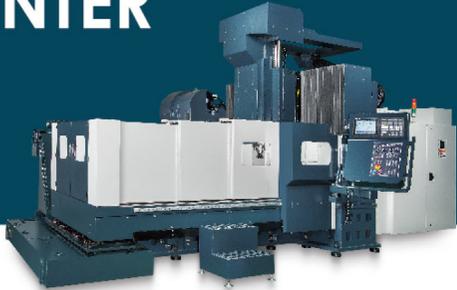


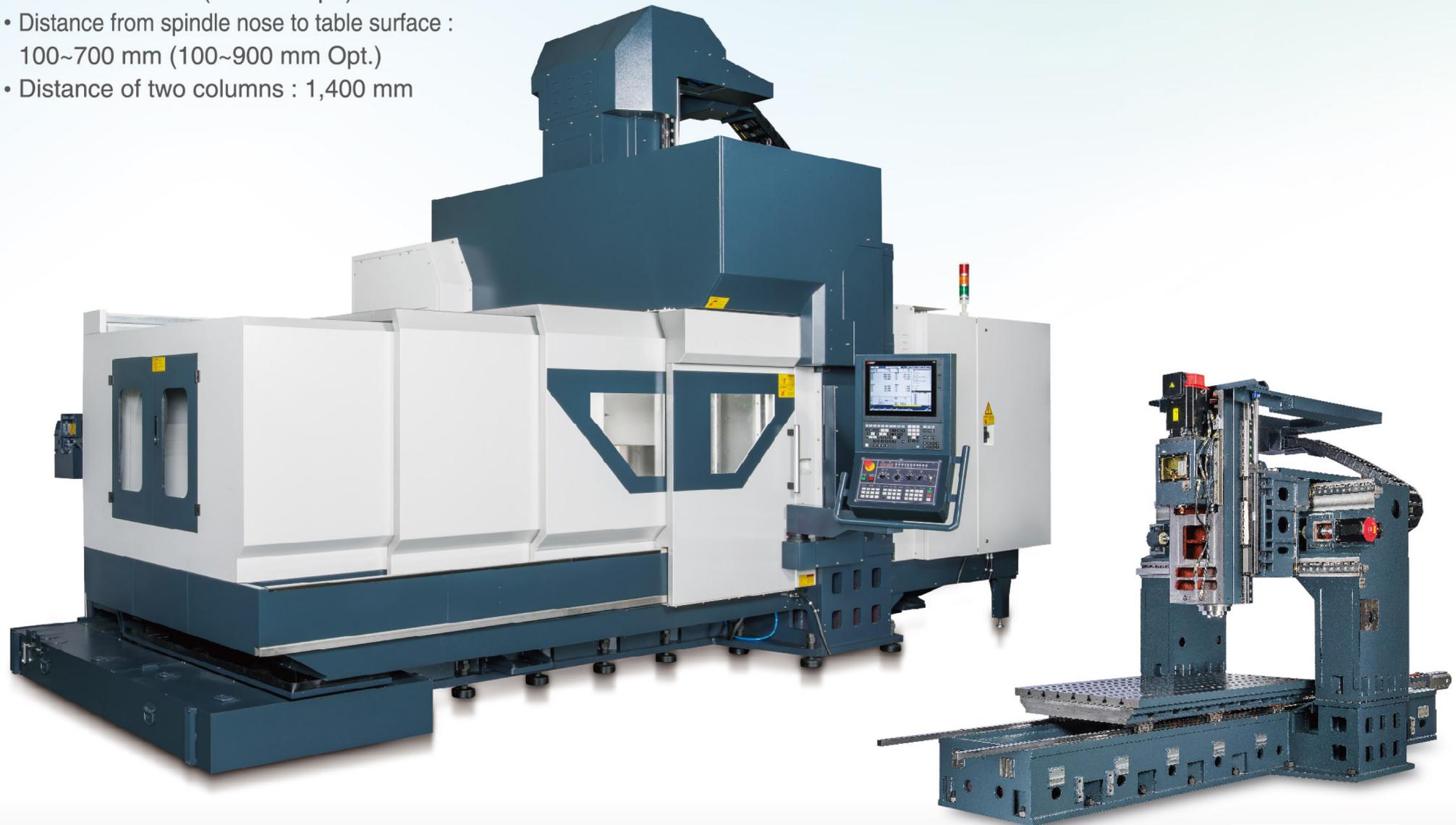
CNC DOUBLE COLUMN MACHINING CENTER

Built with Passion for Quality



DL-2112 / DL-3112 / DL-4112

- X Axis : 2,100 / 3,100 / 4,100 mm
- Y Axis : 1,220 mm
- Z Axis : 600 mm (800 mmOpt.)
- Distance from spindle nose to table surface :
100~700 mm (100~900 mm Opt.)
- Distance of two columns : 1,400 mm



DL-3116 / DL-4116

- X Axis : 3,100 / 4,100 mm
- Y Axis : 1,620 mm
- Z Axis : 800 mm (1,020mm Opt.)
- Distance from spindle nose to table surface : 150~950 mm(150~1,170 mm Opt.)
- Distance of two columns : 1,700 mm

DL-3120 / DL-4120

- X Axis : 3,100 / 4,100 mm
- Y Axis : 2,020 mm
- Z Axis : 800 mm (1,020 mm Opt.)
- Distance from spindle nose to table surface : 150~950 mm(opt.150~1,170 mm)
- Distance of two columns : 2,100 mm

Multiple doors

Specially designed multiple doors provide a spacious space for workpiece loading and unloading.



DL-4232 / DL-5232 / DL-6232

- X Axis: 4200 / 5200 / 6200 mm
- Y Axis: 3200 mm
- Z Axis 800 (Opt.1000 / 1200 / 1400 mm)

Y-axis of DL5232F can be installed with 90-degree milling head, and the five-axis head can have longer travel as 700 mm while the column can be leveled up as 500 mm.



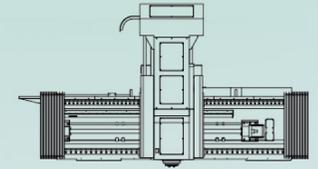
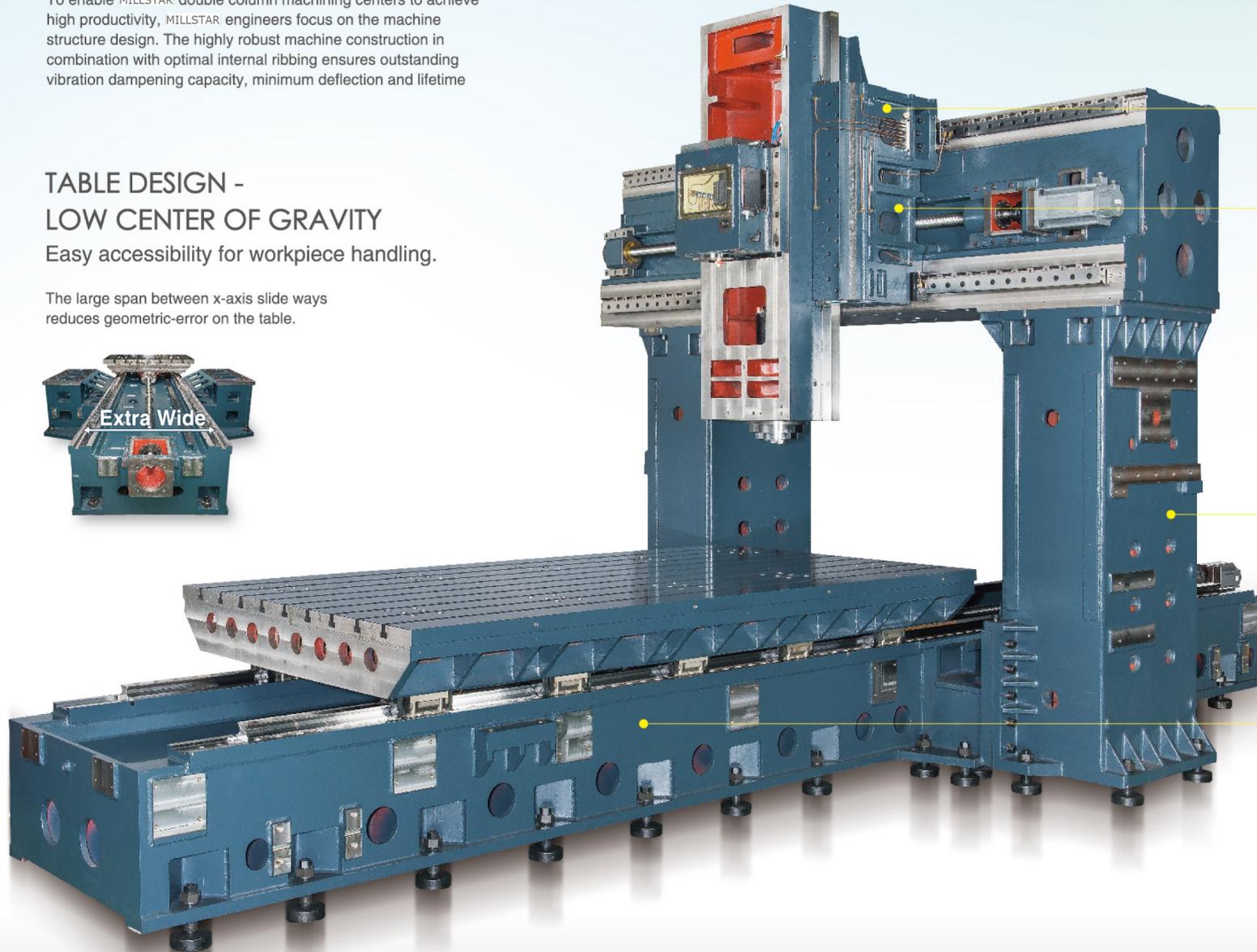
HIGHLY RIGID CONSTRUCTION

To enable MILLSTAR double column machining centers to achieve high productivity, MILLSTAR engineers focus on the machine structure design. The highly robust machine construction in combination with optimal internal ribbing ensures outstanding vibration dampening capacity, minimum deflection and lifetime

TABLE DESIGN - LOW CENTER OF GRAVITY

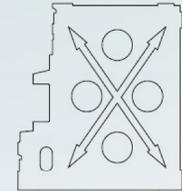
Easy accessibility for workpiece handling.

The large span between x-axis slide ways reduces geometric-error on the table.



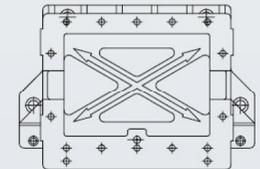
Hydraulic counter-balance

The spindle head is equipped with double hydraulic cylinders for counter-balance, that effectively upgrades the repeatability of the machine and surface finishes on the workpiece. Cutting vibration and deformation to a minimum.



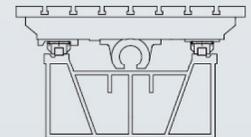
X-shaped ribbing in cross beam

The "x" shape ribbing in the y-axis cross beam helps to increase torsional rigidity during machining, while reducing cutting vibration and deformation to a minimum.



Massive base

The box type column with "x" shape internal ribbing allows for reducing the column weight without affection on its rigidity.

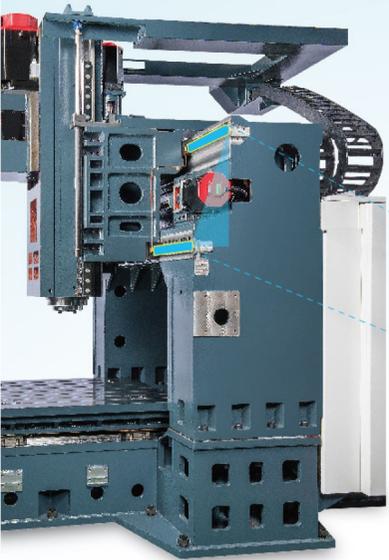


Massive base

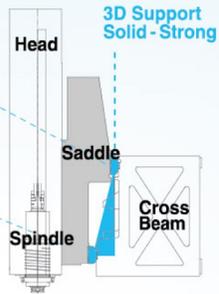
The base is designed with special rib deployment that allows weight to be directly transferred to the floor, leading to high inertia with light weight of base.

STEPPED CROSS BEAM

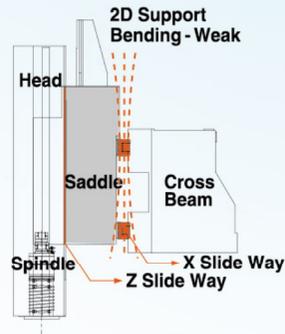
Outstanding torsion-resistance capability.



MILLSTAR DESIGNED



RIVAL DESIGNED



AUXILIARY BOX GUIDE WAYS ON Z AXIS (DL-3120 / DL-4120)

Optimum axial rigidity

The majority of cutting vibration is absorbed by Z axis. For the maximum damping coefficient, in addition to the heavy duty linear roller guide ways, the hardened box ways are added to the head stock ram of machine.



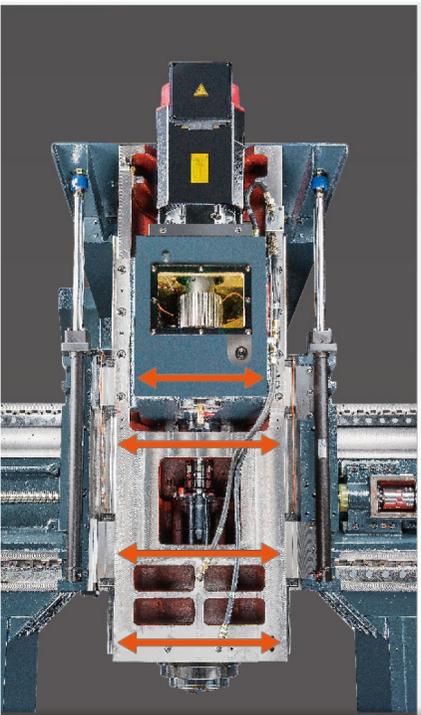
State-of-the-art hand scraping

Hand scrap on DL3120/4120 and DL-3116/4116 Z axis contact surface for the optimum matching accuracy.

THE SYMMETRICAL HEAD DESIGN

That drastically reduces Feed error

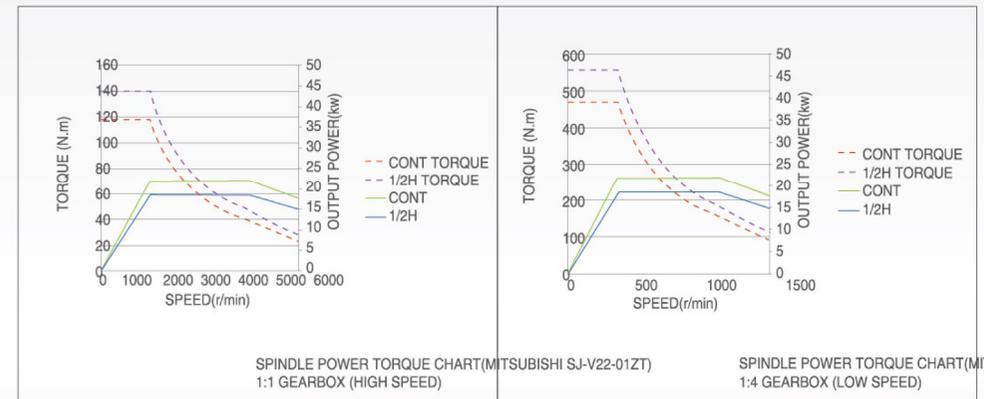
The structure of ram assembly is sophisticated calculated in symmetric form. During long time machining, the thermo deformation phenomenon is minimized due to the machine heat is evenly



Featuring high torque output during low speed range, the standard two-step gearbox powered by high performance servo motor provides continuous cutting force for the best machining efficiency.

TWO-STEP GEAR TRANSMISSION

Superb heavy cutting performance

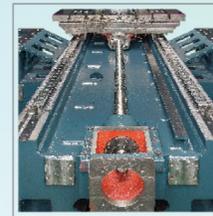


VERSATILITY, FLEXIBILITY AND EFFICIENCY

Additional application versatility.

Various milling heads can be semi-automatically attached to the spindle:

- Right Angle Milling Head
- Universal Milling Head
- Angular Milling Head
- Extension Milling Head



Twin Chip Auger



Electrical System



CTS System
(Optional)



Lift-up Type Chip Conveyor



Fuzzy Human Machine Interface

DRILL

DL-2112

- Spindle type : Direct Drive Spindle
- Max. rpm : 15,000 rpm
- Controller : MITSUBISHI M700
- Workpiece material : S45C
- Cutter : $\varnothing 1$ mm
- Machining parameter : V=12 m/min
F=40 mm/min
d=2 mm
- Continuous drilling : 100 (holes)

DL-3120

- Spindle type : Gear Spindle
- Max. rpm : 6,000 rpm
- Controller : MITSUBISHI M700
- Workpiece : S45C
- Cutter : $\varnothing 3.3$ mm
- Machining parameter : V=20 m/min
F=120 mm/min
d=7 mm
- Continuous drilling : 100 (holes)

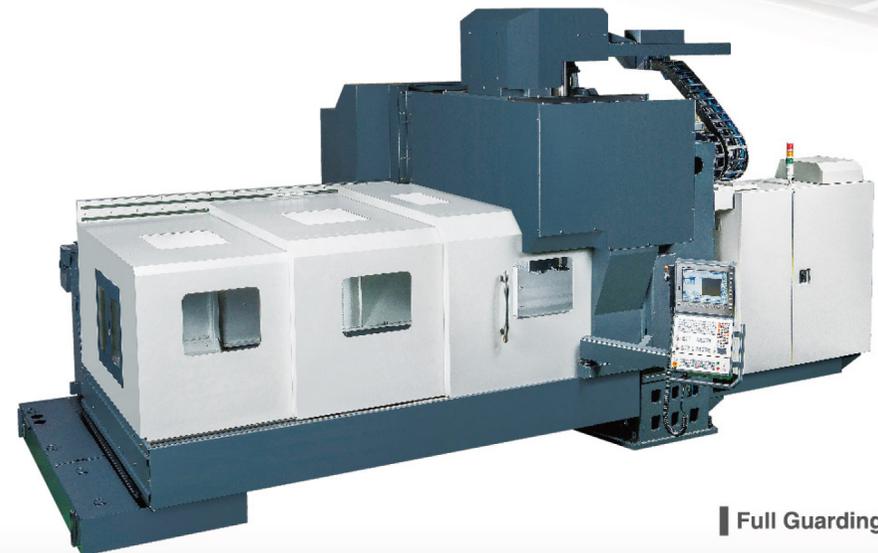
MILLING

DL-2112

- Spindle type : Direct Drive Spindle
- Max. rpm : 1,500 rpm
- Controller : MITSUBISHI M700
- Workpiece material : S45C
- Cutter : Face Mill Tool $\varnothing 80$ mm 45° 6-blade
- Machining parameter : V=227 m/min
Ap=4 mm
Ae=60 mm
F=1,500 mm
- Removal rate : **340** cm³/min

DL-3120

- Spindle type : Gear Spindle
- Max. rpm : 6,000 rpm
- Controller : MITSUBISHI M700
- Workpiece Material : S45C
- Cutter : Face Mill Tool 125 mm 60° 6-blade
- Machining parameter : V=177m/min V=177m/min
Ap=4mm Ap=8mm
Ae=100mm Ae=100mm
F=1680mm F=720mm
- Removal rate : **672** cm³/min **567** cm³/min



Full Guarding

LHL VS OIL COST COMPARISON (EVERY YEAR)



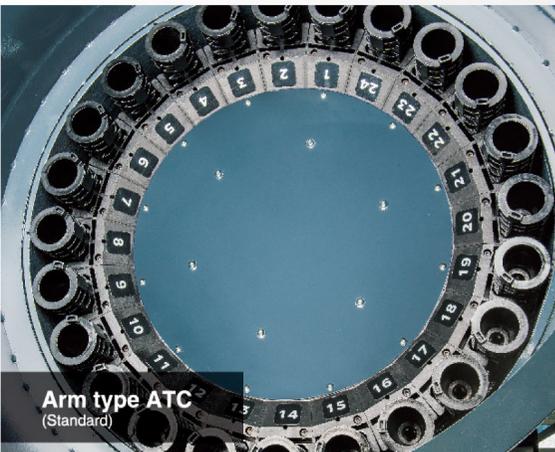
Medium pressure grease system

Compared to high velocity lubrication oil, the med-pressure grease system uses 90% less oil. Pump motor consumes 80% less electricity.

Reliable Automatic Tool Changer

(Optional)

Manford Double Column Machining Centers adopts chain type automatic tool changer, which is side-mounted on the machine base, the independent structure avoids splashes from cutting chips or coolant.



Arm type ATC
(Standard)



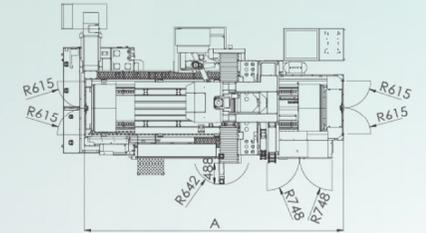
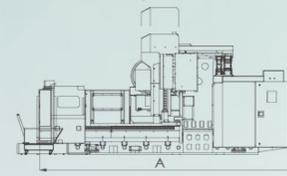
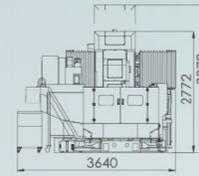
Magazine With Full Cover For
CE Specification.

MACHINE DIMENSIONS

DL-2112 / 3112 / 4112

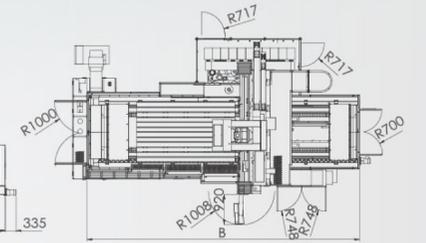
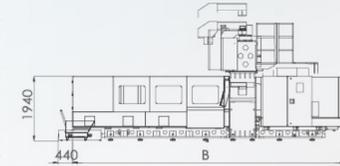
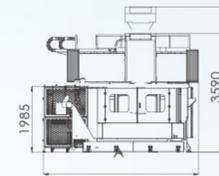
Model	mm	
	A	B
DL2112	5965	
DL3112	7965	
DL4112	9965	

UNIT:mm

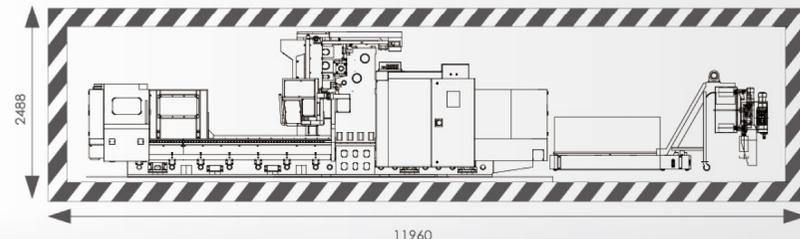
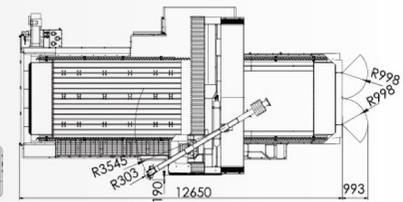
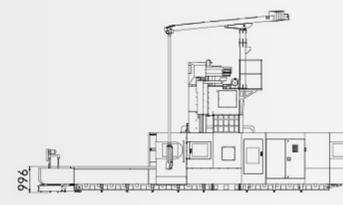
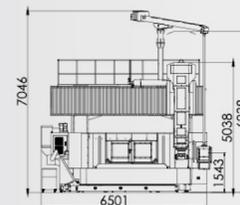


DL-3116 / 4116
DL-3120 / 4120

Model	mm	
	A	B
DL3116	4340	8315
DL4116	4340	10315
DL3120	4740	8315
DL4120	4740	10315



DL-4232 / DL-5232 / DL-6232



*Only for Z axis 600mm

SPECIFICATIONS

DL-2112 / DL-3112 / DL-4112

UNIT:mm

	DL-2112	DL-3112	DL-4112
TRAVEL	#40 (#50 Opt.) BT / CAT / ANSI / ISO		
X Axis	2,100 mm	3,100 mm	4,100 mm
Y Axis	1,220 mm		
Z Axis	600 mm (Opt. 800 mm)		
Distance from spindle nose to table surface (mm)	150~750 mm(Opt. 150~950 mm)		
Distance of two columns		1,400 mm	
TABLE			
Table size	2,000 x 1,200	3,000 x 1,200	4,000 x 1,200
T-Slot (NO.x Slot Width xDist)	7 x 22 mm x 150 mm		
Max. table load (kgs)	4,000	5,000	6,000
SPINDLE			
Spindle taper	ISO NO.40 (ISO NO. 50 Opt.)		
Spindle speed	40#:10000rpm Direct type (12000/15000rpm Opt. Build-in type 50# 6000 Gear / 10000rpm Opt. Direct type		
Spindle motor	#40: 11/15 kw (Opt. #50: 15/18.5 kw, 18.5/22 kw, 22/26 kw)		
FEEDRATE			
Rapid feed rate	24 / 24 / 15 m/min	12 / 24 / 15 m/min	
Cutting feed rate	1~10,000 mm/min		
CNC CONTROL & MOTOR			
Axis motors	7 kw / 4.5 kw / 4.5 kw		
ATC			
Tool storage capacity	Arm Type 24 tools		
MISCELLANEOUS			
Coolant tank capacity	300 L		
3 axis slide ways	X Y Z : Roller type linear guide		
Air source	5~7 kg/cm ²		
Machine gross weight (kgs)	20,000 (kgs)	24,000 (kgs)	28,000 (kgs)

*The manufacturer reserves the right to modify the design, specifications, mechanisms, etc. to improve the performance of the machine. Specifications are subject to change without notice.

DL-3116 / DL-4116

UNIT:mm

	DL-3116	DL-4116
TRAVEL	#50 BT / CAT / ANSI / ISO	
X Axis	3,100 mm	4,100 mm
Y Axis	1,600mm	
Z Axis	800 mm (Opt.1,020mm)	
Distance from spindle nose to table surface (mm)	150~950 mm(Opt. 150~1,170 mm)	
Distance between two columns	1,700 mm	
TABLE		
Table size	3,000 x 1,500	4,000 x 1,500
T-Slot (NO.xSlot WidthxDist)	9 x 22 mm x 150 mm	
Max. table load (kgs)	10,000	12,000
SPINDLE		
Spindle taper	ISO NO. 50	
Spindle speed	50# 2 steps gear 6000 rpm	
Spindle motor	15/18.5 kw (Opt. 18.5/22kw, 22/26 kw)	
FEEDRATE		
Rapid feed rate	12 / 12 / 12 m/min	
Cutting feed rate	1~10,000 mm/min	
CNC CONTROL & MOTOR		
Axis motors kw	9kw / 7kw / 7kw	
ATC		
Tool storage capacity	Chain Type 40 tools	
MISCELLANEOUS		
Coolant tank capacity	800 L	
3 axis slide ways	X Y :Roller type linear guide Z:Box ways	
Air source	5~7 kg/cm ²	
Machine gross weight (kgs)	30000 (kgs)	35000 (kgs)

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SPECIFICATIONS

DL-3120 / DL-4120

UNIT:mm

	DL-3120	DL-4120
TRAVEL	#50 BT / CAT / ANSI / ISO	
X axis	3,100 mm	4,100 mm
Y axis	2,020 mm	
Z axis	800 mm (Opt. 1,020 mm)	
Distance from spindle nose to table surface (mm)	150~950 mm (Opt. 150~1,170 mm)	
Distance between two columns	2,100 mm	
TABLE		
Table size	3,000 x 1,800	4,000 x 1,800
T-Slot (NO.x Slot Width xDist)	11 x 22 mm x 150 mm	
Max. table load (kgs)	10,000	12,000
SPINDLE		
Spindle taper	#50 (BT50 / DIN50 / CAT50)	
Spindle speed	50# 2 steps gear 6000 rpm	
Spindle motor	15/18.5 kw (Opt. 18.5/22kw, 22/26 kw)	
FEEDRATE		
Rapid feed rate	12 / 15 / 15 m/min	
Cutting feed rate	1~10,000 mm/min	
CNC CONTROL & MOTOR		
Axis motors kw	9 kw / 7 kw / 7 kw	
ATC		
Tool storage capacity	Chain Type 40 tools	
MISCELLANEOUS		
Coolant tank capacity	800 L	
3 axis slide ways	X Y : Roller type linear guide Z: Box ways	
Air source	5~7 kg/cm ²	
Machine gross weight(kgs)	33,000 (kgs)	38,000 (kgs)

*The manufacturer reserves the right to modify the design, specifications, mechanisms, etc. to improve the performance of the machine. Specifications are subject to change without notice.

DL-4232 / DL-5232 / DL-6232

UNIT:mm

	DL-4232	DL-5232	DL-6232
TRAVEL	BT50		
X Axis	4,200 mm	5,200 mm	6,200 mm
Y Axis	3,200 mm		
Z Axis	800 mm (Opt. 1,000 / 1,200 / 1,400 mm)		
Distance from spindle nose to table surface (mm)	200~1,000 mm(Opt. 200~1,200 / 1,400 / 1,600 mm)		
Distance of two columns	3,600 mm		
TABLE			
Table size	4,000 x 3,000	5,000 x 3,000	6,000 x 3,000
T-Slot (NO.x Slot Width xDist)	13 x 28 mm x 200 mm		
Max. table load (kgs)	15,000	18,000	20,000
SPINDLE			
Spindle taper	#50 (BT50 / DIN50 / CAT50 / HSK)		
Spindle speed	50# 2 steps gear 6000rpm		
Spindle motor	BT50: 15/18.5 kw		
FEEDRATE			
Rapid feed rate	12 / 15 / 15 m/min	10 / 15 / 15 m/min	
Cutting feed rate	1~10,000 mm/min		1~5,000 mm/min
CNC CONTROL & MOTOR			
Axis motors	X:a40F (1:3) Y:a30 (1:3) Z:a30	X:a40F (1:4) Y:a30 (1:3) Z:a30	
ATC			
Tool storage capacity	Chain Type 32 tools		
MISCELLANEOUS			
Coolant tank capacity	800L		
3 axis slide ways	XY: Roller type linear guide Z: Box ways		
Air source	5~7 kg/cm ²		
Machine gross weight(kgs)	50,000 (kgs)	55,000 (kgs)	60,000 (kgs)

*The manufacturer reserves the right to modify the design, specifications, mechanisms, etc. to improve the performance of the machine. Specifications are subject to change without notice.