PUMA MX series

Multi-Tasking Turning Center

Doosan Machine Tools

Optimal Solutions for the Future

PUMA MX series

The integration of machining center and turning center gives you unmatched flexibility in a wide variety of part configurations. From simple turning and milling, to complex multi-axis simultaneous machining, all operations can be completed in one machine. Off-center machining with the Y-axis and milling of angled surfaces with the B-axis greatly increases the range of machine applications.

Multi-Tasking Turning Center

Machine Construction

The milling spindle(s) and the lower turret can be coordinated to enable machining at the left or right spindle.

Multi-process capability
Shorter setup times
Optimal cycle distribution
Automated operation support

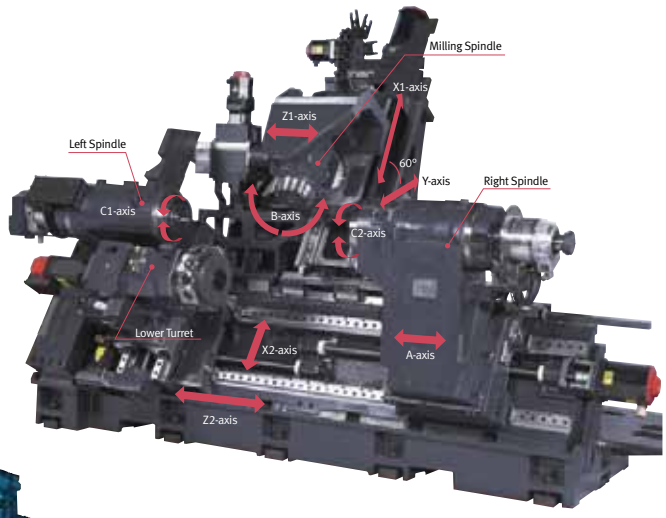
PUMA MX -
maximum economy and productivity

Robust Design PUMA MX2100

Stable base for supporting multi-machining

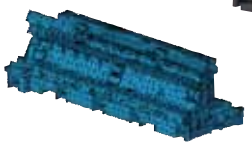
The heavily ribbed torque tube design prevents twisting and deformation. All guideways are wide wrap-around rectangular type for unsurpassed long-term rigidity and accuracy.

	Guideway span
	MX2100
X1-axis	**285 / 315** mm (11.2 / 12.4 inch)
Z1-axis	**540 / 473** mm (21.3 / 18.6 inch)
Y-axis	**435** mm (17.1 inch)



FEM

Finite Element Method (FEM) analysis results in superior machine stability.

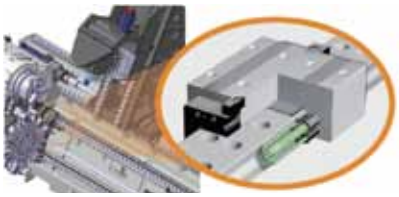


Linear Motion Guide (Roller type)

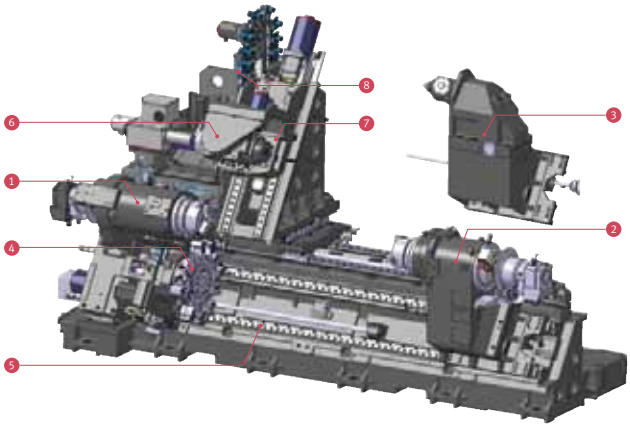
All carriages are mounted on roller-type, linear motion guides to provide high accuracy and rigidity while reducing non-cutting time.

- Zero clearance from preload → High permissible load
- Low friction & wear (LM μ = 0.002~0.003)
- Simple maintenance over the long haul

	Rapid traverse
X1-axis	**36** m/min (1417.3 ipm)
Z1-axis	**36** m/min (1417.3 ipm)
Y-axis	**26** m/min (1023.6 ipm)



LMG (Roller type)



PUMA MX1600

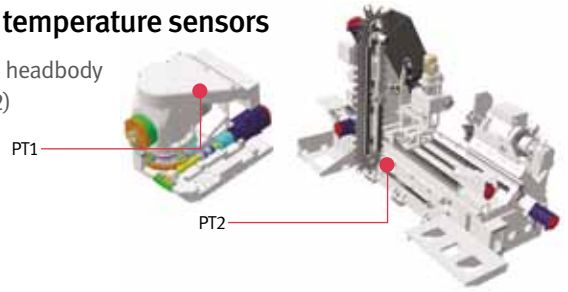
	PUMA MX1600	PUMA MX1600S	PUMA MX1600T	PUMA MX1600ST
1 Left spindle (Mill-turn) : 175mm (6") chuck	●	●	●	●
2 Right spindle (Mill-turn) : 175mm (6") chuck	×	●	×	●
3 Tail stock : Servo driven type	●	×	●	×
4 Lower turret : 16-station 6000 r/min rotary tool	×	×	●	●
5 Roller guide ways for all axes	●	●	●	●
6 Milling spindle : 12000 r/min, Capto C5	●	●	●	●
7 B-axis : Roller gear cam	●	●	●	●
8 ATC & Magazine : 40 ea, Servo driven	●	●	●	●

Thermal compensation system

Milling spindle thermal growth can be compensated for spindle axis direction only. Effectively removes positional deviation of spindle nose due to changing rotational speed.

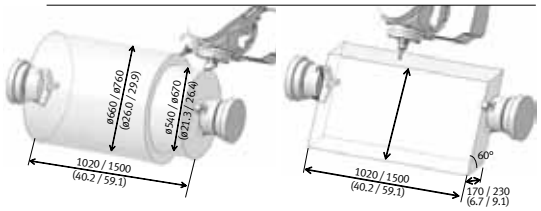
Position of temperature sensors

Milling spindle headbody (PT1), bed (PT2)



Axis Features

Max. working diameter, length (MX 2100 / MX 2600, 3100)



Axis travel

Unit : mm (inch)

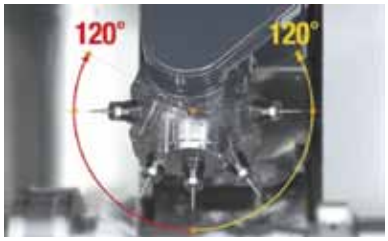
	PUMA MX 2100/2100L	PUMA MX2600/3100	MX1600
X1-axis	565 (22.2)	630 (24.8)	450 (332.1)
X2-axis	187 (7.4)	220 (8.7)	165 (121.8)
Z1-axis	1050/1550 (41.3 / 61.0)	1585 (62.4)	935 (690.0)
Z2-axis	1050/1550 (41.3 / 61.0)	1515 (59.7)	925 (682.7)

Rapid travel

Unit : m/min (ipm)

	PUMA MX2100ST	PUMA MX2600ST	MX1600
X1-axis	36 (1417.3)	36 (1417.3)	36 (1417.3)
X2-axis	24 (944.9)	24 (944.9)	24 (944.9)
Z1-axis	36 (1417.3)	36 (1417.3)	36 (1417.3)
Z2-axis	36 (1417.3)	36 (1417.3)	36 (1417.3)
A-axis	30 (1181.1)	30 (1181.1)	
C-axis	400 (15748.0) r/min	400 (15748.0) r/min	

B-Axis with Virtual Y-Axis



High rigid roller gear cam

B-axis rotating range std.

Precise indexing control of B-axis makes milling jobs on inclined plane possible.

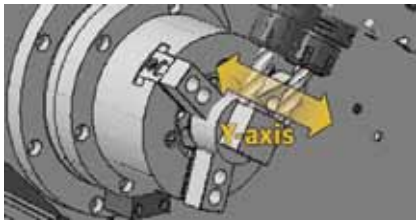
- 5° indexing (by coupling clamp)
- Contouring control in 0.001° increment

B-axis rotation range ± 120°
B-axis indexing time 2 s (90°)

Precision control B-axis movement

The angular position of the B-axis is controlled using precision ground roller gear cam and a highly accurate servo motor.

Virtual Y-axis function



A rigid, double-slide Y-axis construction withstands cutting forces generated during heavy-duty turning and milling.

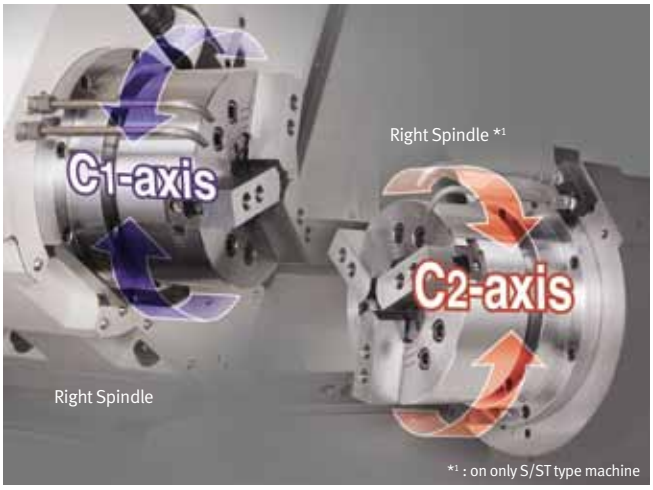
Y-axis stroke 170 mm (6.7 inch) / 230 mm (9.1 inch)
[±85 mm (3.4 inch) / ±115 mm (4.5 inch)]
Y-axis rapid traverse 26 m/min (1023.6 ipm)

Main Spindle

The Perfect Design for Built-in Motor-Driven Spindles.

Main Spindle

Both spindles, left and right, are engineered to minimize the loss of precision through thermal distortion, and to ensure superior performance in applications ranging from heavy-duty cutting at high power and low speed, to fine finishing at high speed.

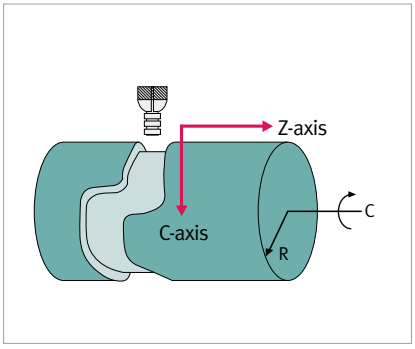


	Max. spindle speed	Motor (30 min)
PUMA MX1600	6000 r/min	15 kW (20.1 Hp)
PUMA MX2100	5000 r/min	22 kW (29.5 Hp)
PUMA MX2600	4000 r/min	26 kW (34.9 Hp)
PUMA MX3100	3000 r/min	30 kW (40.2 Hp)

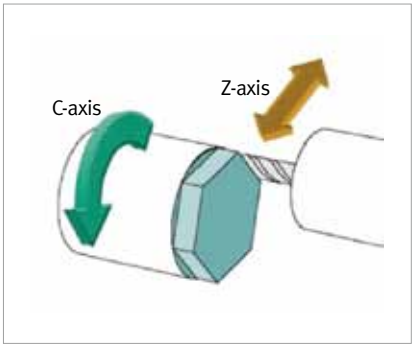
Perfect C-axis control of both spindles

C1, C2-axis index **360°** [in 0.001° increment]

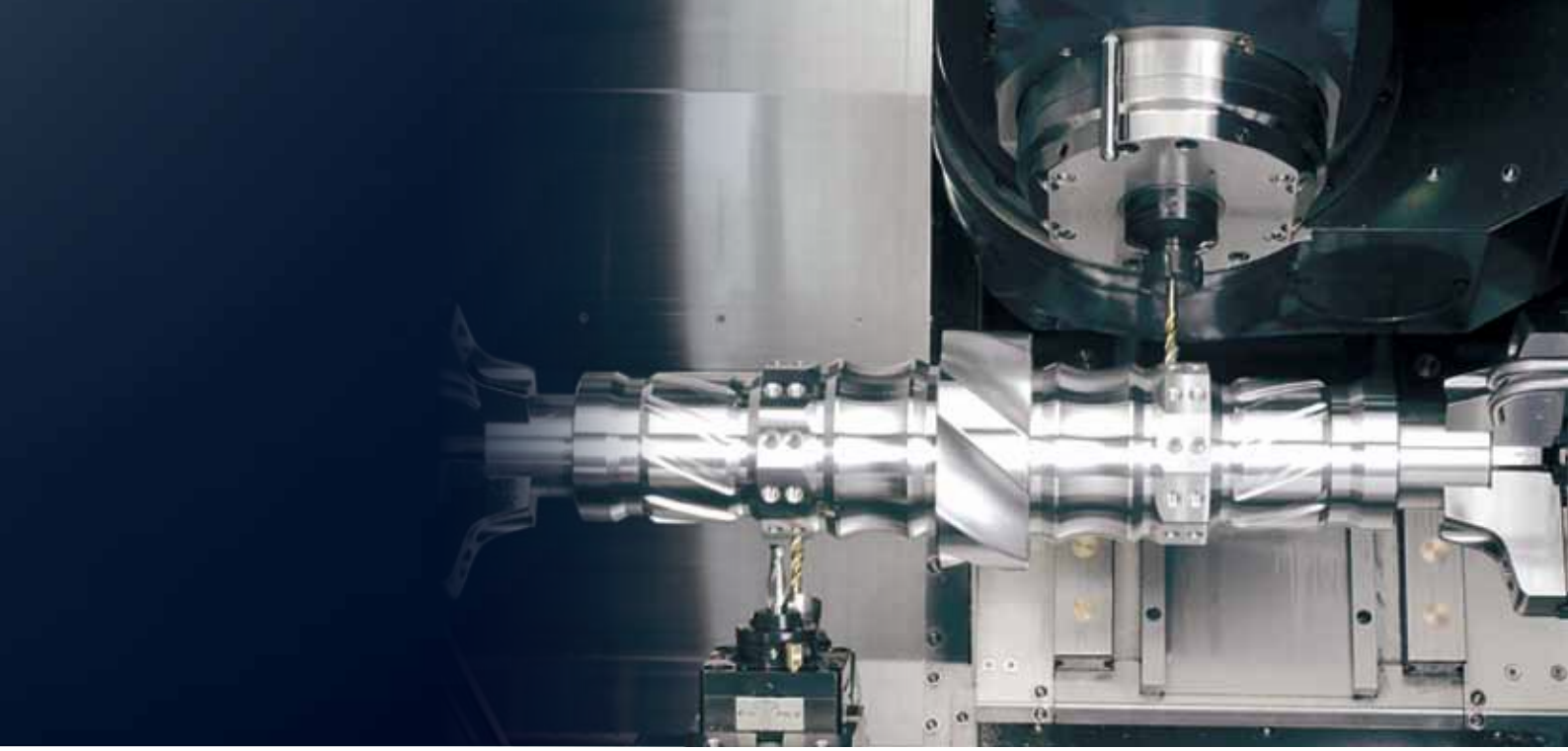
	C1, C2-axis contouring torque
MX1600	208 N·m (153.5 ft·lb)
MX2100S [L/ST/LST]	318 N·m (125.5 ft·lb)
MX2600S/ST	700 N·m (516.6 ft·lb)
MX3100S	1203 N·m (887.8 ft·lb)



C&Z-axis cylindrical interpolation

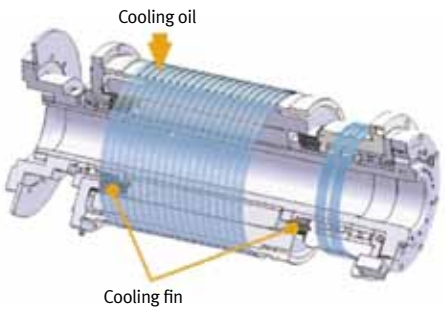


C&X-axis polar interpolation



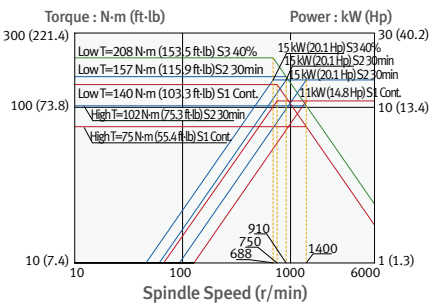
Oil cooling unit for left & right spindles

Both the left and right spindles employ an integral cooling system that circulates coolants through the entire spindle structure. This eliminates thermal distortion in all applications from heavy-duty cutting at high power and low speeds to fine and finish cutting at high speed.



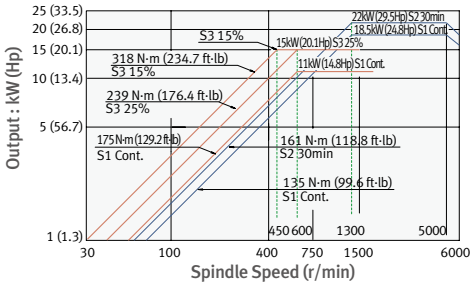
Spindle power-torque diagram

PUMA MX1600



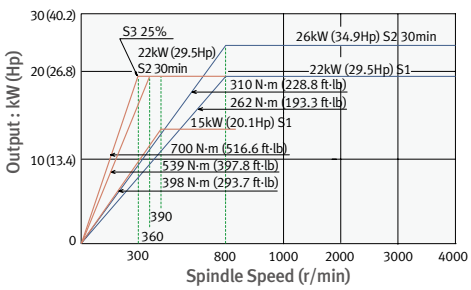
PUMA MX 2100 series (Left & right spindle)

- Spindle motor power : 22 kW (29.5 Hp)
- Max. Spindle speed : 5000 r/min



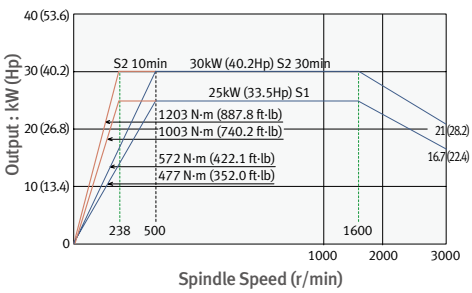
PUMA MX 2600 series (Left & right spindle)

- Spindle motor power : 26 kW (34.9 Hp)
- Max. Spindle speed : 4000 r/min



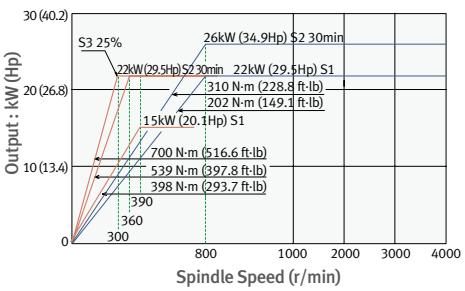
PUMA MX 3100 series (Left spindle)

- Spindle motor power : 30 kW (40.2 Hp)
- Max. Spindle speed : 3000 r/min



PUMA MX 3100 series (Right spindle)

- Spindle motor power : 26 kW (34.9 Hp)
- Max. Spindle speed : 4000 r/min



Milling Spindle

Turning and Milling Perfectly Integrated.

Milling Spindle

Oil-based coolants circulate through the milling spindle, allowing perfect integration of turning and milling applications. An air-gap sensor confirms the clamping status of both tools and parts.

Max. spindle speed **12000** r/min

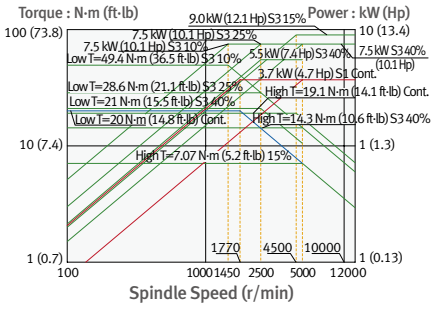
	Motor	Torque
PUMA MX1600	**9** kW (12.1 Hp) [10 min]	**49** N·m (36.2 ft·lb)
PUMA MX2100	**18.5** kW (24.8 Hp) [10 min]	**81** N·m (59.3 ft·lb)
PUMA MX2600/3100	**22** kW (29.5 Hp) [15 min]	**118** N·m (87.1 ft·lb)

Dual Contact Tools (MX 1600 - CAPTO C5, MX2100/2600/3100 - CAPTO C6)

The 360° angular positioning of the milling spindle can accommodate multi insert turning tools that are equipped with two, three, or four inserts.

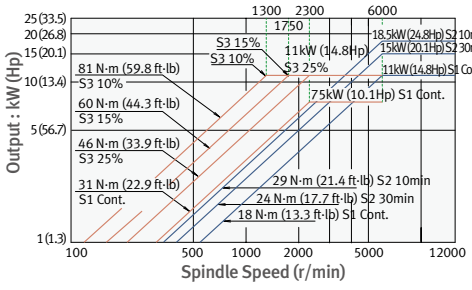
Milling spindle power-torque diagram

PUMA MX1600



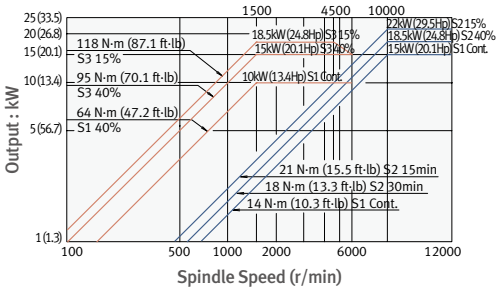
PUMA MX2100 series

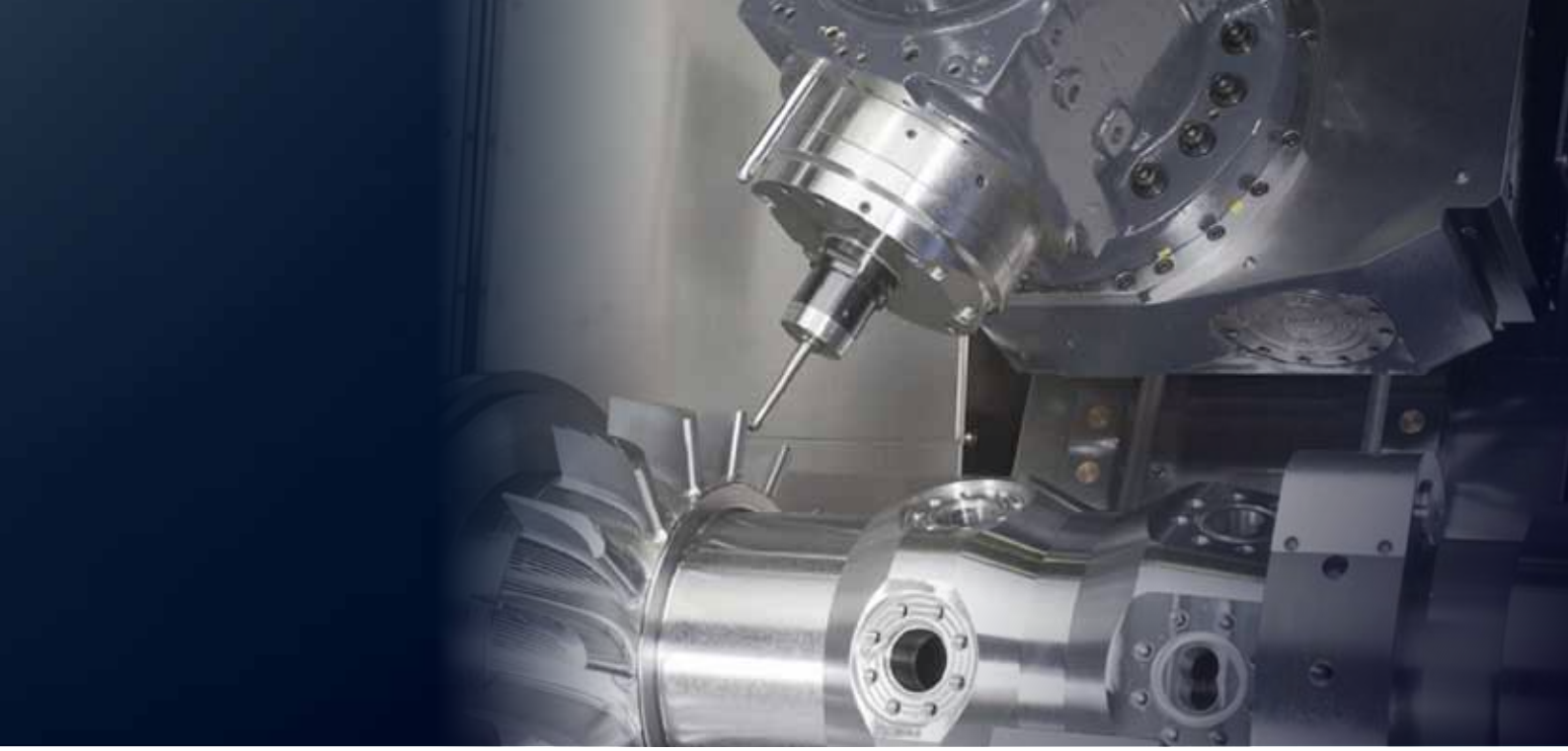
- Spindle motor power : 18.5 kW (24.8 Hp)
- Max. Spindle speed : 12000 r/min



PUMA MX2600/3100 series

- Spindle motor power : 22 kW (29.5 Hp)
- Max. Spindle speed : 12000 r/min





Tool Magazine with ATC

Automatic Tool Changer (ATC)

Advanced mechanisms significantly reduce non-cutting time.

	Tool change time
PUMA MX1600	**2.1** s (T - T - T)
PUMA MX2100	**2.0** s (T - T - T)
PUMA MX2600/3100	**2.0** s (T - T - T)

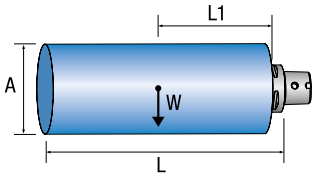
Tool storage capacity

The ATC consists of a servo-driven tool magazine and change arm.

40 ea / **80** ea opt.

Tool Magazine

Maximum tool size

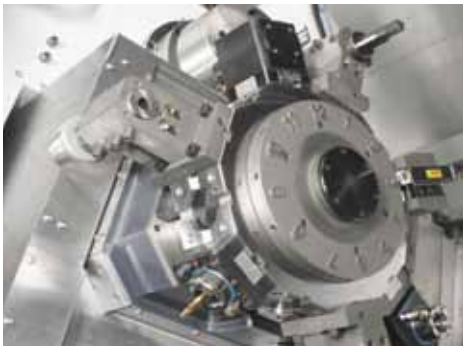


	Max. tool length [L]	Max. tool diameter [A]		Max. tool weight [W]	Max. moment [W x L1]
		Adjacent pots are empty	Continuous		
PUMA MX1600	**200** mm (7.9 inch)	**Ø 95** mm (3.7 inch)	**Ø 70** mm (2.8 inch)	**4** kg (8.8 lb)	**3.9** N·m (2.9 ft·lb)
PUMA MX2100	**300** mm (11.8 inch)	**Ø 120** mm (4.7 inch)	**Ø 90** mm (3.5 inch)	**8** kg (17.6 lb)	**7.54** N·m (5.6 ft·lb)
PUMA MX2600/3100	**400** mm (15.8 inch)	**Ø 130** mm (5.1 inch)	**Ø 90** mm (3.5 inch)	**10** kg (22.0 lb)	**9.81** N·m (7.2 ft·lb)

Lower Turret

Designed for High Accuracy

Lower Turret *1



The 12-station, heavy-duty lower turret features a large-diameter Curvic coupling with heavyduty design for maximum rigidity under tough cutting conditions. Turret rotation, acceleration and deceleration are controlled by a high-torque servo motor. Unclamp and rotation are virtually simultaneous. The fast index response keeps cycle times short.

Index time (1-station swivel) **0.2** s

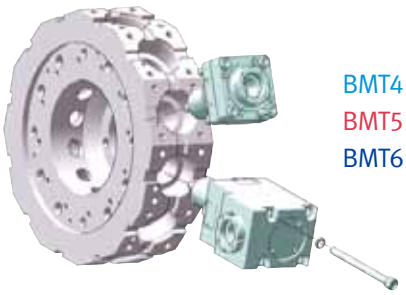
No. of tool station **12** ea (MX2100/2600/3100)

16 ea (MX1600)

*1 : on only T, ST type machine

Radial BMT45P (MX1600), BMT55P (MX2100) and the BMT65P (MX2600)

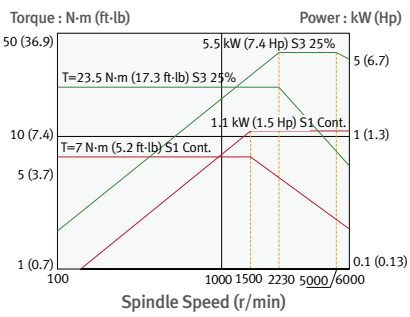
The turret accommodates BMT55P and BMT65P tooling in which the toolholders are mounted directly to the turret's periphery with 4 large bolts. This type of mounting system generates exceptionally high rigidity.



BMT45P (MX1600)
BMT55P (MX2100)
BMT65P (MX2600)

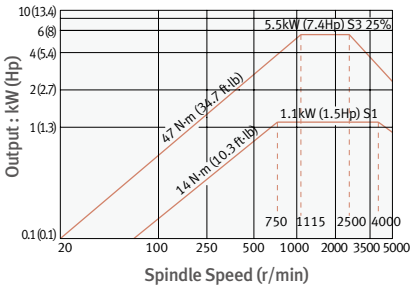
Rotary tool spindle power-torque diagram

PUMA MX1600



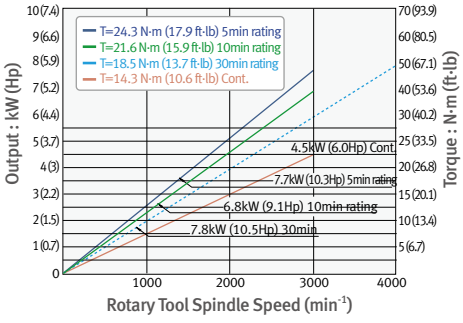
PUMA MX2100 series

- Spindle motor power : 5.5 kW (7.4 Hp)
- Max. Spindle speed : 5000 r/min



PUMA MX2600 series

- Spindle motor power : 7.8 kW (10.5 Hp)
- Max. Spindle speed : 4000 r/min



Servo Driven Tail Stock *1

The tail stock is driven by an AC servo motor and ball screw. Tail stocks thrust force can be controlled and adjusted by using the controls M-code function.

*1 : The servo-driven tail stock with dead center (built in center) is standard on MX2100, 2600/3100 models, but not on those designated as S and ST models.

Programmable tail stock specifications

Model	Unit	MX1600	MX2100	MX2600 / 3100
Bore taper		MT#4	MT#4	MT#5
Travel	mm (inch)	935 (36.8)	1050 (41.3)	1550 (61.0)
Max. thrust force	N (lbs)	3500 (786.8)	7000 (1573.6)	10000 (22480.0)

Machining Capacity

Heavy duty cutting (MX2600) (OD)

Spindle speed r/min	Cutting speed m/min (ipm)	Feedrate m/rev	Cutting depth mm (inch)	Material removal rate cm³/min (in³/min)
910	200 (7874)	0.4	10 (0.4)	800 (315.0)

Milling 1 (MX2600) (Face milling)

Milling Spindle speed r/min	Tool [6Z] mm (inch)	Cutting depth mm (inch)	Feedrate m/rev	Material removal rate cm³/min (in³/min)
1100	Ø80 (3.2)	5 (0.2)	1.0	330 (129.9)

Milling 2 (MX2600) (End milling)

Milling Spindle speed r/min	Tool [6Z] mm (inch)	Cutting depth mm (inch)	Feedrate m/rev	Material removal rate cm³/min (in³/min)
380	Ø25 (1.0)	25 (1.0)	0.5	119 (46.9)

Milling 3 (MX2100) (Drilling)

Milling Spindle speed r/min	Tool [U-drill] mm (inch)	Feedrate m/rev	Material removal rate cm³/min (in³/min)
2000	Ø40 (3.2) [6Z]	0.2	503 (9.7)

- Workpiece material, KS (JIS) : SM45C (S45C), Carbon steel
- The cutting test results indicated above are obtained as an example through real test cutting.
- The results, indicated in this catalogue are provides as example. They may not be obtained due to differences in cutting conditions and environmental conditions during measurement.

Application of Hybrid Motor Starter (Standard Specifications)

Innovative maintenance-free conditions have been realized compared with conventional motor-driven starters via the application of a hybrid motor starter that allows intellectual switching and simple cabling upon frequent operation of the coolant pump motor.

Hybrid motor starter that allows intellectual motor switching and simple cabling

The hybrid motor starter is capable of starting up the motor faster and more securely than competing motor starters.

Hybrid switching technology, fitted with semiconductors for the supply of power, allows streamlined switching, thereby radically reducing the load on relay contacts and extending the lifecycle of the motor starter tenfold compared with conventional switch gear, and facilitates simple and efficient cabling design at the control and signal levels.

Easy Operation System

Alarm Guidance

User check-up points notice function

Self check-up function (OK / NG)

Status of actuators & sensors of unit

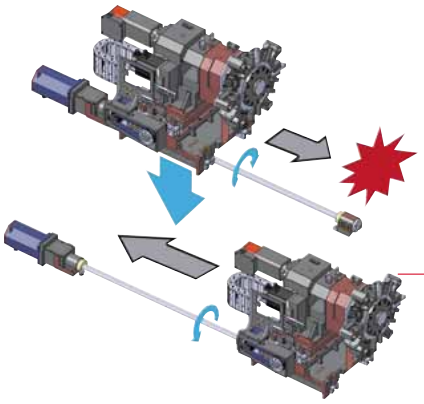
Easy Alarm Check-up & Troubleshooting

Periodic maintenance function

- Avoid Unexpected Downtime
- Optimize the performance
- Increase Efficiently
- Reduce operating costs

Extends the Life of the Tool Machine

Machine - Airbag Function



- It is available on the servo axis (X, Z, B, Y-AXIS).
- This function can not prevent collision but can minimize collision damege.

Machine collision, defection or cutter damage — Caused large load torque

Machine-airbag function

DAMAGE to the machine

Minimize the DAMAGE

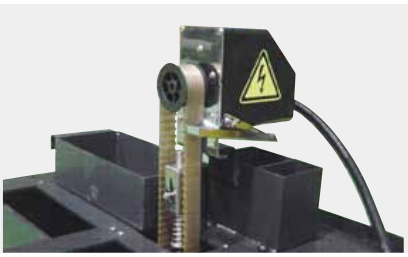
The principle of Machine-airbag Function

1. Higher torque load can be detected than setting vale if machine come into collision.
2. Servo Unit automatically move in the reverse direction instaneously.

Detect the torque data → Machine collision → Instaneous reverse direction moving → Minimize the damage → Protect the machine unit

Various Optional Equipments

Oil mist collector



Oil skimmer

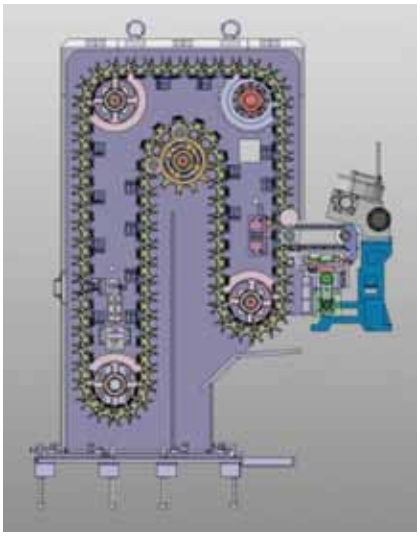
Servo driven steady rest (Automatic type)

Tool setter

Air+Oil mist

Misting device

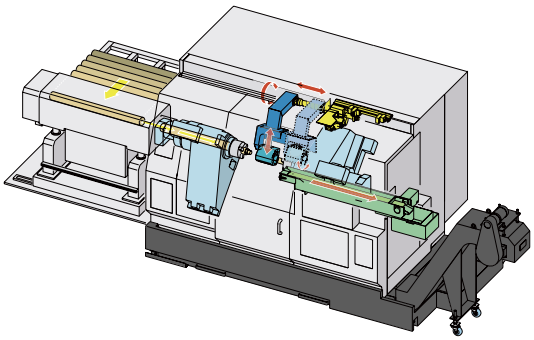
MQL (Minimum quantity lubrication)



Tool magazine 80 tools

Optional Equipments for Automation

- Bar feeder
- Parts unloader & Parts conveyor
- Work ejector



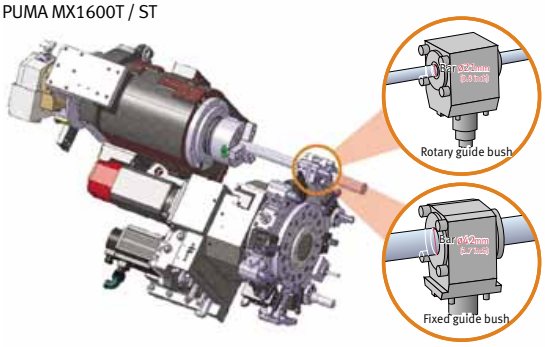
Guide bush* opt.

Combined MX technology with Swiss-turn function for biomedical complex shapes

Rotary guide bush Below 21 mm (0.8 inch)

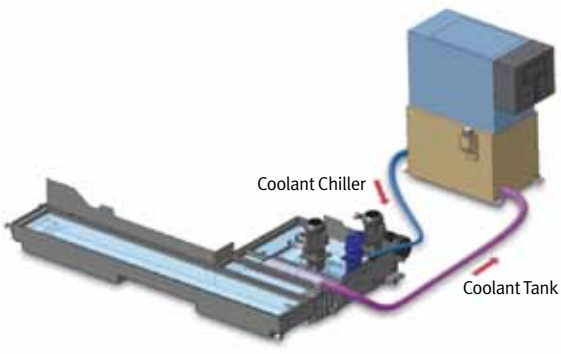
Fixed guide bush Below 22 mm ~ 42 mm (0.9 inch ~ 1.7 inch)

* : PUMA MX1600T / ST



Coolant chiller opt.

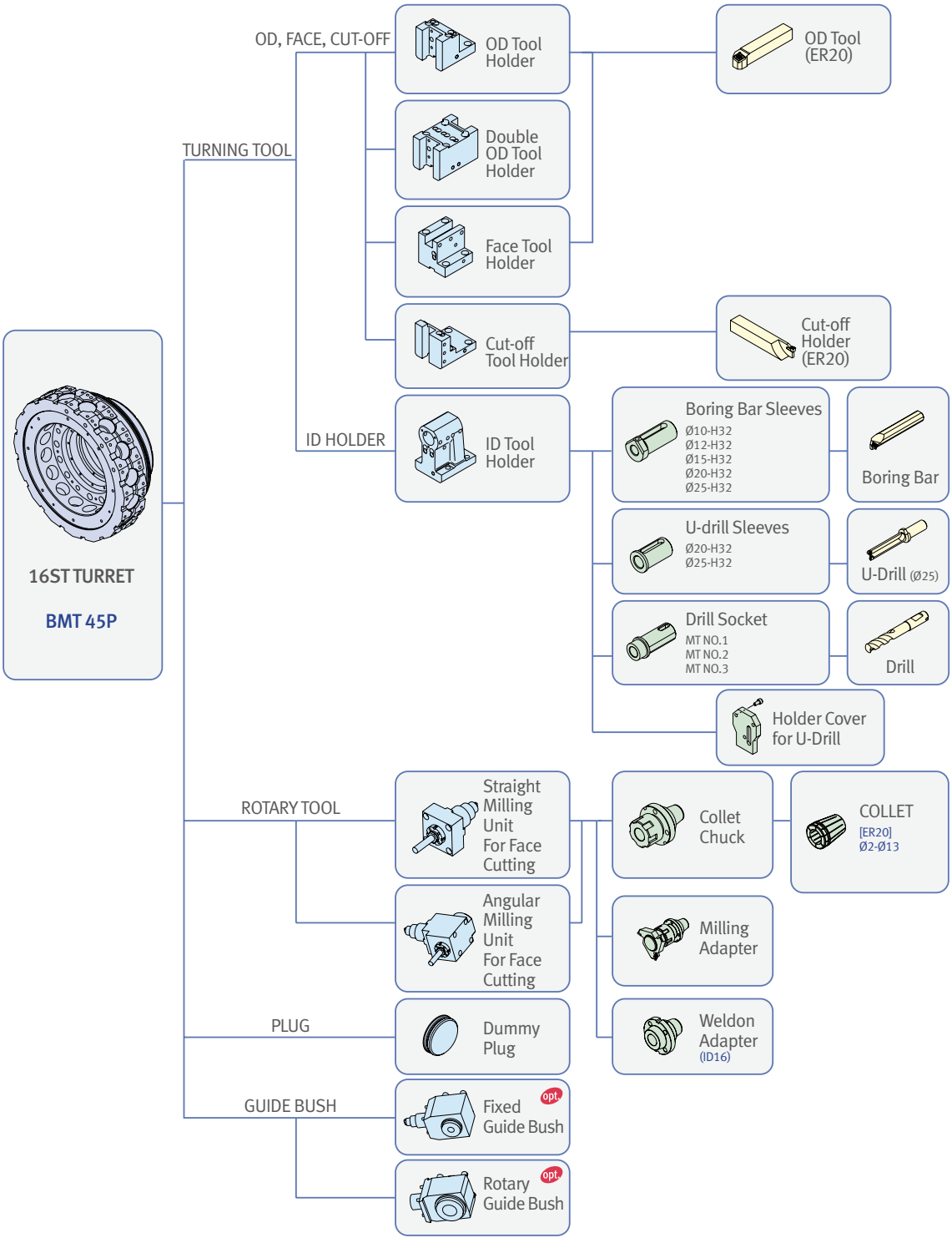
Thermal displacement and dimensional accuracy are greatly influenced by oil temperature in a machine. Coolant Temperature Control unit prevents the coolant from heating. Especially, when using oil-based coolant, the oil temperature can become extremely high.



Tooling System

Unit : mm (inch)

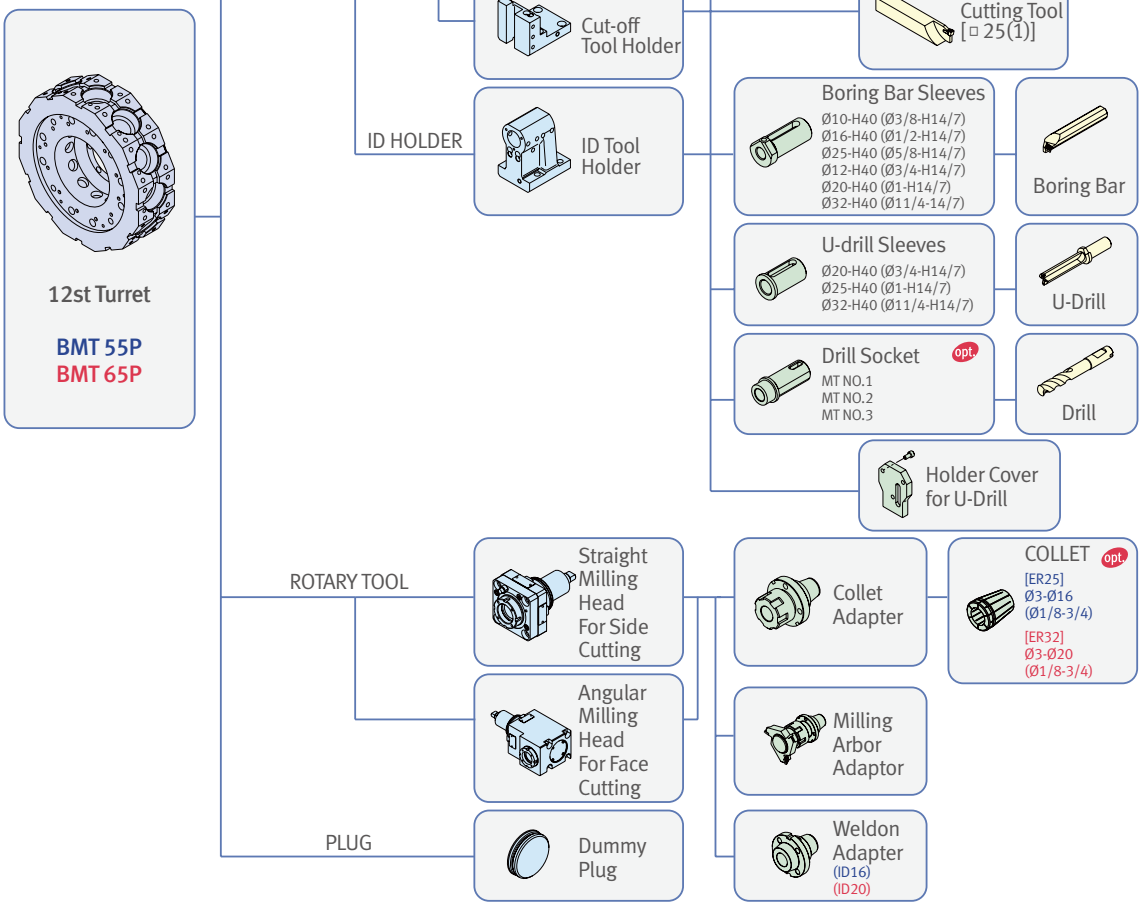
PUMA MX1600



Unit : mm (inch)

PUMA MX2100, PUMA MX2600

- PUMA MX 2100
- PUMA MX 2600

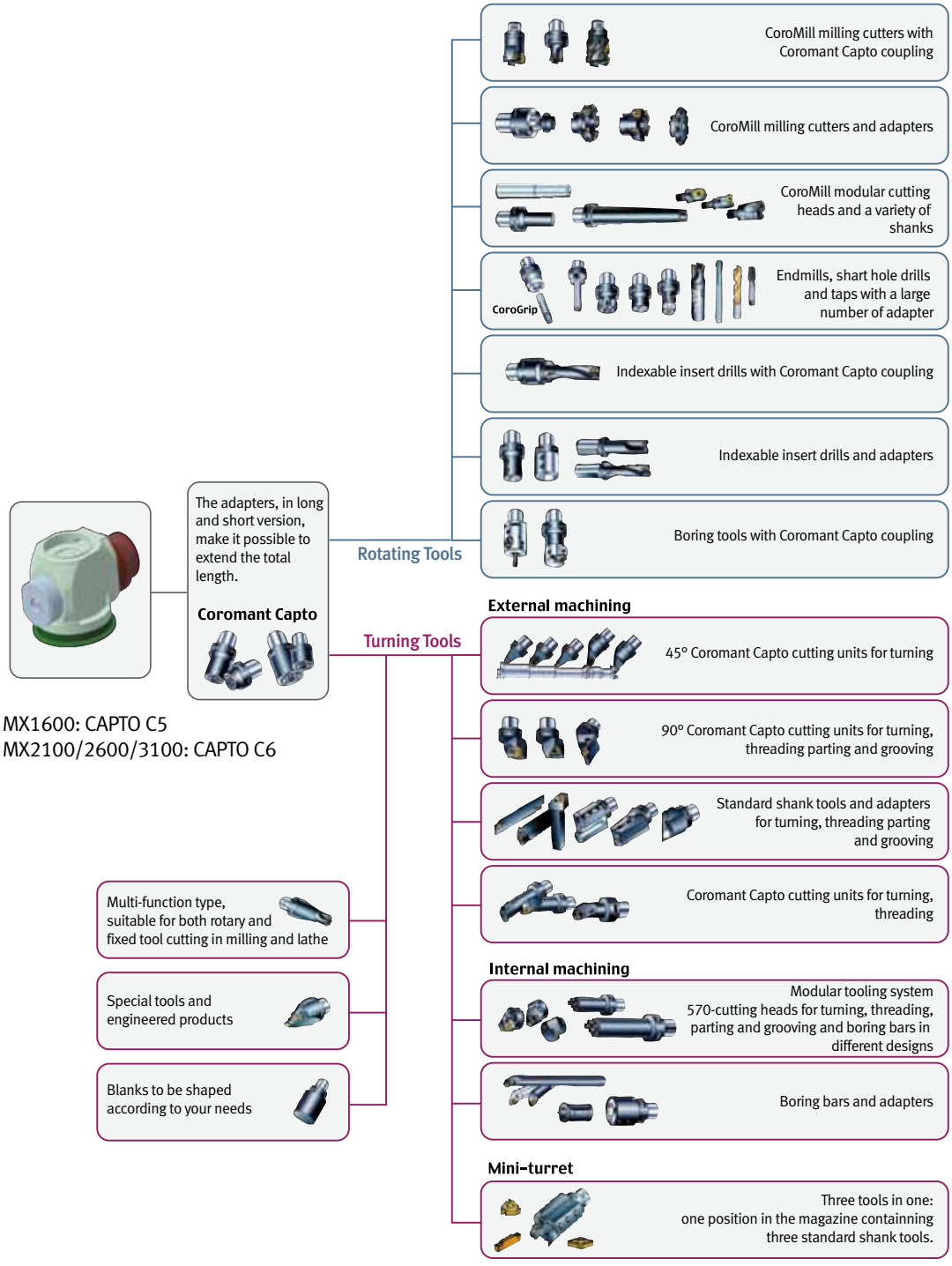


Note) Above tooling system is our recommendation.
Depending on export condition, the standard tooling packed with the machine can be different.

Tooling System

Milling spindle

Unit : mm (inch)

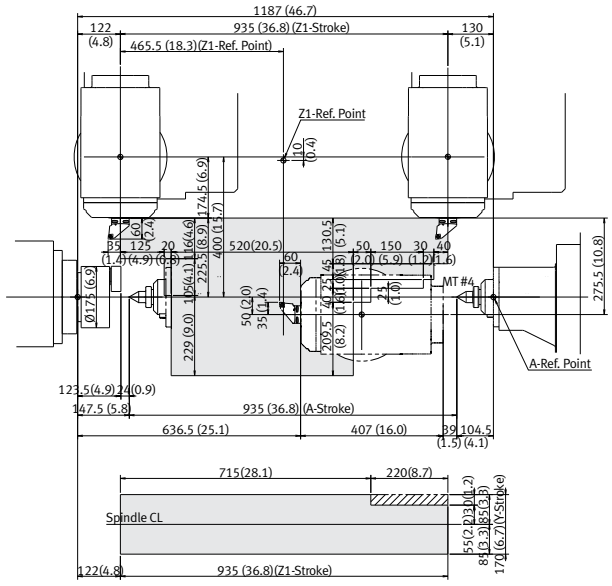


• All holders are not supplied. It is only reference for you.

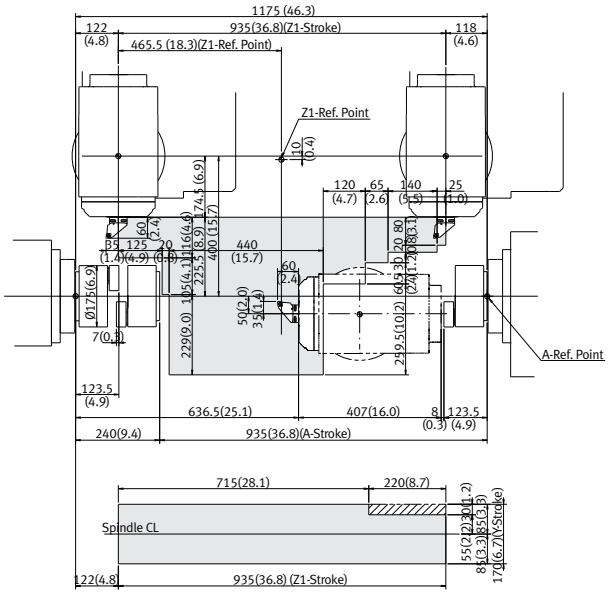
Working Range

Unit : mm (inch)

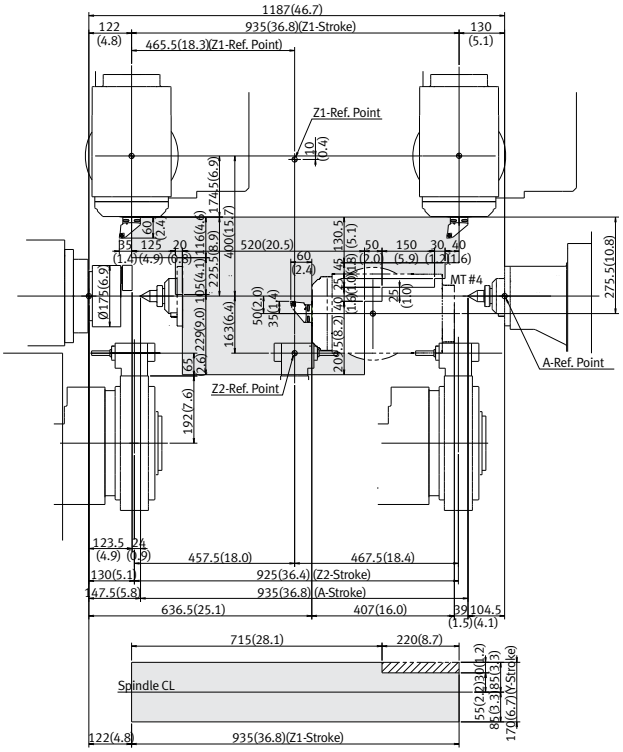
PUMA MX1600



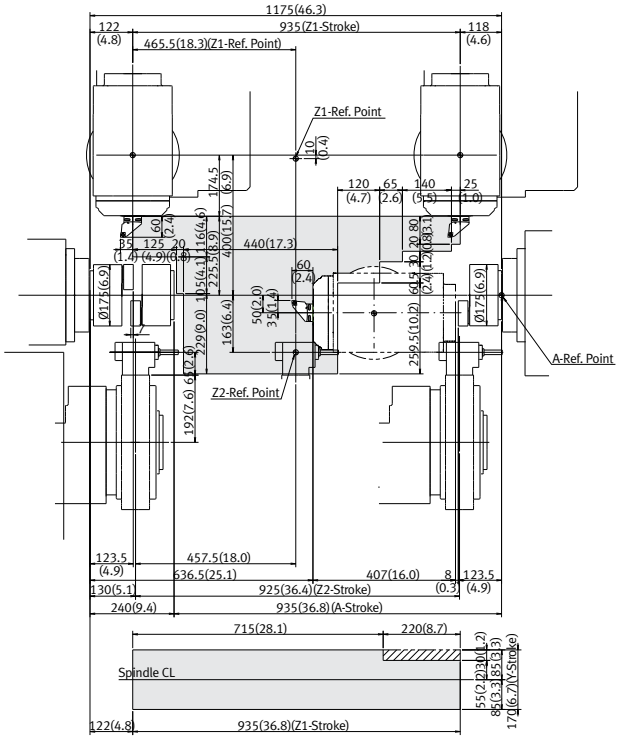
PUMA MX1600S



PUMA MX1600T



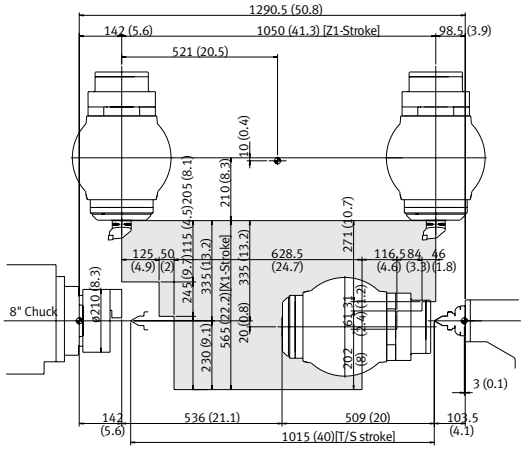
PUMA MX1600ST



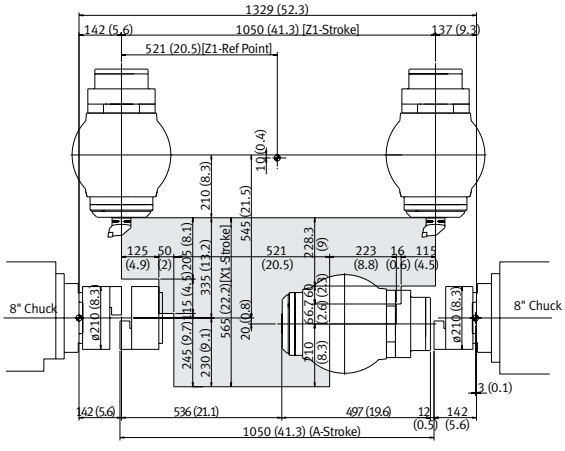
Working Range

Unit : mm (inch)

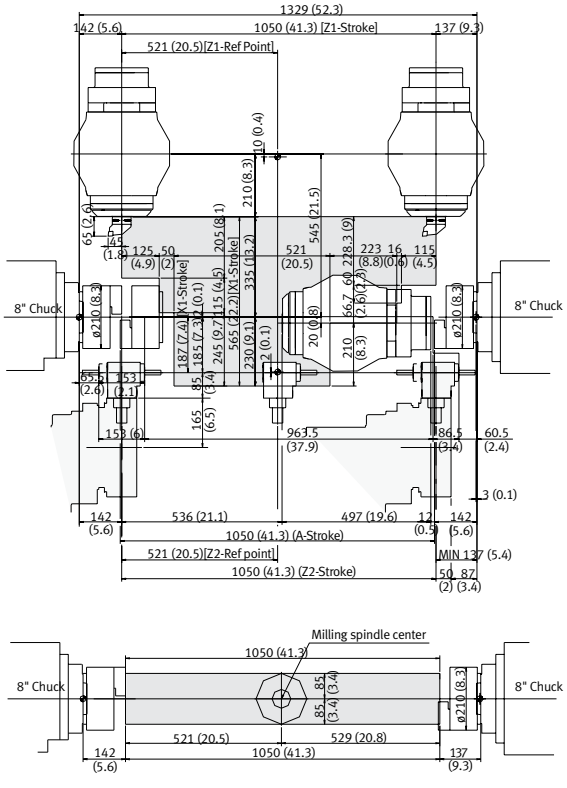
PUMA MX2100



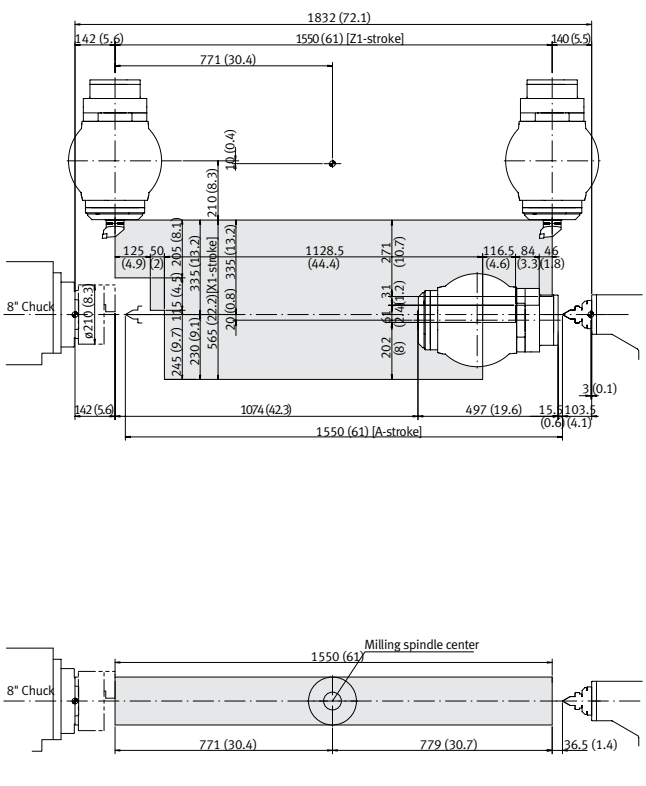
PUMA MX2100S



PUMA MX2100ST



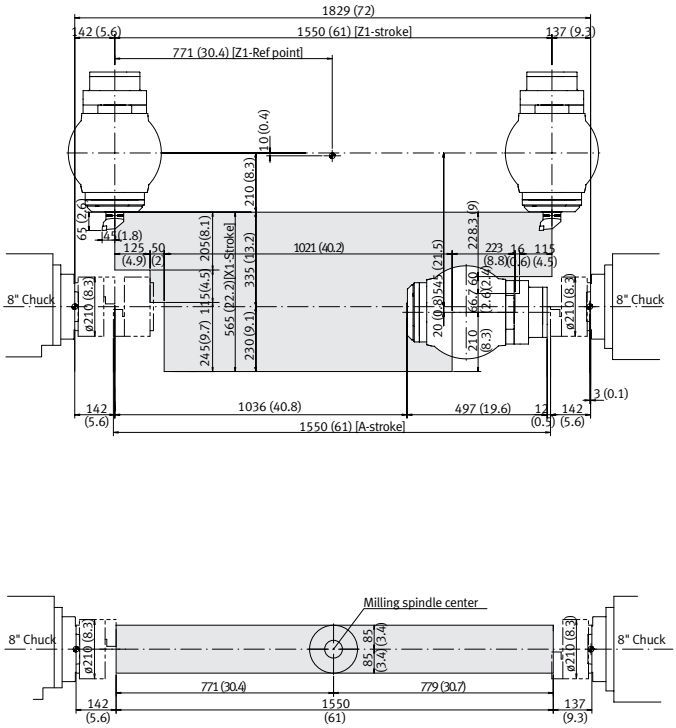
PUMA MX2100L



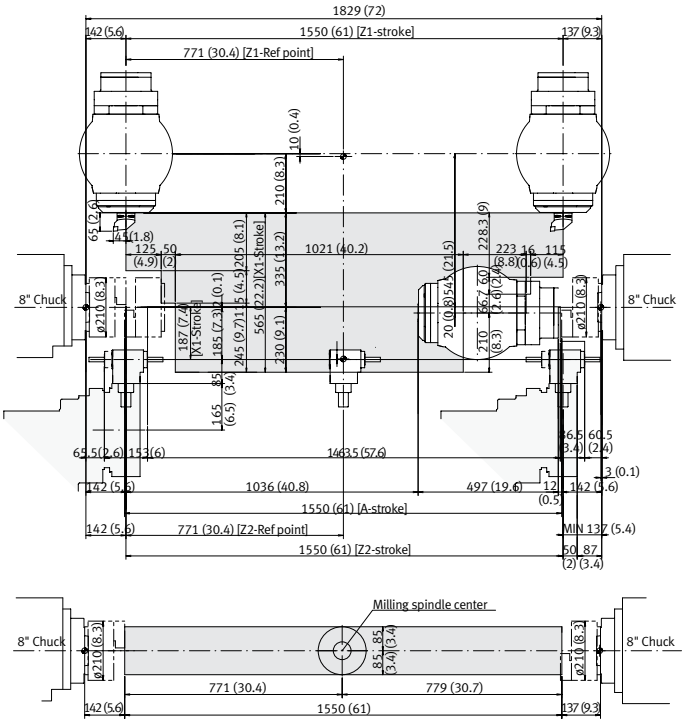
Working Range

Unit : mm (inch)

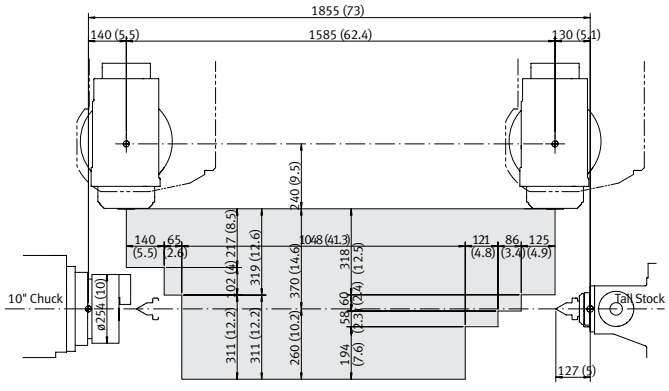
PUMA MX2100LS



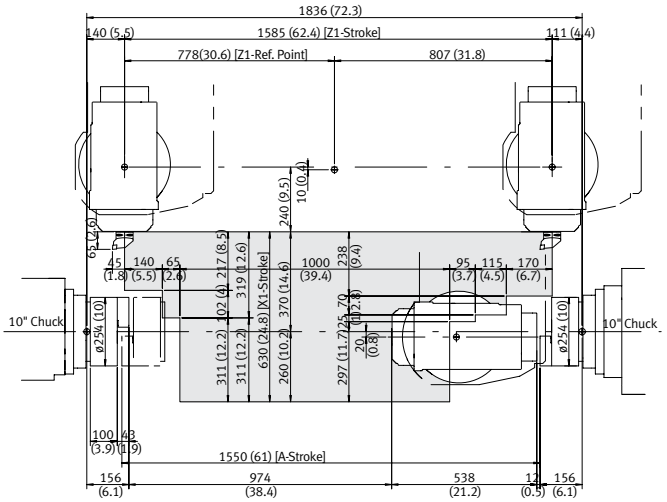
PUMA MX2100LST



PUMA MX2600



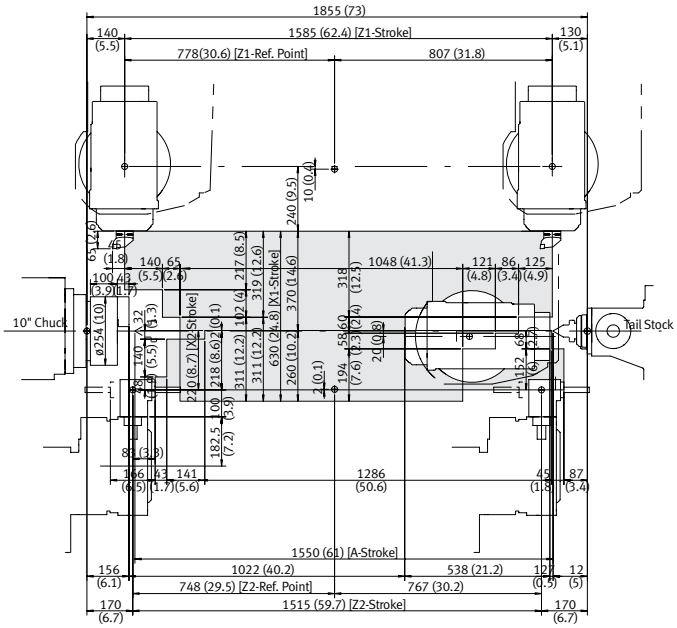
PUMA MX2600S



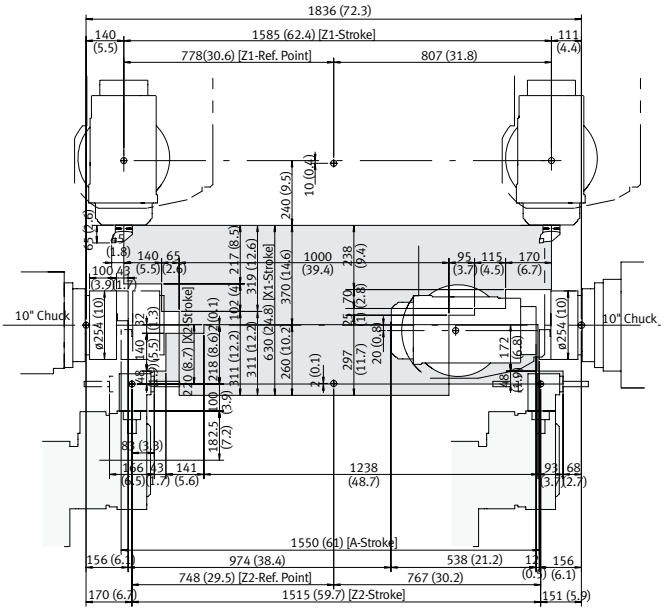
Working Range

Unit : mm (inch)

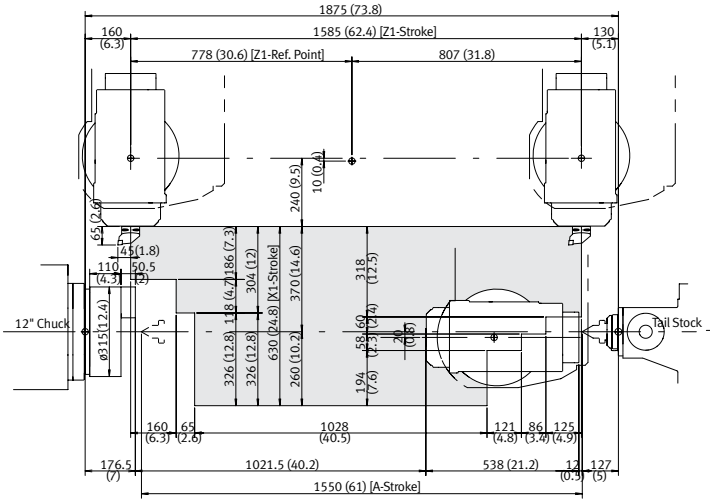
PUMA MX2600T



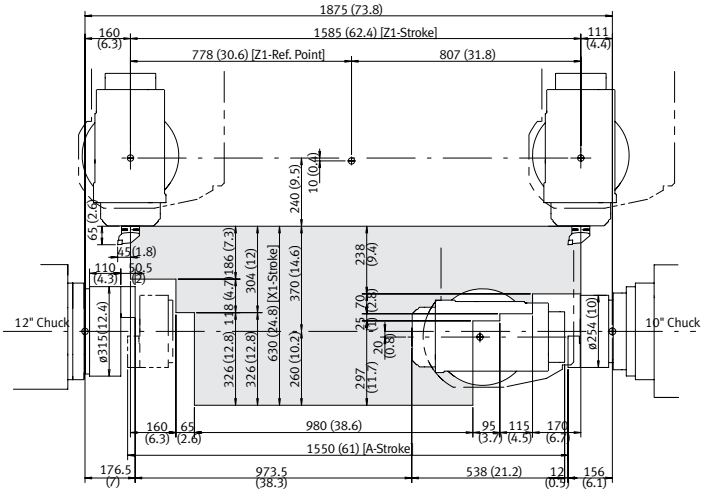
PUMA MX2600ST



PUMA MX3100



PUMA MX3100S

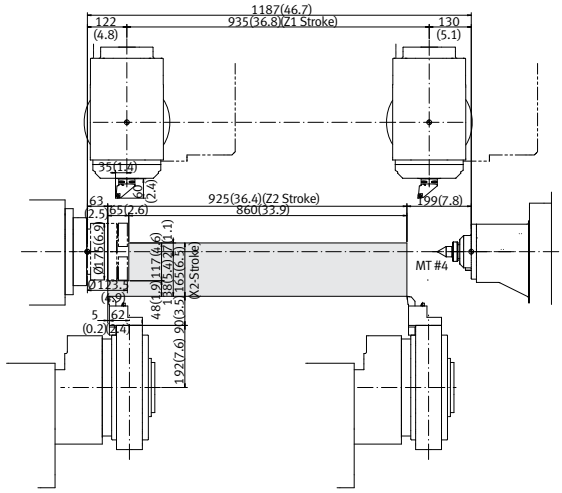


Lower Turret Working Range

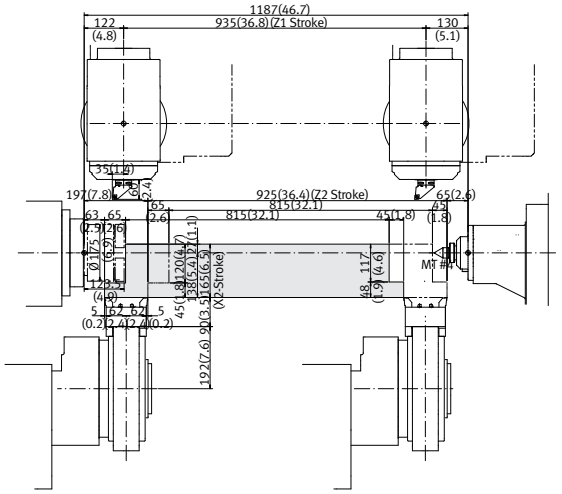
Unit : mm (inch)

PUMA MX1600T

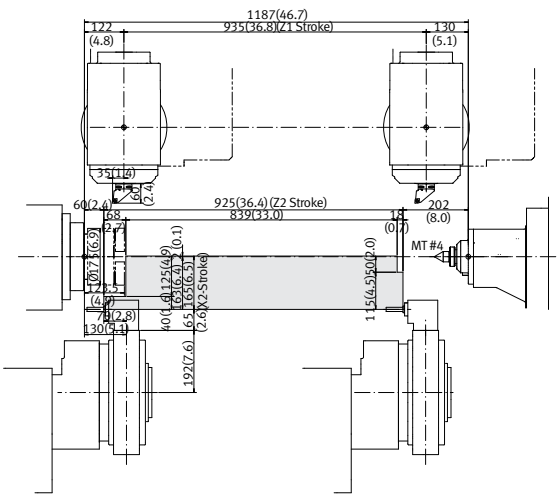
Single OD Tool holder



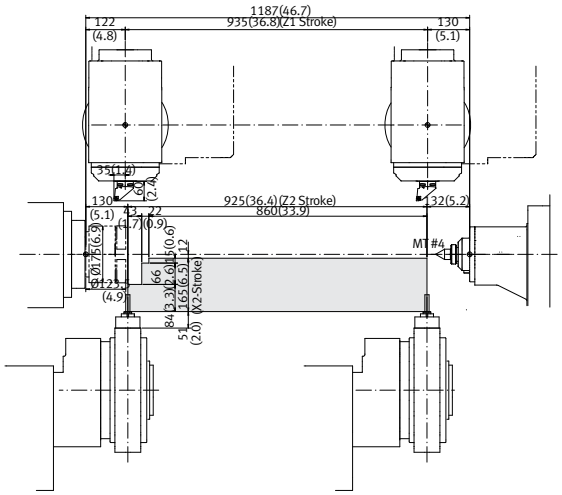
Double OD Tool holder



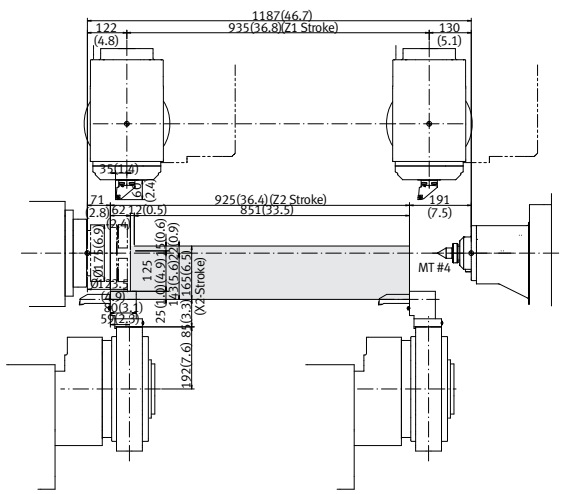
Angular milling head



Straight milling head



ID Tool holder

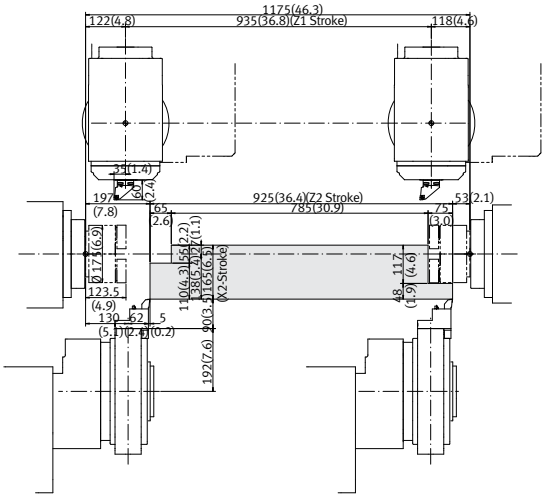


Lower Turret Working Range

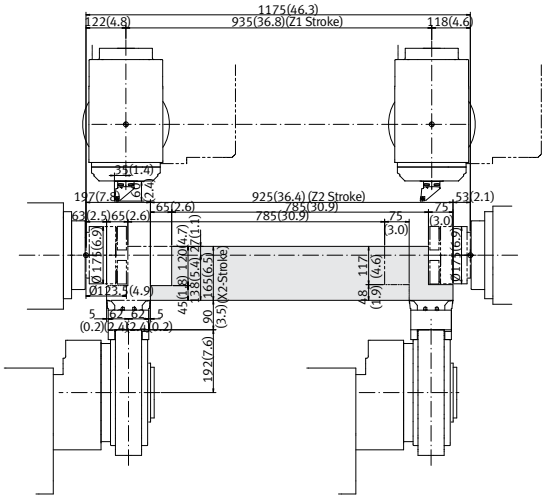
Unit : mm (inch)

PUMA MX1600ST

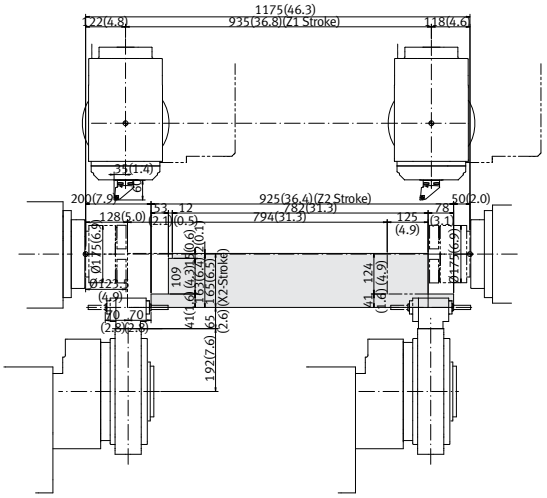
Single OD Tool holder



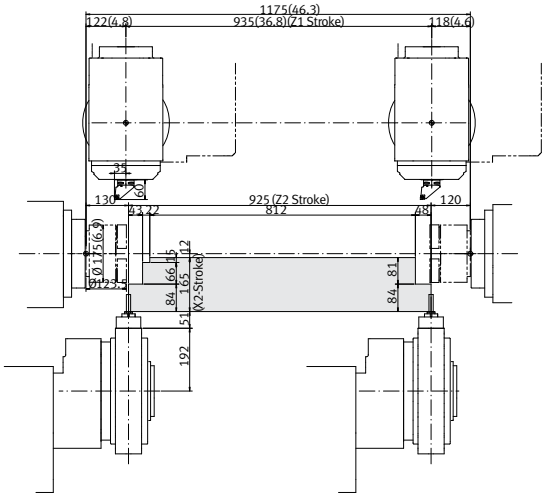
Double OD Tool holder



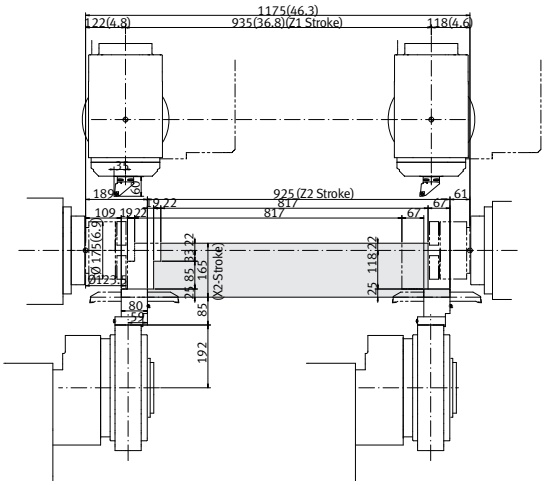
Angular milling head



Straight milling head



ID Tool holder

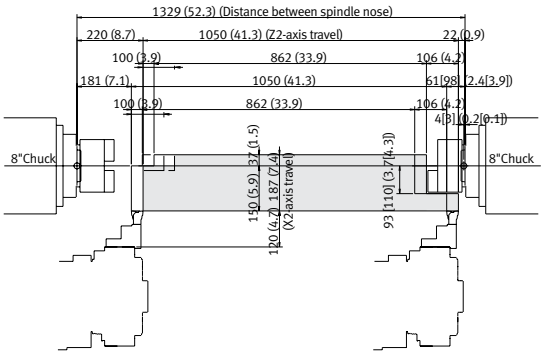


Lower Turret Working Range

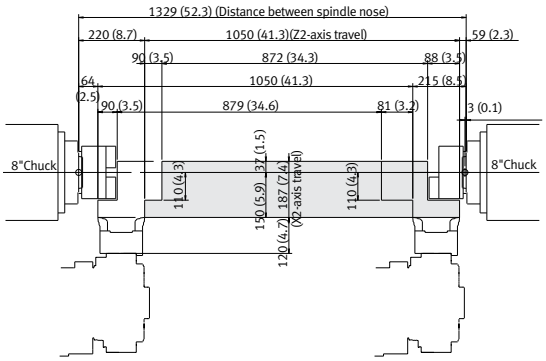
Unit : mm (inch)

PUMA MX2100ST / PUMA MX 2100T

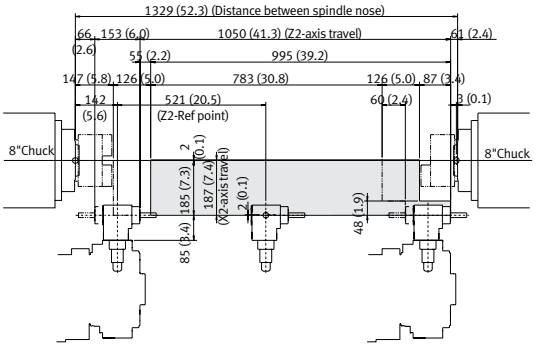
Single OD Tool holder



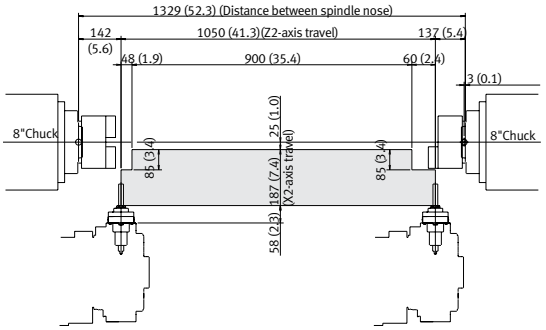
Double OD Tool holder



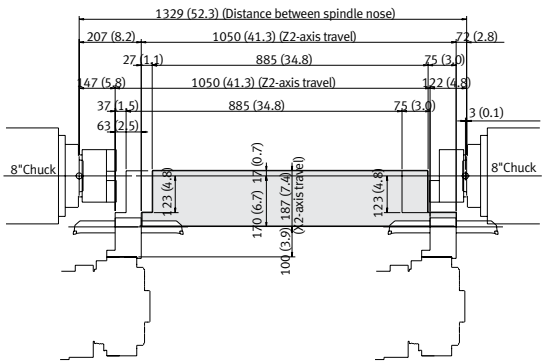
Angular milling head



Straight milling head



ID Tool holder

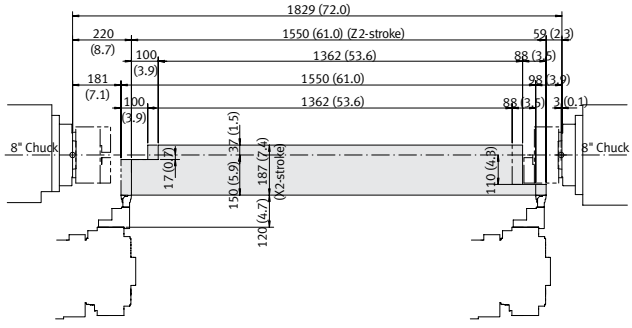


Lower Turret Working Range

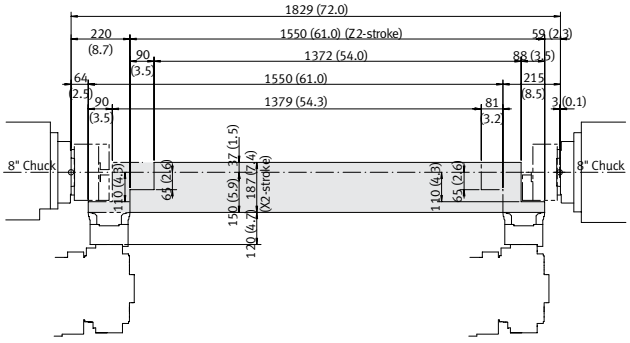
Unit : mm (inch)

PUMA MX2100LST

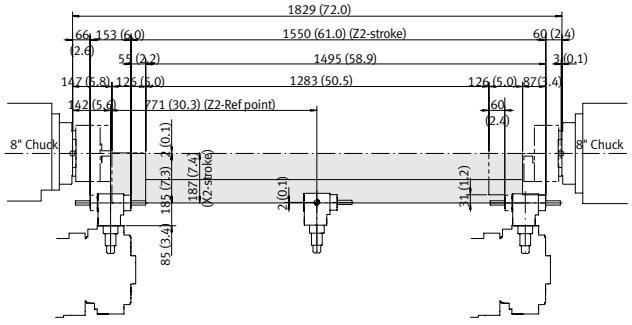
Single OD Tool holder



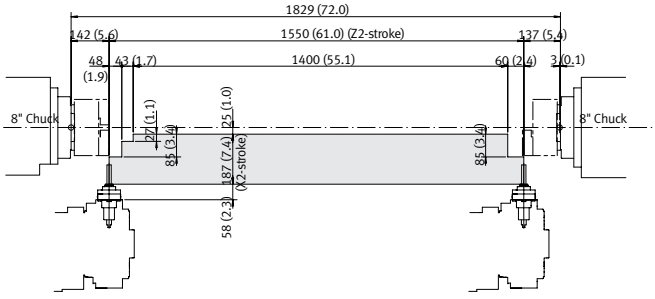
Double OD Tool holder



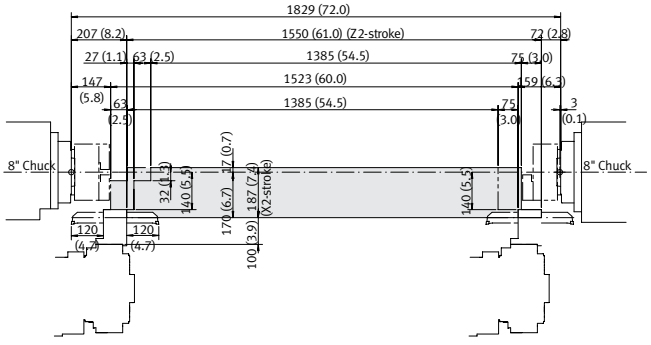
Milling (Angle) head



Milling (ST) head



ID Tool holder

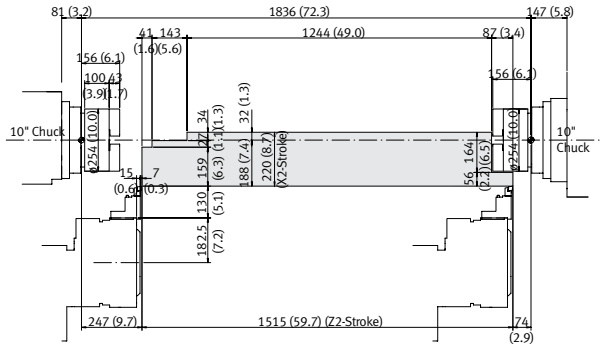


Lower Turret Working Range

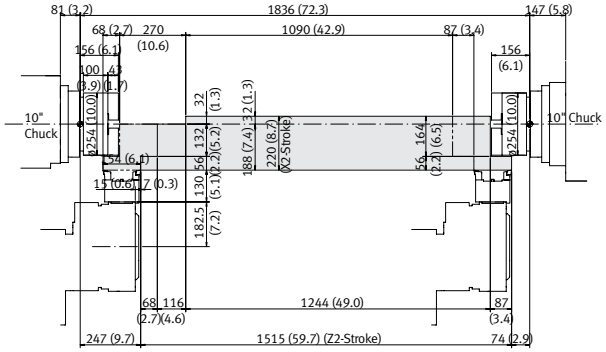
Unit : mm (inch)

PUMA MX2600ST / PUMA MX 2600T

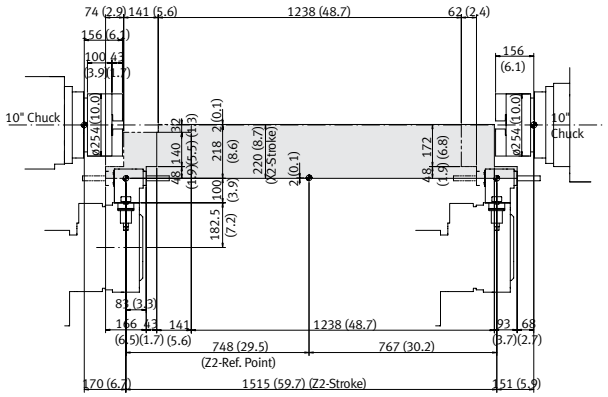
Single OD Tool holder



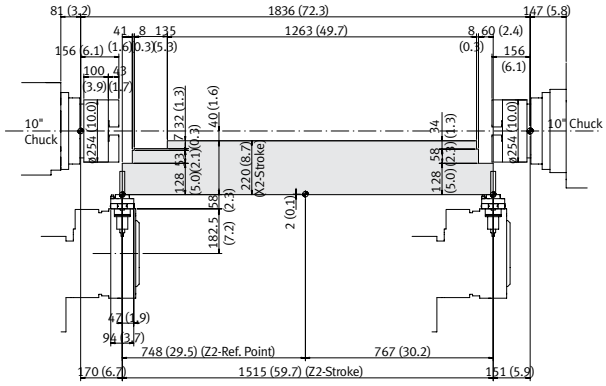
Double OD Tool holder



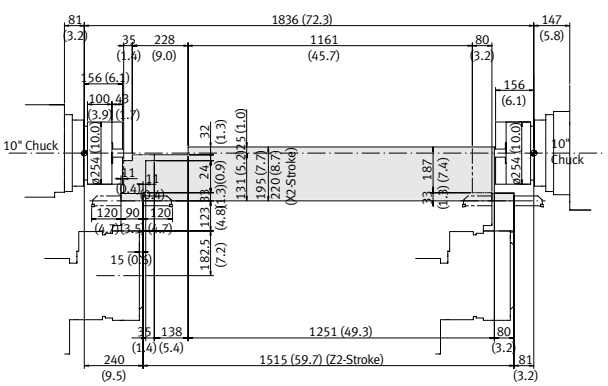
Milling (Angle) head



Milling (ST) head



Boring Bar holder

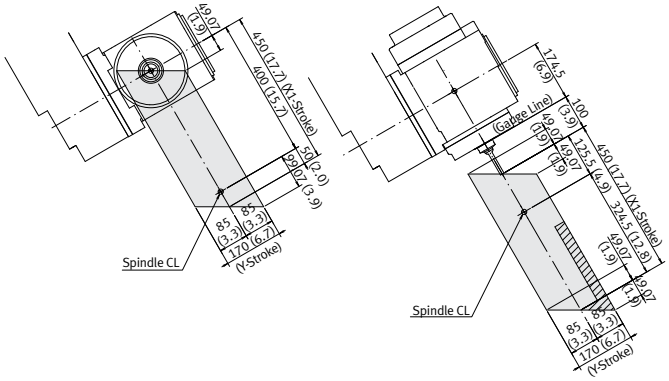


B-axis, Y-axis Working Range

Unit : mm (inch)

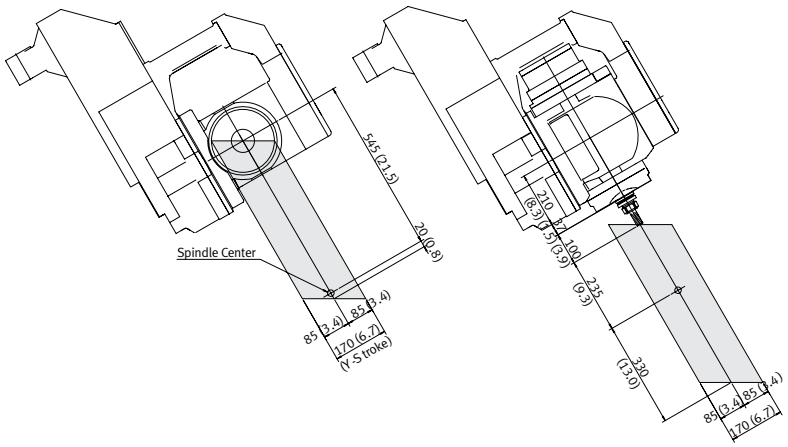
PUMA MX1600

Y-axis working range



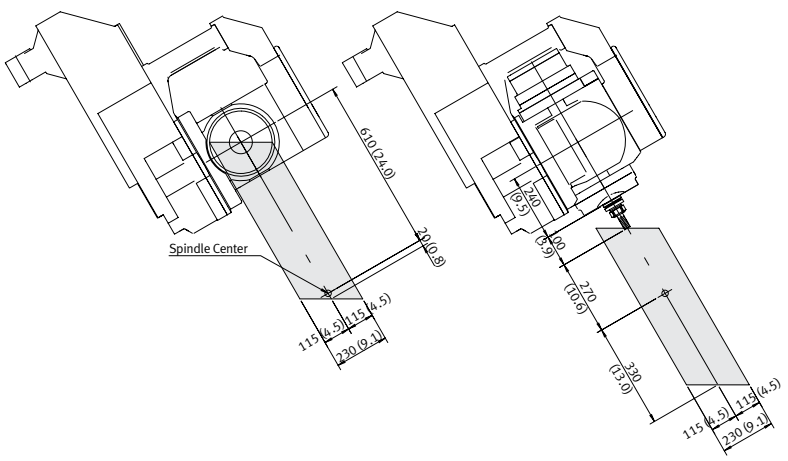
PUMA MX2100

Y-axis working range

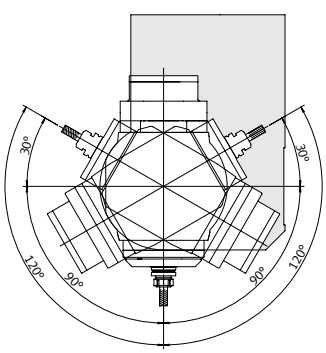


PUMA MX2600 / 3100

Y-axis working range



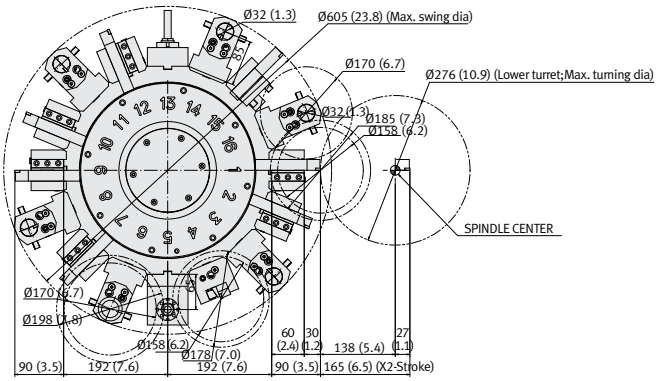
B-axis rotating range



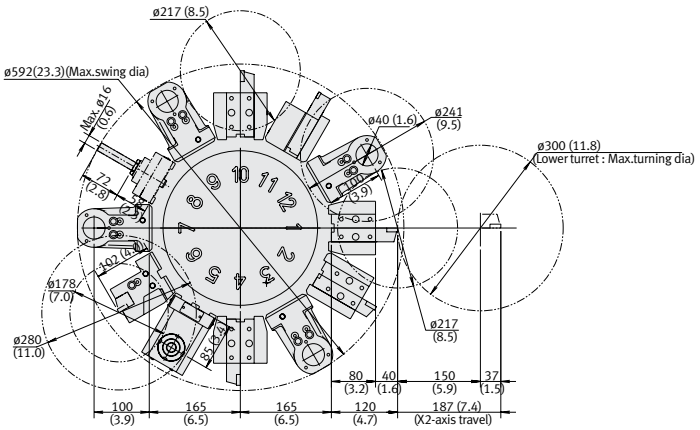
Lower Turret Interference Diagram

Unit : mm (inch)

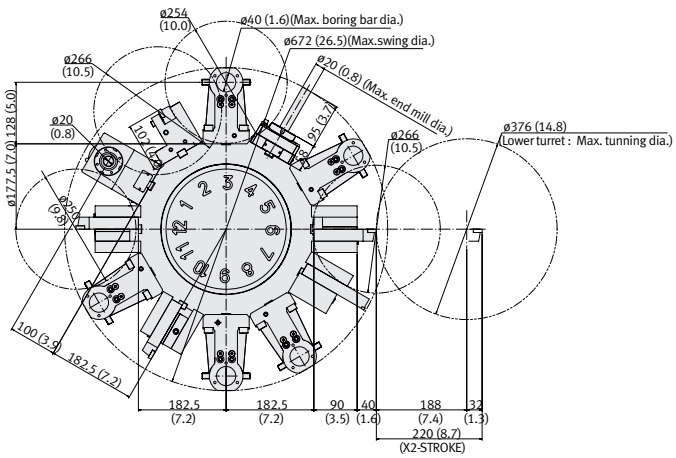
PUMA MX1600



PUMA MX2100



PUMA MX2600

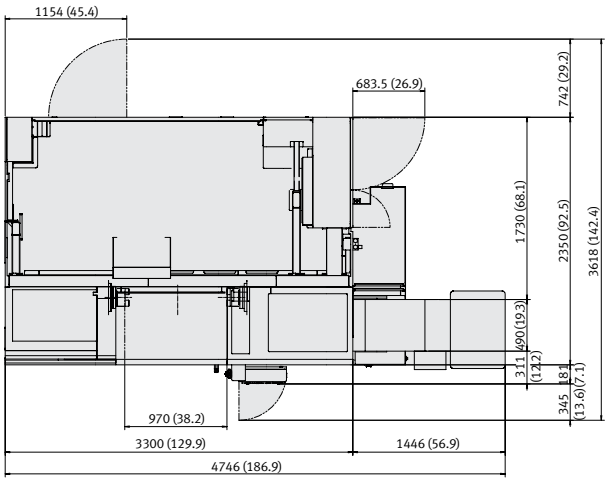


External Dimensions

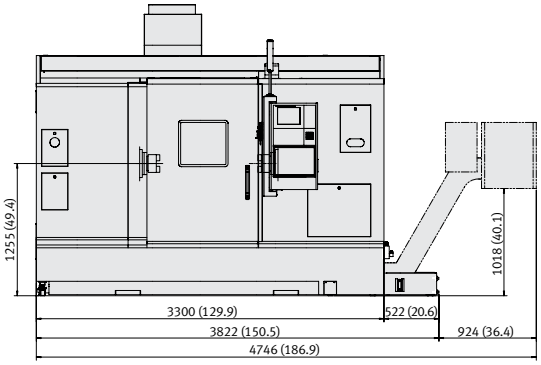
Unit : mm (inch)

PUMA MX1600

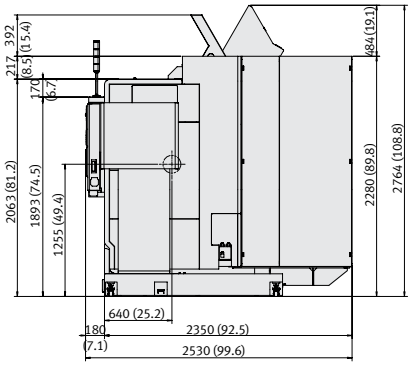
Top view



Front view



Side view

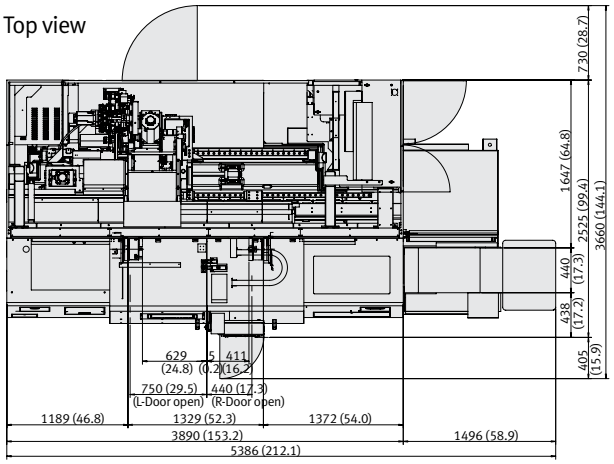


External Dimensions

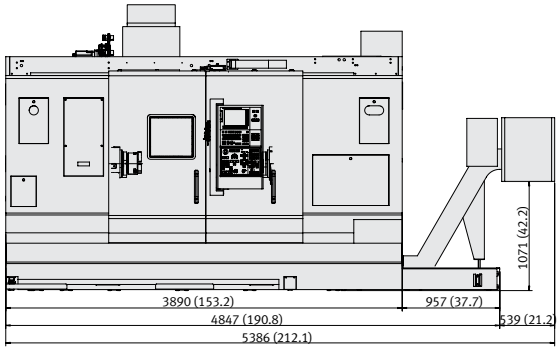
Unit : mm (inch)

PUMA MX2100 (40 Tools)

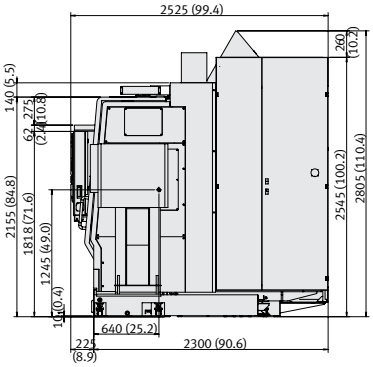
Top view



Front view

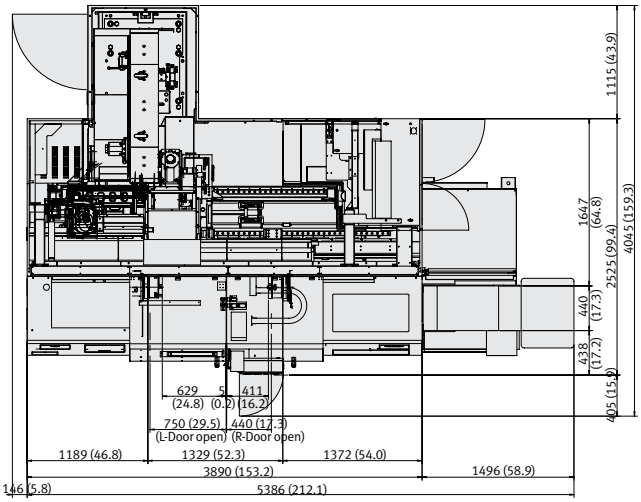


Side view

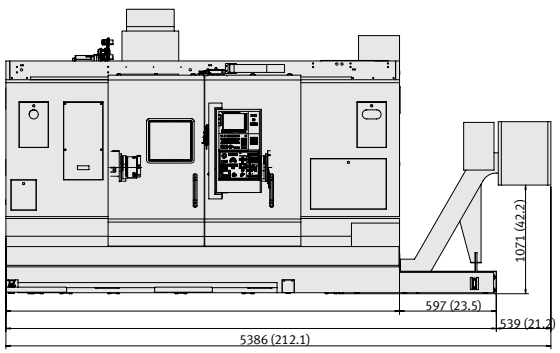


PUMA MX2100 (80 Tools)

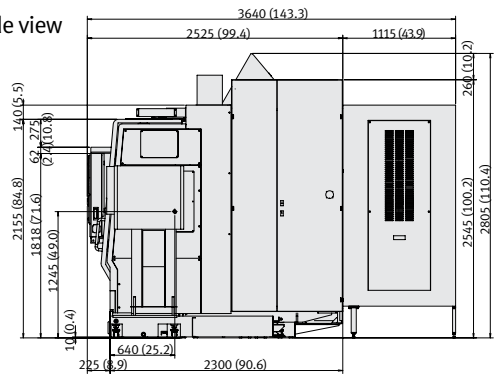
Top view



Front view



Side view

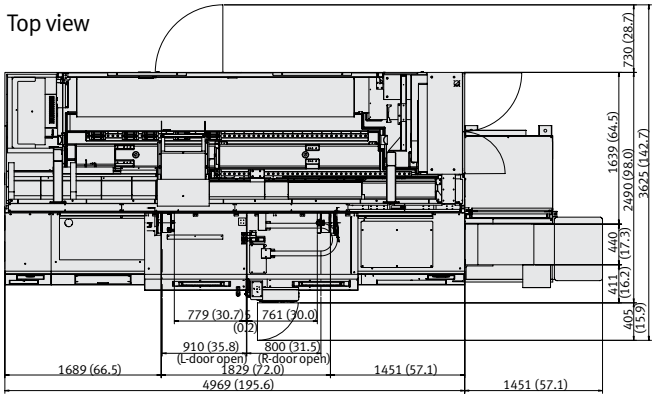


External Dimensions

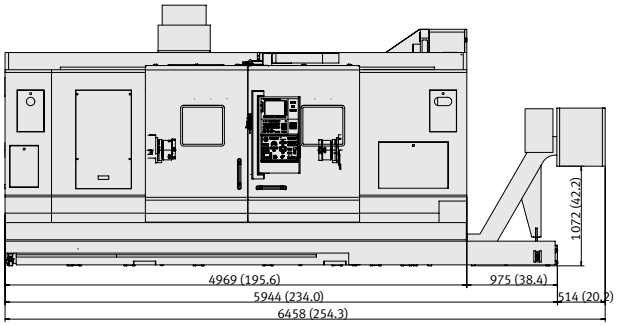
Unit : mm (inch)

PUMA MX2100LST (40 Tools)

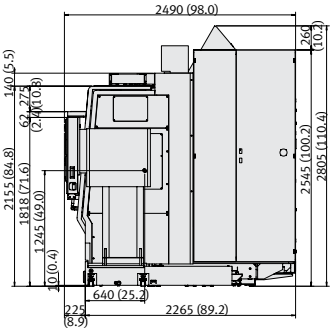
Top view



Front view

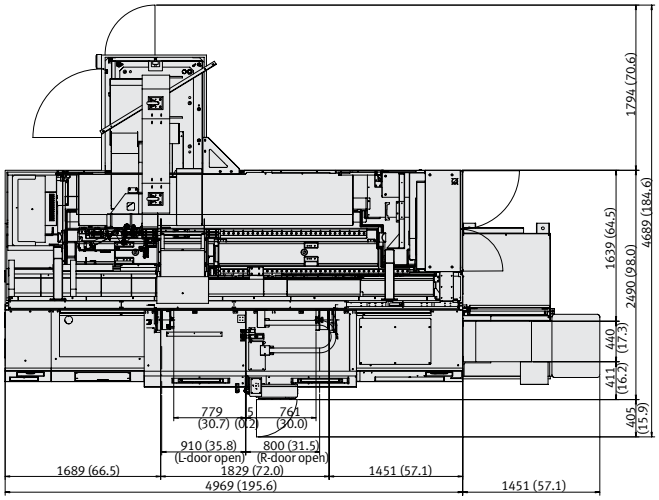


Side view

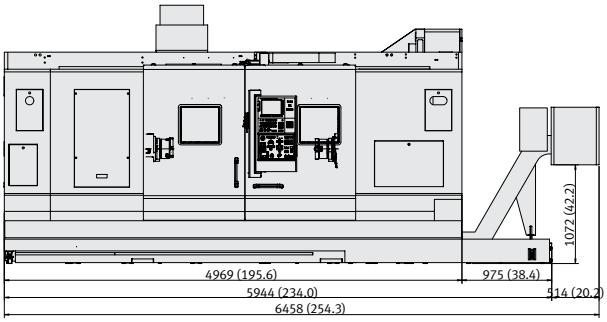


PUMA MX2100LST (80 Tools)

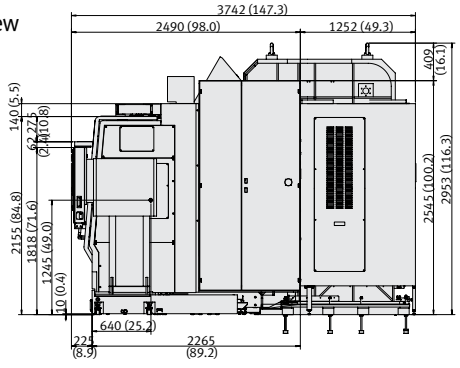
Top view



Front view



Side view

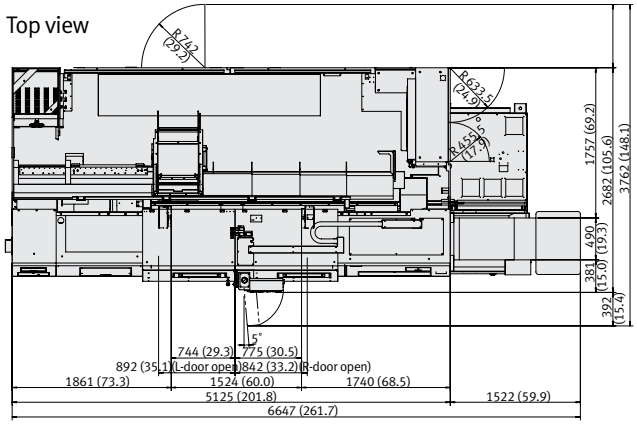


External Dimensions

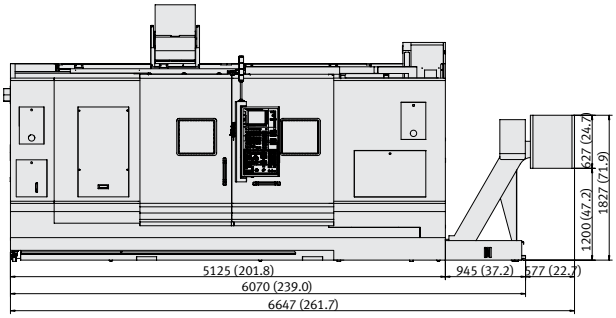
Unit : mm (inch)

PUMA MX2600 / 3100 (40 Tools)

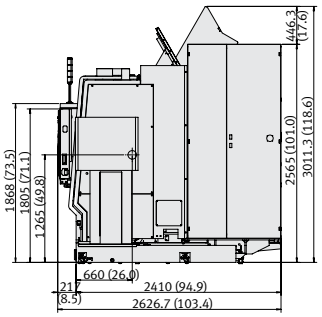
Top view



Front view

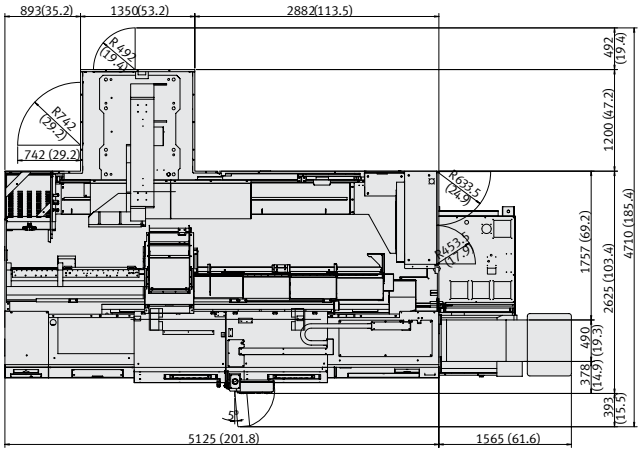


Side view

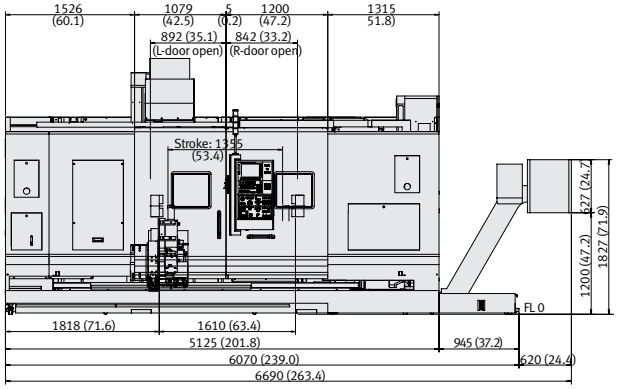


PUMA MX2600 / 3100 (80 Tools)

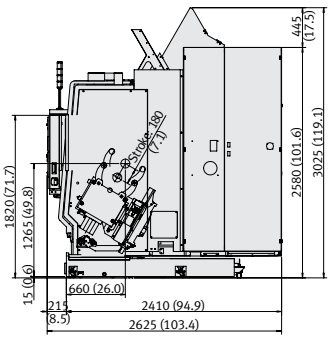
Top view



Front view



Side view



Machine Specifications

PUMA MX1600

Description			Unit	PUMA MX1600	PUMA MX1600S	PUMA MX1600T	PUMA MX1600ST
Capacity	Swing over bed		mm (inch)	680 (26.8)			
	Swing over saddle		mm (inch)	630 (24.8)			
	Recom. Turning diameter		mm (inch)	170 (6.7)			
	Max. Turning diameter		mm (inch)	330 (13.0)			
	Max. Turning length		mm (inch)	900 (35.4)			
	Chuck size		inch	6			
	Bar working diameter		mm (inch)	44 (51) (1.7 (2.0))			
Travels	Travel distance	X1-axis	mm (inch)	450 (17.7)			
		Z1-axis	mm (inch)	935 (36.8)			
		Y-axis	mm (inch)	170 (±85) (6.7 (3.3))			
		X2-axis	mm (inch)	-	-	165 (6.5)	
		Z2-axis	mm (inch)	-	-	925 (36.4)	
		A-axis	mm (inch)	-	935 (36.8)	-	935 (36.8)
Feedrates	Rapid Traverse Rate	X1-axis	m/min (ipm)	36 (1417.3)			
		Z1-axis	m/min (ipm)	36 (1417.3)			
		Y-axis	m/min (ipm)	26 (1023.6)			
		X2-axis	m/min (ipm)	-	-	24 (944.9)	
		Z2-axis	m/min (ipm)	-	-	36 (1417.3)	
		A-axis	m/min (ipm)	-	30 (1181.1)	-	30 (1181.1)
Left spindle	Max. Spindle speed		r/min	6000			
	Spindle nose		ASA	A2-5			
	Spindle bearing diameter (Front)		mm (inch)	100 (3.9)			
	Spindle through hole		mm (inch)	62 (2.4)			
	Min. spindle Indexing angle(C-axis)		deg	0.0001			
Right spindle	Max. Spindle speed		r/min	-	6000	-	6000
	Spindle nose		ASA	-	A2-5	-	A2-5
	Spindle bearing diameter (Front)		mm (inch)	-	100 (3.9)	-	100 (3.9)
	Spindle through hole		mm (inch)	-	62 (2.4)	-	62 (2.4)
	Min. spindle Indexing angle(C-axis)		deg	-	0.001	-	0.001
Milling spindle	Max. spindle speed		r/min	12000			
	Min. spindle Indexing angle(B-axis)		deg.	0.001			
Automoatic Tool Changer	Tool storage capa. (Max.)		ea	40 {80}			
	Tool changer arm			SWING ARM			
	Tool selection			FIXED ADDRESS			
	Max. tool diameter	Continous	mm (inch)	70 (2.8)			
		Without Adjacent Tools	mm (inch)	-			
	Max. tool length		mm (inch)	200 (7.9)			
	Max. tool weight		kg (lb)	4 (8.8)			
	Tool change time (T-T-T)		s	2.1			
Lower Turret	No. of tool stations		ea	-	-	16	
	OD tool size		mm (inch)	-	-	20 x 20 (0.8 x 0.8)	
	Max. boring bar size		mm (inch)	-	-	32 (1.3)	
	Turret Indexing time(1 station swivel)		s	-	-	0.35	
	Max. Rotary tool speed		r/min	-	-	6000	
Tail Stock	Quill diameter		mm (inch)	-	-	-	-
	Quill bore taper		MT	#4	-	#4	-
	Quill travel		mm (inch)	935 (36.8)	-	935 (36.8)	-
Motors	Left spindle motor power		kW (Hp)	15 / 11 (20.1 / 14.8)			
	Right spindle motor power		kW (Hp)	-	15 / 11 (20.1 / 14.8)	-	15 / 11 (20.1 / 14.8)
	Milling spindle motor power		kW (Hp)	9 / 3.7 (12.1 / 5.0)			
	Coolant pump motor power		kW (Hp)	2.2 (3.0)			
Power source	Electric power supply (rated capacity)		kVA	43.35	55.28	52.04	-
Machine Dimensions	Height		mm (inch)	2760 (108.7)			
	Length		mm (inch)	3800 (149.6)			
	Width		mm (inch)	2530 (99.6)			
	Weight		kg (lb)	11100 (24470.9)	11400 (25132.3)	11300 (24911.9)	11600 (25573.2)

{ } : Option

Standard Feature

- Tool locating confirmation (Milling Spindle)
- Through spindle coolant for milling spindle
- Door interlock
- Level bolt and plate
- Manual
- Name plate
- Work light
- Spindle thermal
- Compensation for milling spindle
- Standard tooling kit
- Foot switch
- Workpiece cut off Confirmation
- Signal tower
- B axis contouring Function (4axes control unit)

Optional Feature

- Parts unloader and conveyor
- Workpiece ejector
- Rotary type window Wiper
- Linear scale
- Bar feeder interface
- Air gun
- Tool setter
- Auto. Workpiece Measurement
- Automatic front door
- Dual pressure chucking
- Coolant chiller
- B axis contouring Function (5axes control unit)
- Cooling flow detector
- Steady rest for turret
- Guide bush
- Hardened & ground jaws
- Oil mist collector
- Oil skimmer
- Pressure switch for chucking pressure check
- Parts unloader and conveyor
- Special chucks
- Through spindle coolant (Left/ Right spindle)
- Chip conveyor & bucket
- Coolant blower
- Tool monitoring System

- The specifications and information above-mentioned may be changed without prior notice.
- For more details, please contact Doosan.

Machine Specifications

PUMA MX2100

Description			Unit	PUMA MX2100[L]	PUMA MX2100S[LS]	PUMA MX2100T[LT]	PUMA MX2100ST[LST]
Capacity	Swing over bed		mm (inch)	750 (29.5)			
	Swing over saddle		mm (inch)	650 (25.6)			
	Recom. Turning diameter		mm (inch)	210 (8.3)			
	Max. Turning diameter		mm (inch)	540 (21.3)			
	Max. Turning length		mm (inch)	1020 [1520] (40.2 [59.8])			
	Chuck size		inch	8			
	Bar working diameter		mm (inch)	65 (2.6)			
Travels	Travel distance	X1-axis	mm (inch)	-	565 (22.2)		
		Z1-axis	mm (inch)	-	1050 [1550] (41.3 [61.0])		
		Y-axis	mm (inch)	170 (±85) (6.7 (3.3))			
		X2-axis	mm (inch)	-	-	187 (7.4)	
		Z2-axis	mm (inch)	-	-	1050 [1550] (41.3 [61.0])	
		A-axis	mm (inch)	-	1050 [1550] (41.3 [61.0])	-	1050 [1550] (41.3 [61.0])
Feedrates	Rapid Traverse Rate	X1-axis	m/min (ipm)	36 (1417.3)			
		Z1-axis	m/min (ipm)	36 (1417.3)			
		Y-axis	m/min (ipm)	26 (1023.6)			
		X2-axis	m/min (ipm)	-	-	24 (944.9)	
		Z2-axis	m/min (ipm)	-	-	36 (1417.3)	
		A-axis	m/min (ipm)	-	30 (1181.1)	-	30 (1181.1)
Left spindle	Max. Spindle speed		r/min	5000			
	Spindle nose		ASA	A2-6			
	Spindle bearing diameter (Front)		mm (inch)	110 (4.3)			
	Spindle through hole		mm (inch)	76 (3.0)			
	Min. spindle Indexing angle(C-axis)		deg	0.001			
Right spindle	Max. Spindle speed		r/min	-	5000	-	5000
	Spindle nose		ASA	-	A2-6	-	A2-6
	Spindle bearing diameter (Front)		mm (inch)	-	110 (4.3)	-	110 (4.3)
	Spindle through hole		mm (inch)	-	76 (3.0)	-	76 (3.0)
	Min. spindle Indexing angle(C-axis)		deg	-	0.001	-	0.001
Milling spindle	Max. spindle speed		r/min	12000			
	Min. spindle Indexing angle(B-axis)		deg.	0.001			
Automoatic Tool Changer	Tool storage capa. (Max.)		ea	40 {80}			
	Tool changer arm			SWING ARM			
	Tool selection			FIXED ADDRESS			
	Tool shank			-			
	Max. tool diameter	Continous	mm (inch)	90 (3.5)			
		Without Adjacent Tools	mm (inch)	120 (4.7)			
	Max. tool length		kg (lb)	300 (661.4)			
	Max. tool weight		s	9			
	Tool change time (T-T-T)		s	2.0			
Lower Turret	No. of tool stations		ea	-	-	12	
	OD tool size		mm (inch)	-	-	25 x 25 (1.0 x 1.0)	
	Max. boring bar size		mm (inch)	-	-	40 (1.6)	
	Turret Indexing time(1 station swivel)		s	-	-	0.2	
	Max. Rotary tool speed		r/min	-	-	5000	
Tail Stock	Quill bore taper		MT	#4	-	#4	-
	Quill travel		mm (inch)	1050 [1550] (41.3 [61.0])	-	1050 [1550] (41.3 [61.0])	-
Motors	Left spindle motor power		kW (Hp)	22 / 18.5 (29.5 / 24.8)			
	Right spindle motor power		kW (Hp)	-	22 / 18.5 (29.5 / 24.8)	-	22 / 18.5 (29.5 / 24.8)
	Milling spindle motor power		kW (Hp)	18.5 / 15 / 11 (24.8 / 20.1 / 14.8)			
	Coolant pump motor power		kW (Hp)	2.2 (3.0)			
Power source	Electric power supply (rated capacity)		kVA	50 [53]	56.7 [75]	50 [53]	88 [89.8]
Machine Dimensions	Height		mm (inch)	2805 (110.4)			
	Length		mm (inch)	4850 [5945] (190.9 [234.1])			
	Width		mm (inch)	2525 [2490] (99.4 [98.0])			
	Weight		kg (lb)	11500 [12800] (25352.8 [28218.8])	11800 [13800] (26014.2 [30423.3])	11700 [13700] (25793.7 [30202.9])	12000 [14000] (26455.1 [30864.3])

{ } : Option

Standard Feature

- Air blast (for chuck)
- Coolant supply equipment
- Door interlock
- Standard work tools (including holders)
- Hyd. chuck & actuating cylinder
- Hydraulic power unit
- Level bolt and plate
- Soft jaws
- Spindle head cooling System
- Work light
- Through spindle coolant for milling spindle (Milling spindle)
- Servo driven tail stock (except S/ST type machine)
- Signal tower (yellow, red, green)

Optional Feature

- Air gun
- Automatic door with safety device
- Automatic power off
- Tool setter
- Bar feeder
- Bar puller
- Chip Conveyor & Bucket
- Coolant blower
- Dual chucking pressure
- Hardened & ground jaws
- Oil mist collector
- Oil skimmer
- Pressure switch for chucking pressure check
- Parts unloader and conveyor
- Special chucks
- Through spindle coolant (Left/Right spindle)
- Work ejector
- Linear scale
- Minimum Quantity Lubrication (MQL) system
- Coolant chiller
- Gantry loader
- Servo driven steady rest (except S/ST type machine)
- Tool monitoring system

- The specifications and information above-mentioned may be changed without prior notice.
- For more details, please contact Doosan.

Machine Specifications

PUMA MX2600 / MX3100

Description			Unit	PUMA MX2600	PUMA MX3100	PUMA MX2600S	PUMA MX3100S	PUMA MX2600T	PUMA MX2600ST
Capacity	Swing over bed		mm (inch)	1000 (39.4)					
	Swing over saddle		mm (inch)	700 (27.6)					
	Recom. Turning diameter		mm (inch)	255 (10.0)	310 (12.2)	255 (10.0)	310 (12.2)	255 (10.0)	
	Max. Turning diameter		mm (inch)	760 (29.9)					
	Max. Turning length		mm (inch)	1540 (60.6)					
	Chuck size		inch	10	12	10	12	10	
	Bar working diameter		mm (inch)	76 (3.0)	102 (4.0)	76 (3.0)	102 (4.0)	76 (3.0)	
Travels	Travel distance	X1-axis	mm (inch)	630 (24.8)					
		Z1-axis	mm (inch)	1585 (62.4)					
		Y-axis	mm (inch)	230 (±115) (9.1 (4.5))					
		X2-axis	mm (inch)	-	-	-	-	220 (8.7)	
		Z2-axis	mm (inch)	-	-	-	-	1515 (59.6)	
		A-axis	mm (inch)	-	-	1550 (61.0)		-	1550 (61.0)
Feedrates	Rapid Traverse Rate	X1-axis	m/min (ipm)	36 (1417.3)					
		Z1-axis	m/min (ipm)	36 (1417.3)					
		Y-axis	m/min (ipm)	26 (1023.6)					
		X2-axis	m/min (ipm)	-	-	-	-	24 (944.9)	
		Z2-axis	m/min (ipm)	-	-	-	-	36 (1417.3)	
		A-axis	m/min (ipm)	-	-	30 (1181.1)		-	30 (1181.1)
Left spindle	Max. Spindle speed		r/min	4000	3000	4000	3000	4000	
	Spindle nose		ASA	A2-8	A2-11	A2-8	A2-11	A2-8	
	Spindle bearing diameter (Front)		mm (inch)	130 (5.1)	160 (6.3)	130 (5.1)	160 (6.3)	130 (5.1)	
	Spindle through hole		mm (inch)	86 (3.4)	115 (4.5)	86 (3.4)	115 (4.5)	86 (3.4)	
	Min. spindle Indexing angle(C-axis)		deg	0.001					
Right spindle	Max. Spindle speed		r/min	-	-	4000		-	4000
	Spindle nose		ASA	-	-	A2-8		-	A2-8
	Spindle bearing diameter (Front)		mm (inch)	-	-	130 (5.1)		-	130 (5.1)
	Spindle through hole		mm (inch)	-	-	86 (3.4)		-	86 (3.4)
	Min. spindle Indexing angle(C-axis)		deg	-	-	0.001		-	0.001
Milling spindle	Max. spindle speed		r/min	12000					
	Min. spindle Indexing angle(B-axis)		deg.	0.001					
Automoatic Tool Changer	Tool storage capa. (Max.)		ea	40 {80}					
	Tool changer arm			SWING ARM					
	Tool selection			FIXED ADDRESS					
	Max. tool diameter	Continous	mm (inch)	90 (3.5)					
		Without Adjacent Tools	mm (inch)	130 (5.1)					
	Max. tool length		kg (lb)	400 (881.8)					
	Max. tool weight		s	10					
	Tool change time (T-T-T)		s	2.0					
Lower Turret	No. of tool stations		ea	-	-	-	-	12	
	OD tool size		mm (inch)	-	-	-	-	25 x 25 (1.0 x 1.0)	
	Max. boring bar size		mm (inch)	-	-	-	-	40 (1.6)	
	Turret Indexing time(1 station swivel)		s	-	-	-	-	0.2	
	Max. Rotary tool speed		r/min	-	-	-	-	4000	
Tail Stock	Quill bore taper		MT	#5		-	#5	-	-
	Quill travel		mm (inch)	1550 (61.0)		-	1550 (61.0)	-	-
Motors	Left spindle motor power		kW (Hp)	26 / 22 (34.9 / 29.5)	30 / 25 (40.2 / 33.5)	26 / 22 (34.9 / 29.5)	30 / 25 (40.2 / 33.5)	26 / 22 (34.9 / 29.5)	
	Right spindle motor power		kW (Hp)	-	-	26 / 22 (34.9 / 29.5)		-	26 / 22 (34.9 / 29.5)
	Milling spindle motor power		kW (Hp)	22 / 18.5 / 15 (29.5 / 24.8 / 20.1)					
	Coolant pump motor power		kW (Hp)	2.2 (3.0)					
Power source	Electric power supply (rated capacity)		kVA	70	80	90	100	70	100
Machine Dimensions	Height		mm (inch)	3025 (119.1)					
	Length		mm (inch)	5125 (201.8)					
	Width		mm (inch)	2625 (103.3)					
	Weight		kg (lb)	13900 (30643.8)	14600 (32187.0)	13900 (30643.8)	14600 (32187.0)	14900 (32848.4)	15500 (34171.1)

{ } : Option

Standard Feature

- Air blast
- Coolant chiller
- Door interlock
- Standard work tools (including holders)
- Hyd. chuck & actuating cylinder
- Hydraulic power unit
- Level bolt and plate
- Soft jaws
- Spindle head cooling system
- Work light
- Through spindle coolant for milling spindle
- Servo driven tail stock (except S/ST type machine)
- Signal tower (yellow, red, green)

Optional Feature

- Air gun
- Automatic door with safety device
- Automatic power off
- Tool setter
- Bar feeder
- Bar puller
- Chip Conveyor & Bucket
- Coolant blower
- Dual chucking pressure
- Hardened & ground jaws
- Oil mist collector
- Oil skimmer
- Pressure switch for chucking pressure check
- Parts unloader and conveyor
- Special chucks
- Through spindle coolant (Left/Right spindle)
- Work ejector
- Linear scale
- Minimum Quantity Lubrication (MQL) system
- Coolant Chiller
- Gantry loader
- Servo driven steady rest (except T/ST type machine)
- Tool monitoring system

- The specifications and information above-mentioned may be changed without prior notice.
- For more details, please contact Doosan.

NC Unit Specifications

Fanuc 31i

AXES CONTROL

- Controlled path	1 path / 2 path
- Controlled axes	X1, Z1, C1, Y, B, A, X2, Z2, C2
- Simultaneous controlled axes	4 (5-Only for Fanuc 31i-A5 / B5)axes
- Angular axis control	
- Backlash compensation	0 ~ ±9999 pulses
- Backlash compensation for each rapid traverse and cutting feed	
- Chamfering on/off	
- Synchronous / Composite control	
- Superimposed Control	
- HRV2 control	
- Inch / Metric conversion	
- Interlock	All axis / each axis
- Least input command	0.001 / 0.000 1 mm/inch
- Machine lock	All axis / each axis
- Mirror image	
- Position switch	
- Servo off	
- Stored pitch error compensation	
- Stored stroke check 1	
- Torque control	
- Interference chek for rotary area	
- Unexpected disturbance torque detection function	

OPERATION

- DNC Operation with Memory card	
- Buffer register	
- Dry run	
- Handle incremental feed	X1, X10, X100
- Program restart	
- Wrong operation prevention	
- JOG feed	
- Manual pulse generator (Portable MPG)	1 ea
- Manual reference position return	
- Single block	
- Tool direction handle feed (G68.1)	

INTERPOLATION FUNCTIONS

- Nano interpolation	
- 1st. Reference position return	Manual, G28
- 2nd. reference position return	G30
- 3rd/4th reference position return	
- AICC (Number of lookhead block : 30 Blocks)	
- Balance cutting (Only for 2 path)	
- Continuous threading	
- Cylindrical interpolation	
- Dwell (per sec.)	G04
- Multiple threading	
- Polar coordinate interpolation	
- Reference position return check	G27
- Polygon machining with two spindle	
- Skip	G31
- Thread cutting / Synchronous cutting	
- Torque limit skip	

FEED FUNCTION

- Automatic acceleration / deceleration	
- Cutting feedrate clamp	
- Feed per minute	
- Feed per revolution	
- Feedrate override (10% unit)	0 - 200 %
- Jog feed override (10% unit)	0-2000 mm/min.
- Manual per revolution feed	
- Override cancel	
- Rapid traverse override	F0, 25, 100 %

AUXILIARY / SPINDLE SPEED FUNCTION

- Spindle orientation	
- Constant surface speed control	
- M-code function	M3 digits
- Multi spindle control	
- Rigid tapping	
- S-code function	S4 / S5 digits
- Spindle serial output	S4 / S5 digits
- Spindle speed override	0 - 150 %
- Spindle synchronous control	
- Actual spindle speed output	

PROGRAM INPUT

- 3D coordinate conversion	
- Addition of custom macro common variables	#100~#199, #500~#999
- Canned cycle for turning	
- Circular interpolation by R programming	
- Coordinate system setting	G50
- Coordinate system shift	
- Custom macro	
- Decimal point programming	
- Diameter/radius programming (X axis)	
- Direct drawing dimension programming	
- Direct input of coordinate system shift	
- G code system A	
- G code system B/C	
- Input unit 10 time multiply	
- Label skip	
- Macro executor	
- Manual absolute on and off	
- Maximum program dimension	±9 digit
- Multiple repetitive canned cycle	G70 - G76
- Multiple repetitive canned cycle II	
- Optional block skip	1 piece
- Plane selection	G17, G18, G19
- Program file name	32 characters
- Programmable data input	G10
- Sequence number	N8 digit
- SUB program call	10 folds nested
- Tape code : ISO / EIA auto recognition	EIA RS422/ISO840
- Tape format for FANUC Series15	
- Work coordinate system	G52 - G59

TOOL FUNCTION / TOOL COMPENSATION

- Automatic tool offset	
- Direct input of offset value measured	
- Direct input of offset value measured B	
- T - code function	T2 + 3 digits
- Tool geometry / wear compensation	
- Tool life management	
- Tool nose radius compensation	
- Tool offset	G43, G44, G49
- Tool offset pairs	Upper : ±6 digits : 400 pairs Lower : ±6 digits : 99 pairs
- Tool offset value counter input	
- Y-axis offset	

EDITING OPERATION

- Extended part program editing	
- Number of registered programs	1000 ea
- Part program storage size	512 Kbyte
(Note) Specify total of part program storage size of each path	
- Memory card program edit & operation	
- Program protect	

SETTING AND DISPLAY

- Actual cutting feedrate display	
- Alarm history display	
- Periodic maintenance screen	
- Display of spindle speed and T code at all screens	
- Optional path name display (Only for 2path)	
- Multi-language display	English
- Operation history display	
- Run hours / part count display	
- Self-diagnosis function	
- Servo setting screen	
- Spindle setting screen	

DATA INPUT/OUTPUT

- External key input	
- External data input	
- External work number search	15 points
- Memory card input/output	
- Reader/puncher interface	CH1.interface
- RS232C interface	
- Automatic data backup (자동 데이터 백업)	
- Screen hard copy	

CONTOURING FUNCTION

- Tool center point control by 5-axes:	just on FANUC 31i-5

OTHERS

- Cycle start and lamp	
- Display unit	10.4" Color LCD
- Feed hold and lamp	
- MDI unit for	10.4" LCD
- NC and servo ready	
- PMC system	PMC-31iA
- Reset / rewind	

INTERFACE FUNCTION

- Ethernet function	Embedded ethernet

OPERATION

- DNC operation (Reader/puncher interface is required)	
- Reference position shift	

OPERATION GUIDANCE FUNCTION

- EZ Guide-i (Conversational Programming Solution)	

TOOL FUNCTION / TOOL COMPENSATION

- Tool monitoring system	

OPTIONAL SPECIFICATIONS

INTERPOLATION FUNCTIONS

- Circular threading	
- Multi step skip	
- Variable lead threading	
- High speed skip	

FEED FUNCTION

- AI Contour control (Look-ahead block no. is MAX.200)	G5.1 Q1
- External deceleration	
- Feed stop	

OPERATION

- Manual handle interruption	
- Tool retract and recover	

PROGRAM INPUT

- Addition of workpiece coordinate system pair	48 pairs
- Interruption type custom macro	
- Pattern data input	
- Work coordinate system preset	
- Optional block skip (Includs software operators panel)	9 piece

EDITING OPERATION

- Part program storage size	1MB / 2MB
- Play back	

SETTING AND DISPLAY

- Directory display of floppy cassette	

DATA INPUT/OUTPUT

- Data server	
- DNC control	

CONTOURING FUNCTION

- Tool center point control by 5-axes: just on FANUC 31i	
- AICC600 blocks	

ROBOT INTERFACE

- Robot interface with PMC I/O module (Hardware between PMC I/O mudules)	
- Robot interface with PROFIBUS-DP	

Doosan Machine Tools

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