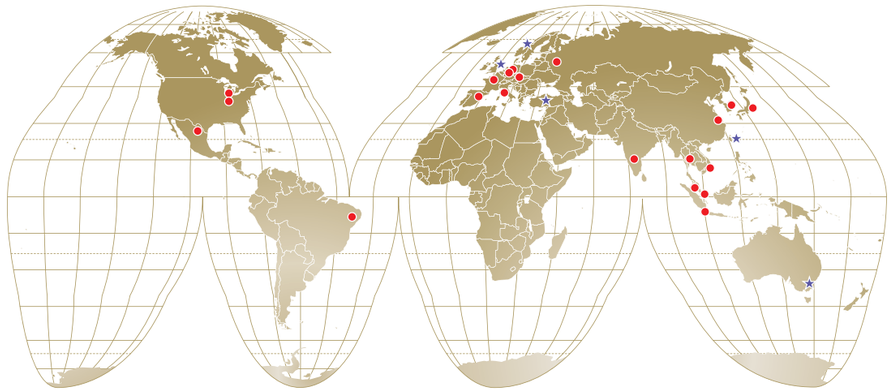

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ISO 9001 ISO 14001 BUREAU VERITAS Certification

Atsugi and Fuji Katsuyama works are certified for ISO14001 and ISO9001.

Printed in Japan M447Ea 1502/1 (V-T-D)

D300 • D500

5-Axis Vertical Machining Center

MAKINO

The 5-Axis Vertical Machining Center brings

Smooth launch on job-shop, and surefire success.

Photo: D300

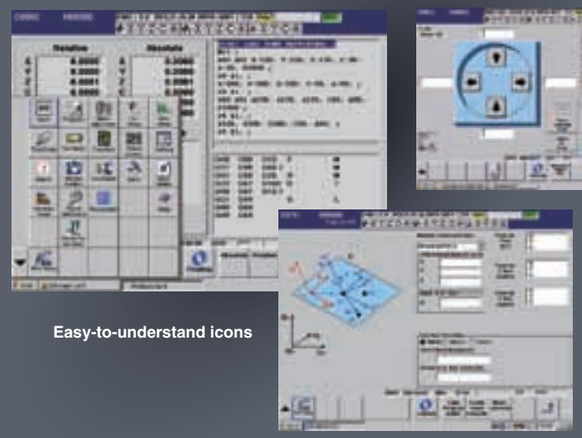
Photo: D500

5-Axis Vertical Machining Center

D series

Easy operation without instruction manual

Professional 5 [CNC Controller]



Easy-to-understand icons

Photo: D500/2000 min^{-1} spindle (optional specification)

“Interference-free” table and slim size spindle-head

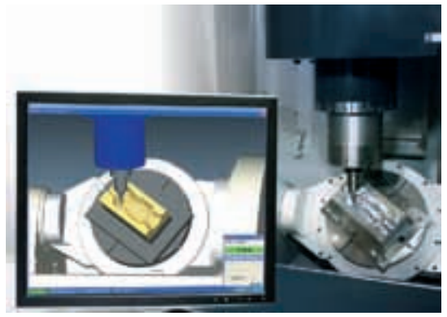
Spindle-table crash avoidance function

Setting interference area by inputting tool length, tool diameter and workpiece height, unexpected collision can be prevented. This function is effective not only during machining, but also during MDI/Manual operation.

Collision safeguard

(Software, sold separately)

Real time interference check
Machining operation is monitored in real time, thereby reducing the risk of interference



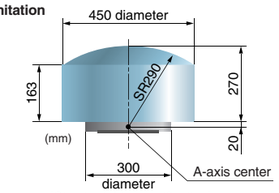
D300

Travels

X × Y × Z axis	: 300 × 500 × 350 mm
A axis (tilting axis)	: 240 (−120 ~ +120) degrees
C axis (rotating axis)	: 360 degrees (continuous rotation)

Maximum table road : 120 kg

Workpiece limitation



(Circular table specification)

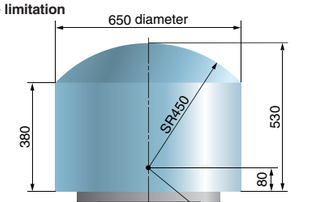
D500

Travels

X × Y × Z axis	: 550 × 1000 × 500 mm
A axis (tilting axis)	: 150 (−120 ~ +30) degrees
C axis (rotating axis)	: 360 degrees (continuous rotation)

Maximum table road : 350 kg

Workpiece limitation



(Circular table specification)

Photo: D300

Functions for precision

2+3 axis machining™

Workpiece setting function

(Including tilted working plane indexing command)

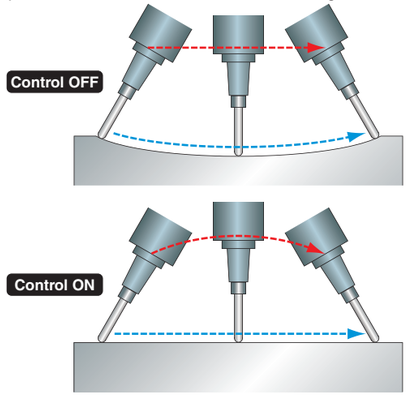
By simply entering drawing data in the dedicated screen, a indexing program can be automatically generated.

Simultaneous 5-axis machining

Tool Center Point control

(G43.4, G43.5)

Tool center point is automatically controlled so that it moves along the programmed toolpath at the commanded speed even if the orientation of the tool changes.

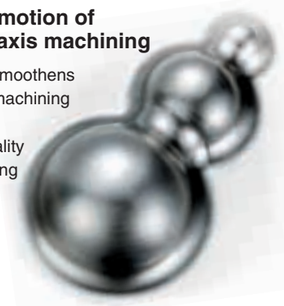


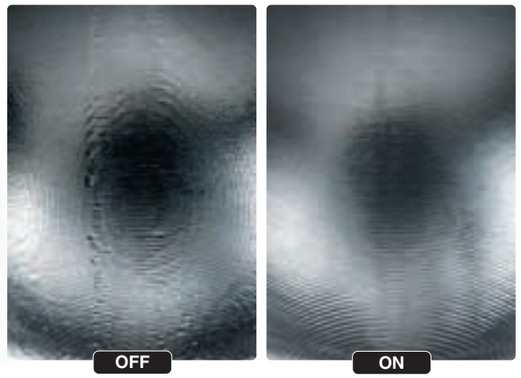
High-speed smooth TCP

Smooth control motion of simultaneous 5-axis machining

The control function smoothens simultaneous 5-axis machining motion and improves machined surface quality and shortens machining time drastically.

D300: optional equipment
D500: standard specification





Maintains high shape accuracy at high speed machining

GI.4 (*1: D300) **/ Super GI.4 control** (*2: D300, *3: D500)

*1: standard specification *2: optional equipment *3: standard specification

The control feature markedly improves the processing capacity for tiny blocks of NC data. It delivers error-free shape accuracy and uniform machined surfaces of high quality even at high cutting feeds. Three modes can be selected to match the machining job, depending on whether the emphasis is on speed or accuracy.

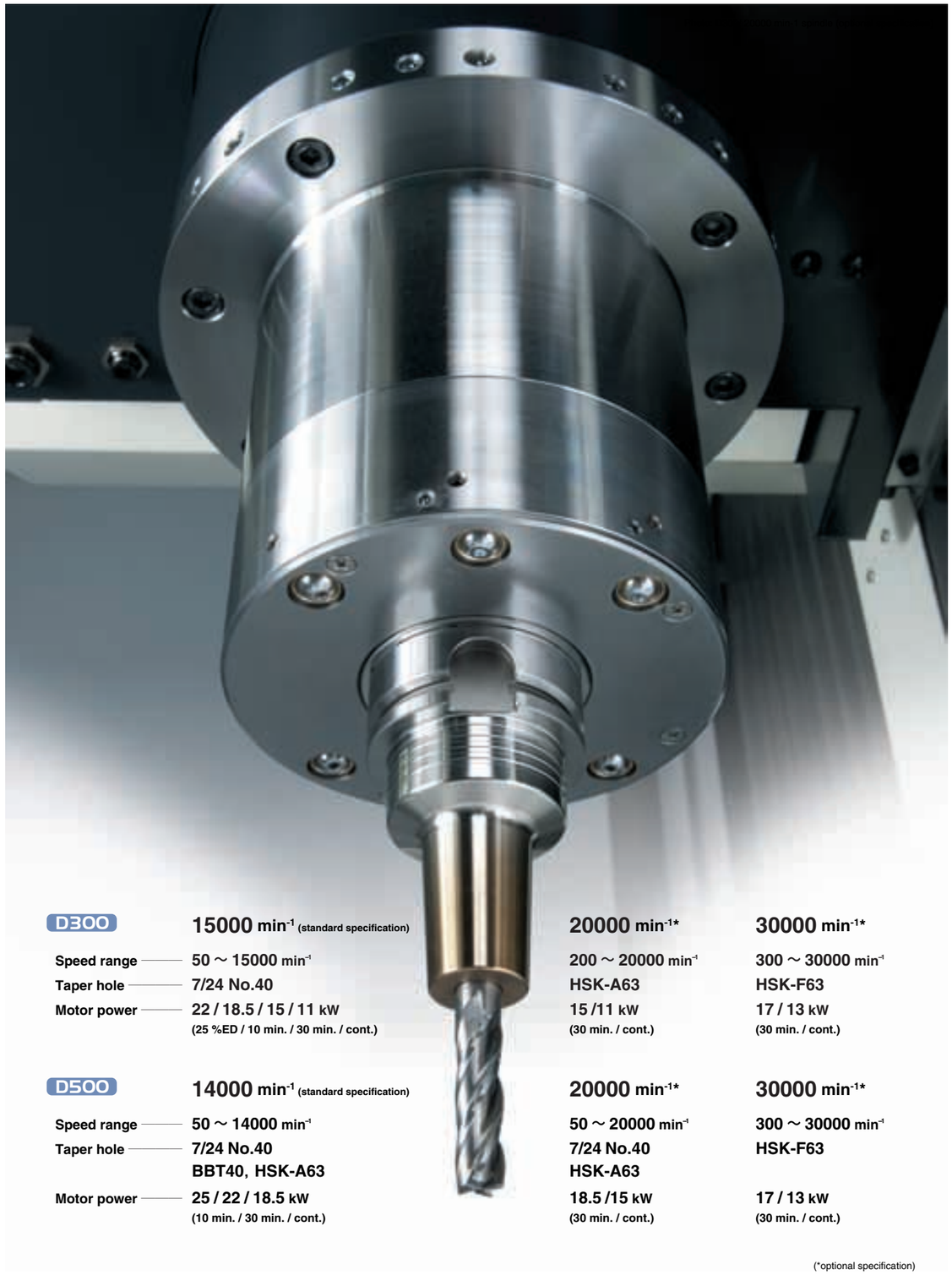
Speed ⟷ High accuracy

High Performance Mode for rotary axis	High Accuracy Mode for rotary axis	Ultra High Accuracy Mode for rotary axis
M257	M253	M258

Without GI control

With super GI.4 control

Spindles



	D300		
	15000 min^{-1} (standard specification)	20000 min^{-1}*	30000 min^{-1}*
Speed range	50 ～ 15000 min^{-1}	200 ～ 20000 min^{-1}	300 ～ 30000 min^{-1}
Taper hole	7/24 No.40	HSK-A63	HSK-F63
Motor power	22 / 18.5 / 15 / 11 kW (25 %ED / 10 min. / 30 min. / cont.)	15 /11 kW (30 min. / cont.)	17 / 13 kW (30 min. / cont.)

	D500		
	14000 min^{-1} (standard specification)	20000 min^{-1}*	30000 min^{-1}*
Speed range	50 ～ 14000 min^{-1}	50 ～ 20000 min^{-1}	300 ～ 30000 min^{-1}
Taper hole	7/24 No.40 BBT40, HSK-A63	7/24 No.40 HSK-A63	HSK-F63
Motor power	25 / 22 / 18.5 kW (10 min. / 30 min. / cont.)	18.5 /15 kW (30 min. / cont.)	17 / 13 kW (30 min. / cont.)

(*optional specification)

Cutting performance


Face mill


End mill


Drill


Tap

D300	Face mill		End mill		Drill		Tap	
Material	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)
Tool diameter	: 63 mm	: 50 mm	: 20 mm	: 16 mm	: 35 mm	: 35 mm	: M24-3.0	: M20-2.5
Radial depth of cutting	: 50 mm	: 35 mm	: 14 mm	: 14 mm	—		—	
Axial depth of cutting	: 5 mm	: 3 mm	: 15 mm	: 2.5 mm	: 35 mm	: 35 mm	: 24 mm	: 20 mm
Metal removal rate	: 1364 cm³/min	: 209 cm³/min	: 936 cm³/min	: 56 cm³/min	: 245 cm³/min	: 221 cm³/min	—	
Spindle speed	—		—		—		: 300 min⁻¹	: 250 min⁻¹

D500	Face mill		End mill		Drill		Tap	
Material	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)	: Aluminum (A5052)	: Steel (S50C)
Tool diameter	: 80 mm	: 80 mm	: 20 mm	: 32 mm	: 48 mm	: 48 mm	: M30-3.5	: M30-3.5
Radial depth of cutting	: 60 mm	: 60 mm	: 15 mm	: 20 mm	—		—	
Axial depth of cutting	: 4 mm	: 4 mm	: 14 mm	: 8 mm	: 20 mm	: 20 mm	: 20 mm	: 20 mm
Metal removal rate	: 2400 cm³/min	: 480 cm³/min	: 2016 cm³/min	: 216 cm³/min	: 445 cm³/min	: 206 cm³/min	—	
Spindle speed	—		—		—		: 106 min⁻¹	: 106 min⁻¹

D300: 20000 min⁻¹ spindle
D500: 14000 min⁻¹ spindle

Machining example

D300

Die cast mold part

Material : **Tool steel** (SKD61, 48HRC)
Size : **104 × 74 × 100 mm**
Number of tools : **5**
Machining time : **1 hr. 26 min.**

Triple splitter impeller

Material : **Titanium** (Ti-6Al-4V)
Size : **Diameter 196 × 90 mm**
Number of tools : **6**
Machining time : **4 hr. 22 min.**

Inserts of plastic mold

Material : **Mold steel** (PX5, 33HRC)
Size : **75 × 60 × 65 mm**
Number of tools : **3**
Machining time : **1 hr. 24 min.**

Roller

Material : **Carbon steel** (SCM420H, 62HRC)
Size : **Diameter 120 × 35 mm**
Number of tools : **cBN Electroplated grinding wheel, diamond grinding wheel**
Machining time : **1 hr. 31 min. 50 sec.**

Roundness (circumferential/ height direction)
2.0 μm / 2.0 μm

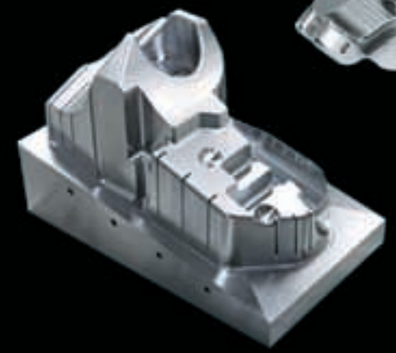
Surface finish (circumferential/ height direction)
Rz0.5 μm / Rz1.0 μm

*Requires the special specification for grinding machining.

D500

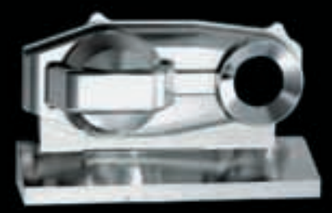
Plastic mold (core)

Material : **Mold steel** (PX5, 33HRC)
Size : **440 × 260 × 300 mm**
Number of tools : **30**
Machining time : **71 hr. 24 min.**



Knuckle arm

Material : **Aluminum** (A5052)
Size : **Diameter 300 × 100 mm**
Number of tools : **14**
Machining time : **41 hr. 51 min.**



Crankcase cover

Material : **Aluminum** (A5052)
Size : **285 × 75 × 170 mm**
Number of tools : **3**
Machining time : **30 hr.**

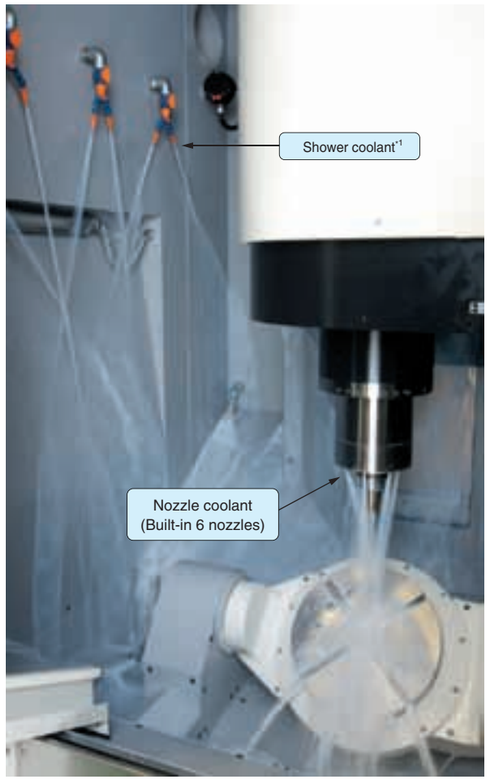
Slide core

Material : **Mold steel** (PX5, 33HRC)
Size : **300 × 200 × 165 mm**
Number of tools : **24**
Machining time : **12 hr. 47 min.**

Chip evacuation

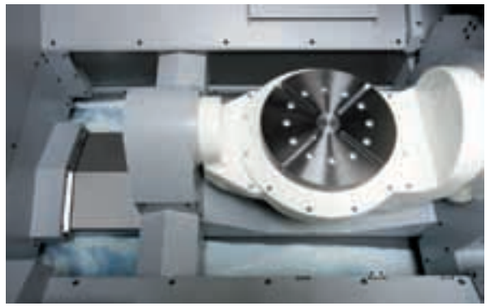
By nozzle coolant supply device and shower coolant*1, chips are flushed into the troughs along the table.
Then, they are reliably evacuated from machine by the base coolant and Lift-up chip conveyor*2.

Nozzle coolant / shower coolant*1



(*1: optional specification) Photo: D300

Base coolant / conveyor in splash guard*2



(*2: D300: Optional specification, D500: Standard specification) Photo: D300

Lift-up chip conveyor*3

D300 **Lift-up chip conveyor with coolant filtration** (scraper type)
(optional specification)

D500 **Lift-up chip conveyor with coolant filtration** (scraper type)

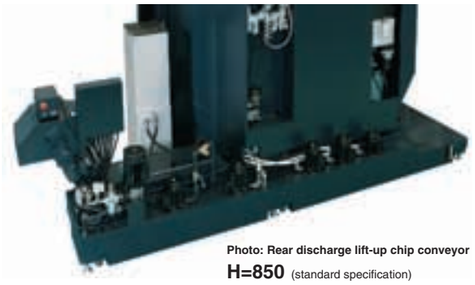


Photo: Rear discharge lift-up chip conveyor
H=850 (standard specification)

Photo: Front discharge lift-up chip conveyor
H=1250 (optional specification)

(*3: Refer to Page 16 specification list.)

Photo : D500
Pallet table specification
(optional specification)

Structure for smooth operation

Operator-friendly design

Tool tip and workpiece can be checked in natural posture.
Furthermore, workpiece loading is easy, thanks to the full overhead clearance for crane.

Photo: D300

Photo: D500/Front discharge lift-up chip conveyor H1250 spec.* (*optional specification)

Photo: D300/ Thermal Guard*, lift-up chip conveyor spec.* (*optional specification)

Photo: D300

Maintenance

Units that require daily checking are concentrated on the side of the machine

Center of Rotation Axis measurement

Before special high precision machining, center of rotation axes can be measured easily.

Photo : D500
Pallet table specification
(optional specification)

Photo: D500/Automatic tool changer

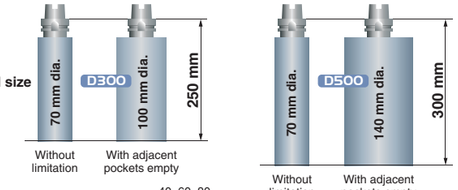
Photo: D300/Automatic pallet changer (optional specification)

Automation

Automatic tool changer

		D300	D500
No. of tool storage capacity	(standard)	40	40
	(optional)	60, 124	60, 80, 113, 155, 197 239, 281, 323
Maximum weight (kg)		8	8
Change time (sec)		0.8 (tool-to-tool)	4.2 (tool-to-tool)

Maximum tool size



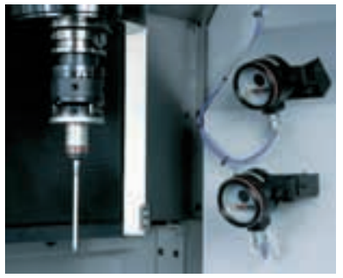
40, 60, 80		
113, 155, 197, 239, 281, 323	Without limitation	Only 4 tools

Photo: D300

Non-contact tool length measuring device

(optional specification)

Automatic workpiece measuring device



(optional specification)

Automatic pallet changer

(optional specification)

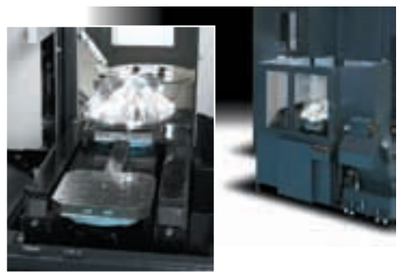


Photo: D500

Photo: D300

Photo: D500/ Pallet magazine specification

	D300	D500
Number of pallets	2	2
Exchange method	Two pallets simultaneous change by turning arm	
Maximum pallet load (kg)	100	250, 300, 500

◎**Robot shutter***
◎**Loader interface***
◎**Pallet magazine***

(*optional specification)

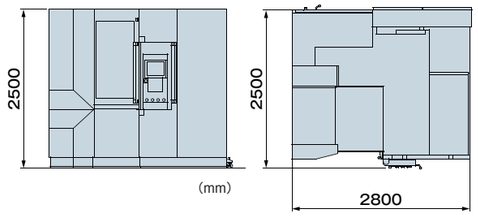
Automatic work changer (loading example)

Photo: D300

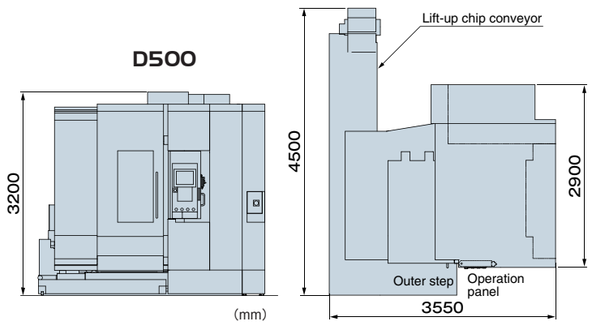
Specifications (standard specifications)			D300	D500
Travels	X × Y × Z axis		300 × 500 × 350 mm	550 × 1000 × 500 mm
	A axis		240° (−120° ~ +120°)	150° (−120° ~ +30°)
	C axis		360° (continuous rotation)	←
Table	Table working area		300 mm diameter	500 mm diameter
	Maximum workpiece size (diameter × height)		450 × 270 mm (with limitation)	650 × 500 mm (with limitation)
	Maximum table load		120 kg	350 kg
	Table surface configuration		T-slot (12H8 × 4)	T-slot (18H8 × 4)
Spindle	Speed range		50 ~ 15000 min⁻¹	50 ~ 14000 min⁻¹
	Motor power		22 / 18.5 / 15 / 11 kW (25%ED / 10 min. / 30 min. / cont.)	25 / 22/ 18.5 kW (10 min. / 30 min. / cont.)
	Torque		120 / 99 / 77 / 42 N·m (10%ED / 15%ED / 25%ED / cont.)	201 / 167 / 118 / 96 N·m (15%ED / 25%ED /15 min. / cont.)
	Taper hole		7/24 taper No. 40	←
	Bearing inner diameter		70 mm	85 mm
	Number of speed range		2 step with electric changeover	←
	Cooling / lubrication		Jacket / Oil-air	←
Feedrates	Rapid traverse	X, Y, Z axis	60000 mm/min	48000 (X axis), 50000 (Y, Z axis) mm/min
		A axis	45000°/min	18000°/min
		C axis	54000°/min	18000°/min
	Cutting feed	X, Y, Z axis	1 ~ 60000 mm/min	1 ~ 32000 (X axis), 40000 (Y, Z axis) mm/min
		A axis	1 ~ 45000°/min	1 ~ 18000°/min
		C axis	1 ~ 54000°/min	1 ~ 18000°/min
Automatic tool changer	Tool shank		JIS B6339 40T	←
	Retention knob		JIS B6339 40P	←
	Tool storage capacity		40 tools	←
	Maximum tool diameter (without limitation / with limitation)		70 / 100 mm	70 / 140 mm
	Maximum tool length		250 mm	300 mm
	Maximum tool weight		8 kg	←
Machine size (standard)	Height		2500 mm	3200 mm
	Width × Depth		2800 × 2500 mm	3550 × 4500 mm
	Machine mass (including NC unit)		7600 kg	15700 kg
Floor space	Width × Depth		3605 × 3675 mm	5000 × 4500 mm

Front view / Floor plan

D300



D500



* The space for the movable parts and maintenance in addition to the space for the machine main body are required. For the details, please refer to the specification.

Standard Specifications ● D300 ● D500

- ● | | 15000 min⁻¹ spindle
- | ● | 14000 min⁻¹ spindle
- ● | ● | Spindle temperature controller
- ● | | 300 mm diameter T-slot circular table
- | ● | 500 mm diameter T-slot circular table
- ● | ● | 40-tool magazine
- ● | ● | Base coolant
- | ● | Conveyor in splash guard (operator side)
- ● | ● | Nozzle coolant (D300: Built-in 6 nozzles / D500: 8 nozzles)
- ● | ● | Through spindle air
- ● | ● | ATC door interlock
- ● | ● | Operator door interlock (operation mode)
- ● | ● | Automatic grease supply unit
- ● | ● | Portable manual pulse generator (with the handle enable button)
- ● | ● | Lighting device inside of splash guard (D300: 1 LED light, D500: 1 fluorescent light)
- | ● | Lift-up chip conveyor with coolant filtration (scraper type) H=850 (select front or rear type)
- ● | ● | Part program storage 320 mm
- ● | ● | Registered program number 63
- ● | ● | Data center
- ● | ● | Rigid tapping
- ● | | GI.4 Control
- | ● | Super GI.4 Control
- | ● | High Speed Smooth TCP
- ● | ● | Tool Center Point control
- ● | ● | VP Control
- ● | ● | Workpiece setting function (including tilted working plane indexing command)
- | ● | 3-dimensional cutter compensation
- | ● | 3-dimensional manual feed
- ● | ● | Spindle-table crash avoidance function
- ● | ● | Standard tool length function
- ● | ● | Automatic fire extinguisher interface
- ● | ● | ECO mode functions

Optional Specifications ■ D300 ■ D500
Optional Equipment ★ D300 ★ D500

- ■ | ■ | 20000min⁻¹ spindle (HSK-A63 only)
- ■ | ■ | 30000min⁻¹ spindle (HSK-F63 only)
- ■ | | Tool magazine (60, 124 tools)
- | ■ | Tool magazine (60, 80, 113, 155, 197, 239, 281, 323 tools)
- ■ | ■ | Scale feed back
- ★ | ★ | Automatic workpiece measuring device (with center of rotation axis measurement and measuring block)
- ★ | ★ | Non-contact tool length measuring device
- ■ | | 300 mm diameter circular table (T-slot, 200 kg weight load)
- | ■ | 500 mm diameter circular table (T-slot, 500 kg weight load)
- | ■ | 630 mm diameter circular table (T-slot, 350 kg / 500 kg weight load)
- ■ | | Pallet table specification (200 mm dia. / 300 mm dia.)
- | ■ | □400 Pallet table specification (tapped hole / T-slot, 200 kg weight load, 1pc pallet)
- | ■ | □500 Pallet table specification (tapped hole, 250 kg / 500 kg weight load, 1pc pallet)
- | ■ | □500 Pallet table specification (T-slot, 500 kg weight load, 1pc pallet)
- ■ | ■ | Pallet changer
- ■ | ■ | Through spindle coolant (1.5 MPa / 7 MPa) and Air
- ★ | ★ | Shower coolant system (D300: 9 nozzles *6 nozzles when pallet changer is selected, D500: 15 nozzles)
- ★ | ★ | Tiltable chip bucket
- ★ | ★ | Tilt truck chip bucket
- ■ | | Conveyors in splash guard (hinge type)
- ★ | | Lift-up chip conveyor with coolant filtration (Right discharge, scraper type, 350L / 600L)
- | ■ | Lift-up chip conveyor with coolant filtration (Rear / Front discharge, scraper type, 820 L) H1250
- ★ | ★ | MQL unit
- ■ | ■ | Operator door lock & ATC door lock (with power shut off)
- ★ | ★ | Coolant temperature controller (with heater)
- ★ | ■ | Thermal guard
- ★ | | Super GI.4 control *D500: standard specification
- ★ | ★ | Helical interpolation
- ★ | | High Speed Smooth TCP
- ★ | | 3-dimensional cutter compensation
- ★ | | 3-dimensional manual feed
- ★ | ★ | 3-dimensional circular interpolation
- ★ | ★ | 3-dimensional coordinate conversion
- ★ | ★ | Scroll machining function
- ■ | ■ | Customer specified machine color


D series
D300
D500