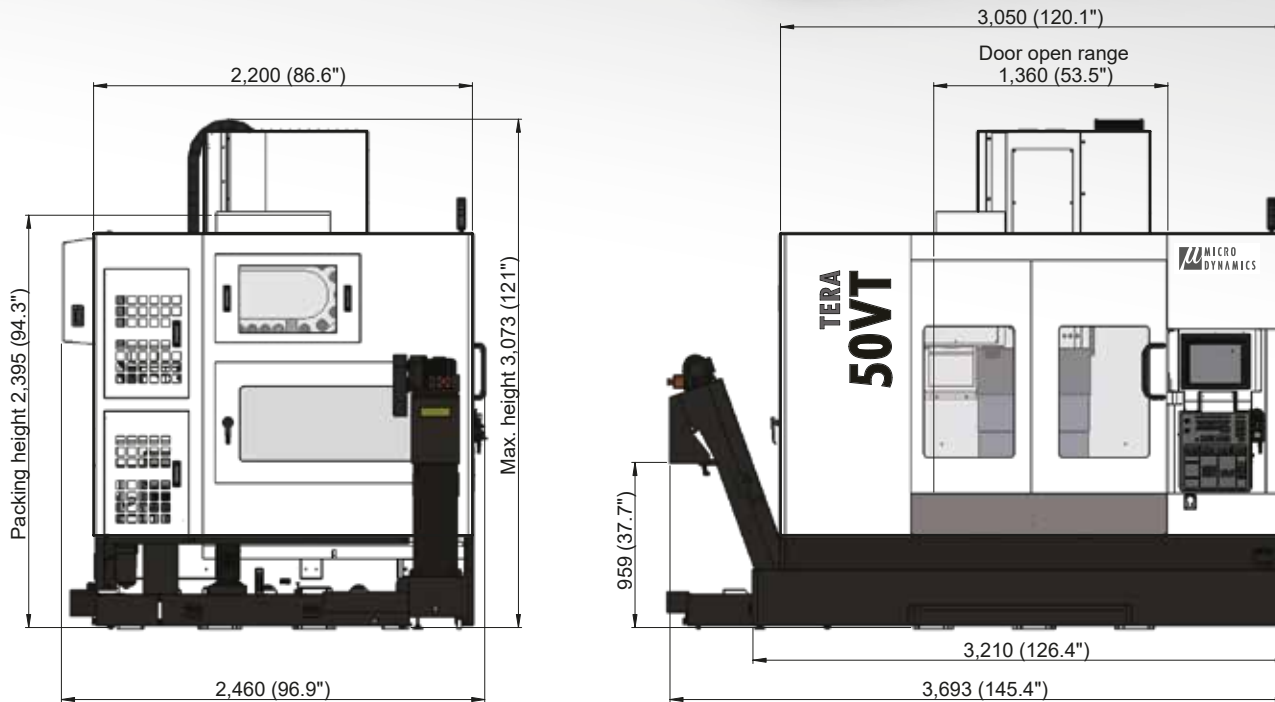
MACHINE DIMENSIONS



TERA 50VT



MACHINE DIMENSIONS

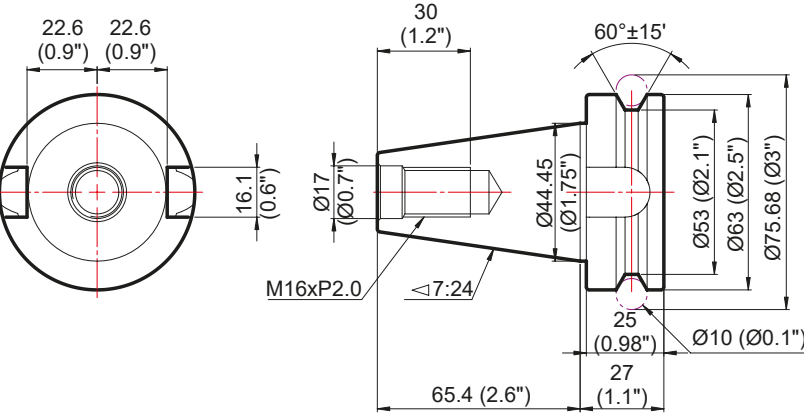


EQUIPMENT

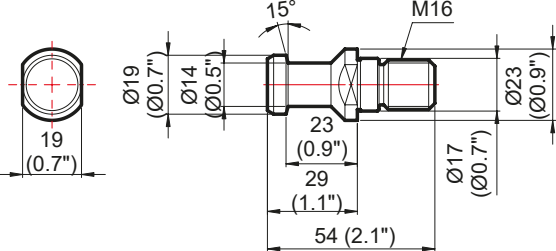
SERIES / MODELS	MEGA				TERA			
	30V	40V	20VAPC	30VT	40V	50V	60V	50VT
15,000 rpm Built-in Spindle	●	●	●	●	●	●	●	●
18,000 rpm Built-in Spindle	○	○	○	○	○	○	○	○
20,000 rpm Built-in Spindle	○	○	○	○	○	○	○	○
DYPEC® Thermal Compensation	●	●	●	●	●	●	●	●
DYPEC® Ball Screws Pitch Error Compensation	○	○	○	○	○	○	○	○
Tool Magazine Capacity - 30	●	-	-	-	●	-	-	-
Tool Magazine Capacity - 40	-	●	●	●	-	●	●	●
15" Touchscreen Display	●	●	●	●	●	●	●	●
Micro Dynamics® HMI	●	●	●	●	●	●	●	●
Full Chip Enclosure	●	●	●	●	●	●	●	●
Scraper Type Lift-up Chip Conveyor	●	●	●	●	●	●	●	●
Chain Type Lift-up Chip Conveyor	○	○	○	○	○	○	○	○
Rear Exit Lift-up Chip Conveyor*	○	○	○	○	●	○	○	○
Twin Chip Augers	●	●	●	●	●	●	●	●
CTS Preparation (without Rotary Union)	●	●	●	●	●	●	●	●
20-Bar (290 psi) / 40-Bar (580 psi) / 70-Bar (1,000 psi) CTS	○	○	○	○	○	○	○	○
Metal Coolant Ring	○	○	○	○	○	○	○	○
ATC Magazine Panel	-	●	●	●	-	●	●	●
Tool Magazine LED	-	●	●	●	-	●	●	●
Automatic Power Off	●	●	●	●	●	●	●	●
Safety Door	●	●	●	●	●	●	●	●
Spinning Window	○	○	○	○	○	○	○	○
CE-Conformity Package	○	○	○	○	○	○	○	○
X/Y/Z Axis Linear Scale (Fagor / Heidenhain)	○	○	○	○	○	○	○	○
A/C Axis Rotary Scale (Fagor / Heidenhain)	-	-	-	○	-	-	-	○
Automatic Door (Pneumatic / Servo)	○	○	○	○	○	○	○	○
Tool Measurement / Workpiece Measurement	○	○	○	○	○	○	○	○
Column Riser*	○	○	○	○	○	○	○	○
Disc Type Oil Skimmer	○	○	○	○	○	○	○	○
4th Axis Pre-wiring	○	○	○	○	○	○	○	○
300 mm (11.8") / 350 mm (13.7") Diameter Face Table	-	-	-	○	-	-	-	-
500 mm (19.6") Diameter Face Table	-	-	-	-	-	-	-	○
8 M-Codes (M20 ~ M27)	●	●	●	●	●	●	●	●
Extra 8 M-Codes (M130 ~ M137)	○	○	○	○	○	○	○	○
Oil Mist Collector	○	○	○	○	○	○	○	○
Transformer	○	○	○	○	○	○	○	○
Manuals / Tool Kit / Foundation Kit	●	●	●	●	●	●	●	●

* Factory order ● Standard ○ Optional

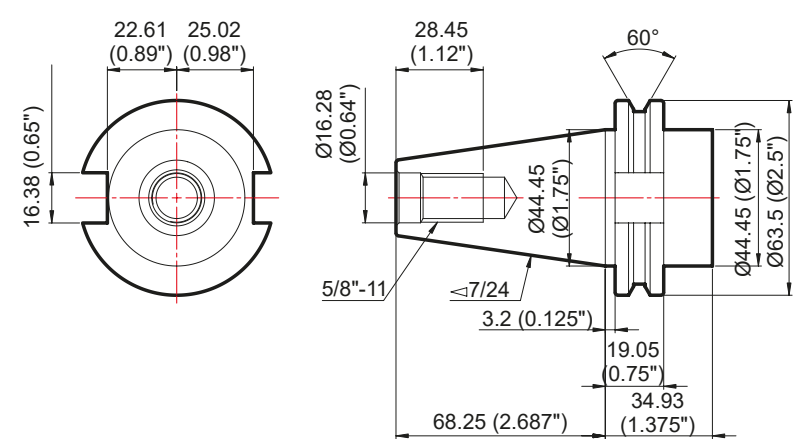
Tool Shank BT40



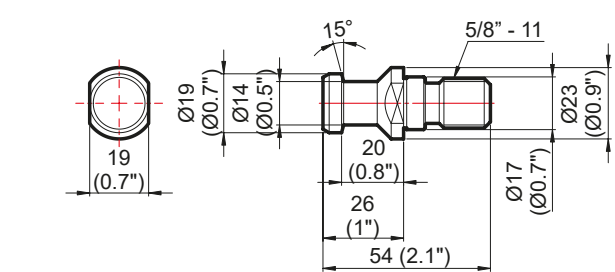
Pull Stud JIS6339B



Tool Shank CAT40



Pull Stud CAT40



SPECIFICATIONS

ITEM		UNIT	MEGA 30V	MEGA 40V	MEGA 20VAPC	MEGA 30VT	TERA 40V	TERA 50V	TERA 60V	TERA 50VT
TRAVEL	X Axis	inch	30"	40"	24"	30"	40"	50"	60"	38"
	Y Axis	inch	20"	20"	20"	20"	28"	25"	28"	25.5" / 27.9" (90°)
	Z Axis	inch	20"	20"	20"	17.3"	25"	25"	25"	19.6"
	A Axis (Tilting Axis)	deg	N/A			40° ~ -120°	N/A			40° ~ -120°
	C Axis (Rotary Axis)	deg	N/A			360°	N/A			360°
	Spindle Nose to Table Surface	inch	4" ~ 24"	4" ~ 24"	3.5" ~ 23.5"	2" ~ 19.3"	4" ~ 29"	4" ~ 29"	4" ~ 29"	2" ~ 21.6"
	Spindle Center to Column Front	inch	21.7"					28.8"	26"	28.8"
TABLE	Table Size	inch	34" x 20"	44" x 20"	22" X 15.7"	ø8.7" (20" x 11.8")	44" x 27.5"	55.9" x 24.8"	65.9" x 27.5"	ø12.6" (28.3" x 15.8")
	Min. Table Index Unit	deg	N/A			0.001°	N/A			0.001°
	Max. Table Load	lb	1,800	2,200	440 x 2	330 (0°~45°) / 190 (45°~90°)	3,300	3,300	4,400	440 (0°~45°) / 330 (45°~90°)
	Table Height (from the Ground)	inch	33"	33"	37"	43"	35"	35"	35"	47"
SPINDLE	Spindle Taper		40 Taper Dual Contact							
	I.D. of Spindle Bearing	inch	ø2.75"							
	Max. Cutting Torque	ft-lb	104							
	Spindle Speed	rpm	50 ~ 15,000 (Opt. 20,000)							
	Max. Speed for Rigid Tapping	rpm	6,000							
FEEDRATE	Rapid Feedrate - X Axis	ipm	2,047	2,047	2,047	1,889	2,047	2,047	2,047	1,889
	Rapid Feedrate - Y Axis	ipm	2,047	2,047	2,047	1,889	2,047	2,047	2,047	1,889
	Rapid Feedrate - Z Axis	ipm	1,889	1,889	1,889	1,889	1,889	1,889	1,889	1,889
	Rapid Feedrate - A (Tilting) Axis	rpm	N/A			25	N/A			33
	Rapid Feedrate - C (Rotary) Axis	rpm	N/A			33	N/A			66
	Cutting Feedrate	ipm	0 ~ 787							
ATC	Magazine Capacity		30	40			30	40		
	Tool Selection		Bi-Direction / Random							
	Tool Shank Type		BT40 / CAT40 / DIN40							
	Pull Stud Type		BT40 / CAT40 / DIN40							
	Max. Tool Diameter x Length	inch	ø3" x 9"	ø3" x 12"	ø3" x 10"	ø3" x 12"				
	Without Adjacent Tool	inch	ø6"							
	Max. Tool Weight	lb	16							
PERIPHERAL	Power Consumption (220V/3PH)	KVA	30				40			
	Pneumatic Supply	L/min (ANR)	300 (0.6MPa)							
	Cutting Coolant Pump Motor	hp	1.5							
	Base Wash Pump Motor	hp	1				1.5			
	CTS Pump Motor (Opt.)	hp	4							
	Coolant Tank Capacity	gal	66	79	79	79	92	105	105	105
	Foot Print Size (W x D)	inch	94" x 88.3"	119.6" x 90.3"	100.8" x 117"	119.6" x 90.3"	129.6" x 108.2"	141.4" x 96.9"	173" x 96.9"	145.4" x 96.9"
	Machine Height (H)	inch	111.2"	111.2"	115"	117.1"	120.5"	116.3"	116.3"	121"
	Packing Size (W x D x H)	inch	108.4" x 90.2" x 100.4"	130" x 91" x 100.4"	126" x 86.6" x 100.4"	130" x 91" x 100.4"	130" x 91" x 100.4"	153.5" x 91" x 100.4"	167.3" x 91" x 100.4"	159.5" x 96.5" x 100.4"
	Machine Net Weight	lb	9,970	12,390	14,240	13,390	15,880	16,540	17,640	18,080
	Machine Gross Weight	lb	10,390	12,900	14,950	13,890	16,760	17,420	18,530	18,960
	Positioning Accuracy / Full Stroke	inch	0.0002" (VDI 3441)							
	Repeatability Accuracy	inch	0.0001"							



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