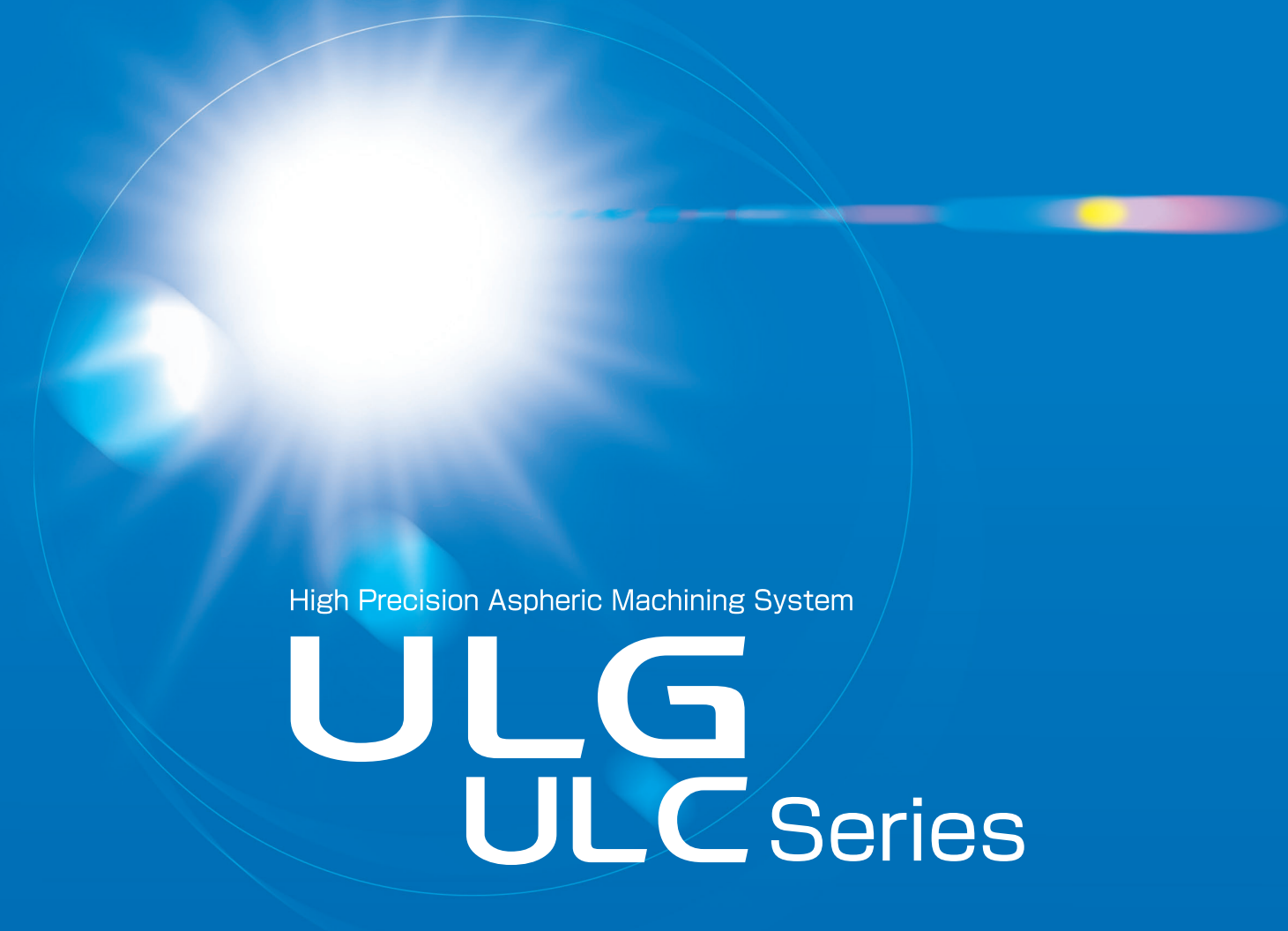




Numazu Headquarters Plant (Fuji Mountain in the background)



High Precision Aspheric Machining System

ULG ULC Series

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ULC / ULG Series

"Ultra-precision Machining Is Leading The Way In Optics"

The unlimited pursuit of precision paved the way for the world of light.

Ultra-precision machining technology is indispensable for the manufacturing of micro-machine parts and lens elements for optical equipment. Our impressive delivery accomplishment and core technologies derived from continuous development and improvement in the field of ultra-precision machining -- where any subtle deviation is unacceptable -- has culminated in the ULC/ULG series. Set to achieve the fusion with light and provide solutions with next generation machines.

In-House High-Precision Aerostatic Bearings

Grinding Spindles

In this series, spindles known for their high speed, high precision, high rigidity, low heat generation, and high reliability are used as grinding spindles.

Features

- High rotational accuracy 20nm (Remark 1)
- Semi-permanent life due to non-contact bearings
- Use of synchronous motors with high rotational accuracy
- Spindles with porous restrictors in aerostatic bearings available as special specifications, resulting in considerably lower air consumption and energy saving



Grinding spindle

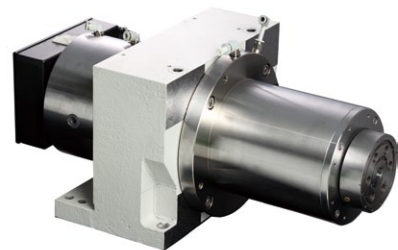
(Remark1) Measurements conducted by Single Point Asynchronous error Motion (SPAM).

Work Spindles

In addition to their high precision, rigidity, and reliability, the spindles used as work spindles are highly stable and contribute to energy saving.

Features

- High rotational accuracy: 5nm (Remark 1)
- Semi-permanent life due to non-contact bearings
- Good response through a wide speed range from high to low speeds due to digital servo
- Lower air consumption (ratio compared to the company's previous model: 1/6) by applying porous type restrictors.



Work spindle

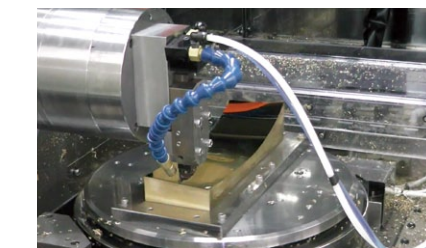
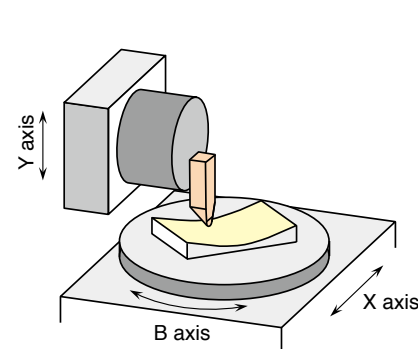
Features of ULG-100D(5A)

- 5 axes synchronous control and various machining applications (Horizontal/vertical turning, planing, fly-cutting, milling, etc.) It corresponds to various free-form surface processing.
- Quick response, high servo rigidity, and high efficiency (energy saving) were achieved through applying synchronous linear motors with cores for X, Y, and Z linear axes.
- Smoothly finished surface can be obtained through the lowest vibration level aerostatic bearings with porous restrictors for the work spindle and the B axis table.

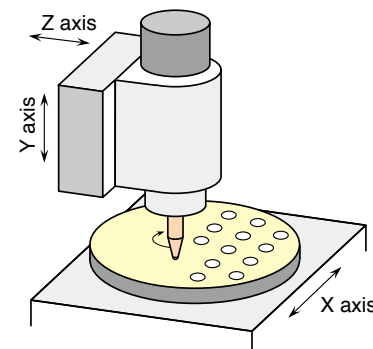


ULG-100D(5A)

ULG-100D(5A) Machining setup examples



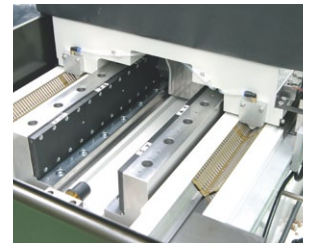
Machining large aperture f-θ lens mold on B axis



Machining wafer-level lens array mold

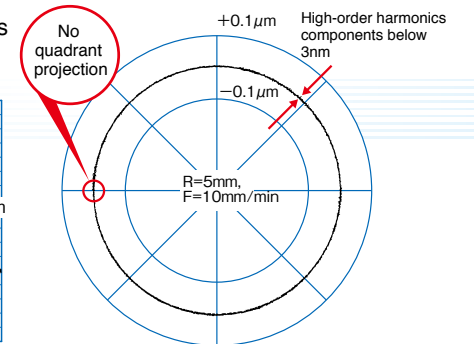
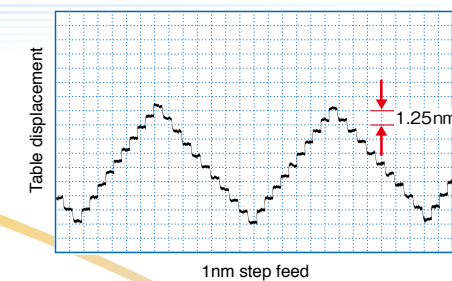
High-precision, high-rigidity V-V roller guide way with linear motors

A refined positioning accuracy is achieved through the use of a high-precision, high-rigidity, high-reliability, and extremely stable guide way system to avoid problems faced by hydrostatic guide system and the like, such as thermal or unbalanced loading displacement. The roundness, cylindricity and diameter variation of the rollers are thoroughly controlled. Reducing the use of lubricant oil contributes to save energy and protecting the environment.



Precise response step feed

Stable and steady 1 nm step feed was achieved.



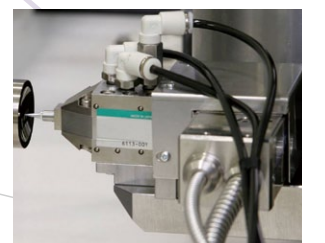
Reducing quadrant projections and high-order harmonics components at circular interpolation

Reducing quadrant projections and high-order harmonics components

Quadrant projection are reduced by the combination of linear motors with cores and high-precision V-V roller guide ways. High-order harmonics components are significantly reduced. Smoothly processed surfaces can be obtained with circular interpolation and free-form surface machining.

On-machine measuring system

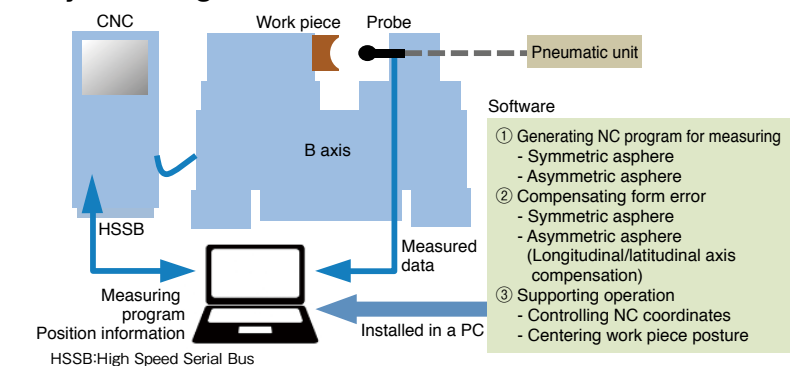
On-machine measuring for checking the process or generating the compensation program is possible without removing the work piece from the machine.



Features

- Measuring probe displacement with He-Ne laser system
- Measuring pressure 0.005N was realized with differential pressuring system
- Low measuring pressure enables measuring steep incline. (Max. 72.5 deg.)
- The probe is supported by aerostatic bearings, and the displacing is very smooth.

System diagram

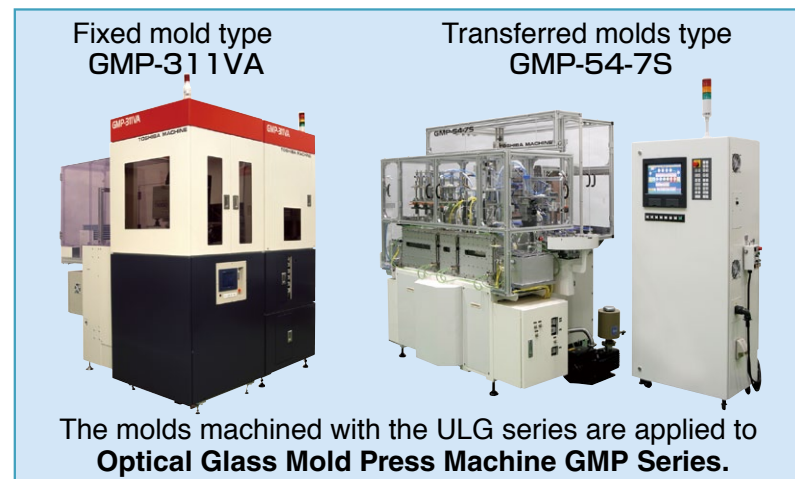
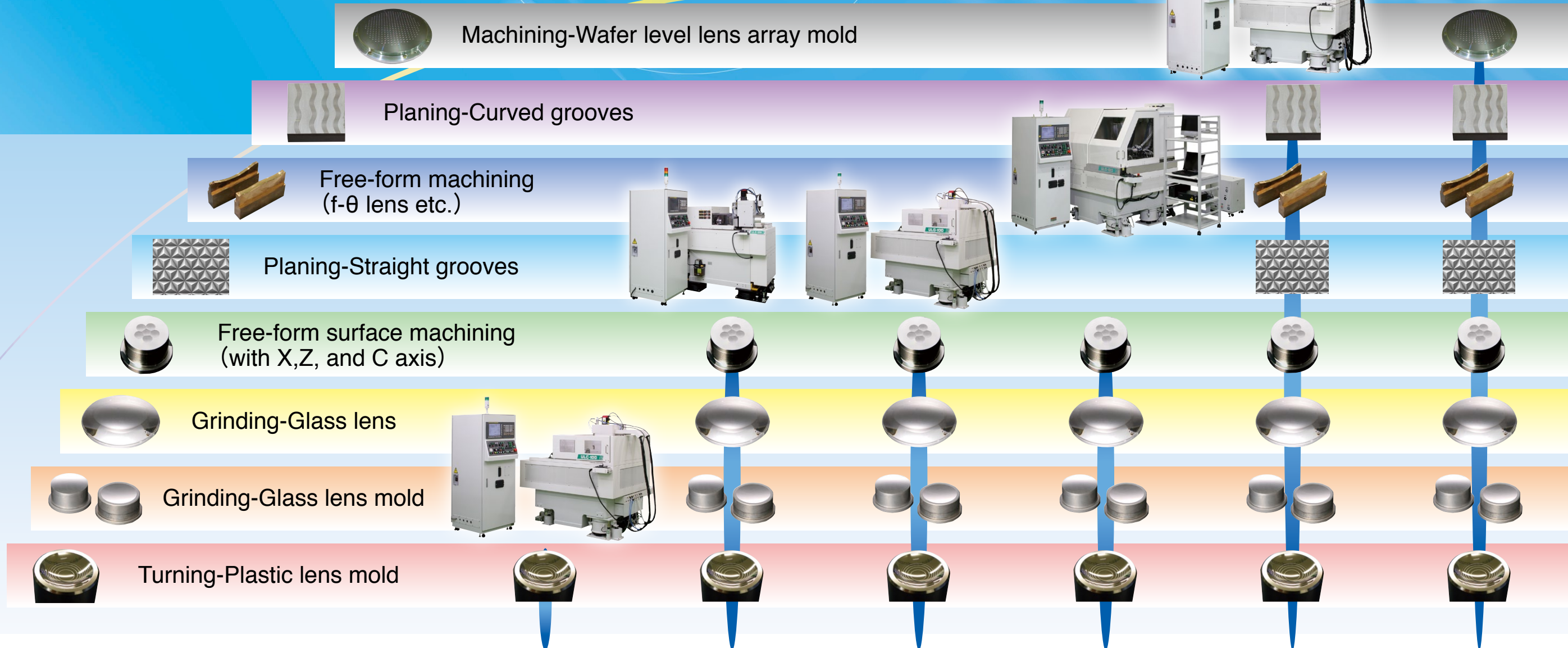


The system was developed by RIKEN and applied by Toshiba Machine.

The most suitable model can be selected for your application processes.

ULC / ULG Series

Typical applications and the machine model



Model and the NC axes	ULC-100D(S)	ULG-100E(HY)	ULG-100D(HYS)	ULG-100D(HYB)	ULG-100D(H ³)	ULG-100D(5A)
	Turning	Grinding	Turning / Grinding		Turning / Grinding / Fly cutting / Planing	
	ULC	ULG Series				

Remark 1: (Y) means the Y axis of the machine can be used only for positioning.
 Remark 2: The feed mechanism of each model is different.
 (The details are shown in specifications chart p5-p6)

Main Specifications for ULC,ULG Series

No.	Main Specification	Item	Model		Turning Machine		Grinding Machine		Turning/Grinding Machine		Turning/Grinding/Planing/Fly cutting/Planing Machine		
			ULC-100D (S)	ULG-100E (HY)	ULG-100D (HYS)	ULG-100D (HYB)	ULG-100D (H ³)	ULG-100D (5A)					
1	Typical applications (*1)	Turning molds for plastic lenses	●	●	●	●	●	●	●	●	●	●	
		Grinding molds for glass lenses	×	●	●	●	●	●	●	●	●	●	
		Grinding glass lenses	×	●	●	●	●	●	●	●	●	●	
		Planing fine grooves	×	×	×	×	●	●	●	●	●	●	
		Machining free-form surface	×	×	×	×	●	●	●	●	●	●	
		Milling array	×	×	×	×	●	●	●	●	●	●	
		Planing/turning large free-form surface	×	×	×	×	×	×	×	×	●	●	●
2	Axis constitution, Additional axis () is available as an option		X-Y-Z(-C)	X-Y-Z(-C)	X-Y-Z(-C)	X-Y-Z-B-C	X-Y-Z(-C)	X-Y-Z(-C)	X-Y-Z(-C)	X-Y-Z(-C)	X-Y-Z-B-C	X-Y-Z-B-C	
3	Linear axis	Travel (mm)	X:300 Y:25 Z:150	X:220 Y:20 Z:150	X:300 Y:25 Z:150		X:300 Y:100 Z:150		X:300 Y:100 Z:150		X:450 Y:100 Z:150		
		Max. feedrate (mm/min)	X,Z:~500 Y:~300				X,Z:~1000 Y:~500		X,Z:~1000 Y:~500		X,Z:~1000 Y:~500		
		Driving system	X,Z:Linear motor Y:Ball screw				X,Z:Linear motor Y:Ball screw		X,Z:Linear motor Y:Ball screw		X,Y,Z:Linear motor		
		Programming resolution	1										
4	Work spindle (C axis)	Bearing system	Porous restriction aerostatic bearing										
		Rotational speed (min ⁻¹)	~1500				~1500		~1500		~2000		
		C axis function	-		-		-		-		Standard accessory		
		Feedrate (deg/min)	-		-		-		-		~36000		
		Progmrng resolution (deg)	-		-		-		-		0.0001		
5	Grinding spindle	Bearing system	-				Aerostatic bearing		Aerostatic bearing		Aerostatic bearing		
		Ratational speed (min ⁻¹)	-				5000~40000		10000~80000		5000~40000		10000~80000
6	Indexing table (B axis)	Bearing system	-		-		Porous restriction aerostatic bearing		-		Porous restriction aerostatic bearing		
		Feedrate (deg/min)	-		-		~10800		-		~10800		
		Programming resolution (deg)	-		-		0.0001		-		0.00001		
7	CNC controller	Model	FANUC Series 30i-MODEL B		FANUC Series 31i-MODEL B		FANUC Series 30i-MODEL B		FANUC Series 30i-MODEL B		FANUC Series 30i-MODEL B		
		Number of simultaneously controle axes/Controle axes	2/3		3/3(3/4)		4/5		4/4		5/5		
8	Machine mass (kg) (Control cabinet is not included.)	3500		2300		3500		3600		3500		4000	
9	Power source	Main circuit supply AC200V±10%, 50/60Hz±2%, 3phases 7kVA											
10	Standard accessories	1) Isolator	●	●	●	●	●	●	●	●	●	●	
		2) Pneumatic unit	●	●	●	●	●	●	●	●	●	●	
		3) Vacume chuck (φ100, stainless steel)	●	●	●	●	●	●	●	●	●	●	
11	Optional accessories (*2)	1) Coolant supply unit	-	●	●	●	●	●	●	●	●	●	
		2) Mist coolant supply unit	●	●	●	●	●	●	●	●	●	●	
		3) Collet chuck	-	●	●	●	●	●	●	●	●	●	
		4) Truer with a fixture	-	●	●	●	●	●	●	●	●	●	
		5) Tool holder	●	●	●	●	●	●	●	●	●	●	
		6) Fly cutting tool holder	-	-	-	-	-	-	-	-	●	●	
		7) Slant type grinding spindle	-	●	●	●	●	●	●	●	-	-	
		8) Aspheric surface machining software	-	●	●	●	●	●	●	●	●	●	
		•Symmetric aspheric surface machining software (Including machining with slant spindle and B axis)	●	●	●	●	●	●	●	●	●	●	
		•Asymmetric aspheric surface machining software(X-Y-Z)	-	●	●	●	●	●	●	●	●	●	
		•Free-form surface machining software(X-Y-Z)	-	-	-	-	-	-	-	-	●	●	
		•Fresnel lens machining software(X-Z)	●	●	●	●	●	●	●	●	●	●	
		•Aspheric surface machining software with Diffractive Optical Element	●	●	●	●	●	●	●	●	●	●	
		•Aspheric surface analysis software	●	●	●	●	●	●	●	●	●	●	
		9) Precise temperature control air dryer	●	●	●	●	●	●	●	●	●	●	
		10) Air filter unit	●	●	●	●	●	●	●	●	●	●	
		11) Mist collector	●	●	●	●	●	●	●	●	●	●	
		12) Grinding condition monitor	-	●	●	●	●	●	●	●	●	●	
13) On-machine measuring system	●	●	●	●	●	●	●	●	●	●			
14) Enclosure(±0.1℃ Thermal chamber) (*3)	●	●	●	●	●	●	●	●	●	●			
15) Micro scope for tool height centering	●	●	●	●	●	●	●	●	●	●			
16) Field balancer	-	●	●	●	●	●	●	●	●	●			
17) Electronic balance	-	●	●	●	●	●	●	●	●	●			
18) Centering microscope for B axis(W axis)	-	-	-	-	-	-	-	-	●	●			

(*1) The (●) and (X) marks in the processed work field indicate respectively "applicable" and "not-applicable".
 (*2) The mark (●) in 'optional accessories' means "supported", while the (-) mark means not-supported or not necessary.
 (*3) The enclosure for ULG-100D (5A) is constructed from an integrated standard cover and an optional air conditioner.

