HT13000-S001-E4
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GENERAL SPECIFICATIONS FOR

TWIN-SPINDLE FULLY AUTOMATIC WAFER DICING MACHINE

MODEL: A-WD-300T

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1. Machine Name, General Description and Features

1-1 Machine Name

1-1-1 Full Name: ***Twin-Spindle Fully Automatic Wafer Dicing Machine 300T***

1-1-2 Common Name: ***Twin-Dicer 300T***

1-1-3 Model no: ***A-WD-300T***

1-2 General

This machine precisely cuts wafers into dices with a very thin outer-edge diamond blade rotating at high speed driven by a high precision air-spindle with built-in high-speed motor. The machine incorporates image processing-type alignment function.
With the alignment function running on pre-set data, the machine handles full-automatically wafers attached to frames for loading, alignment, dicing, spinner-cleaning, and unloading to the cassette.

1-3 Features

- ***The world's smallest twin-spindle full-automatic machine for 12-inch wafer***
- ***Multi-cut and step-cut for twin-spindle***
- Spindle with built-in brushless DC motor (low vibration, low power consumption)
- High throughput
  X-axis return speed: max. 600 mm/s
- High reliability
  with ceramic air slider
- Performance enhanced loader
  a) Separate inspection stage as standard spec
  b) Equipment of the exclusive cassette for automatic blade dressing
  c) Load ports type-->Support for overhead transport(OHT).
  d) Cassette storage type-->Changeable to next lot during cutting process with two-stack cassette storage.
- ***Higher performance and expandability with AT/PC***

2. Functions

2-1 Functions

2-1-1 Cutting Capability

(1) Applicable wafer size: ***25 mm to 310 mm diameter***
25 mm to 210 mm diagonal

2-1-2 Cutting Method

(1) Cutting method: Tape cutting
(2) Cutting form: Single cutting(with single spindle only)
multi cutting
step cutting
(3) Cutting pattern: Circle or square cutting
(4) Cutting mode: Single direction (down or up) cutting
Bidirectional (up and down) cutting
(5) Cutting depth: Single pass cutting
Multiple-pass cutting

2-1-3 Blade Dressing

(1) Dressing on special dressing data
Cutting feed rate and cutting depth are specified with number of cut lines.
(2) Dressing on wafer data
The cutting feed rate is continuously increased to a preset value while cutting wafers.

2-1-4 Auto-focus Function

Referring to the data on wafer thickness and tape thickness, the machine searches the range of +/-40 μm for the focus setting. If the focus point is within +/-80μm of the set value, auto-focus function is executed by automatic expansion of search range.

2-1-5 Alignment Function

Each wafer is automatically aligned using a preset model pattern. The automatic registering function of model pattern is included in the alignment function.

Kerf Inspection Function

(1) Measured items:
Kerf center displacement from the target position
Max. kerf width including chipping area
Min. kerf width
Max. distance of kerf edge from kerf center
Max. width of chipping area in one side
(2) Control functions:
The kerf displacement can be automatically corrected.
This function can stop the machine operation with alarm in the following conditions;
i) The max. width of chipping area in one side has exceeded the set limit.
ii) The max. kerf width has exceeded a limit or has been found smaller than the blade thickness.
iii) The kerf center displacement from the target position has exceeded the set limit.

2-1-6 Spinner Cleaning Function

(1) Cleaning: High pressure cleaning at 3 ~ 10MPa
Low pressure cleaning at less than 0.4MPa (optional)
Rinsing at less than 0.4MPa

(2) Drying: N2 gas of 0.5MPa (or dry air)

(3) Back surface drying: N2 gas of 0.5MPa (or dry air)

2-1-7 Operation Modes

(1) Fully automated mode: Fully automatic operation

(2) Basic mode: Manual cutting only

2-1-8.Self-diagnosis Function

Indicates malfunctions of individual units.

2-1-9 Maintenance Program

Individual unit drive for maintenance

3. Specifications

3-1 Applicable Wafer Size
- (1) Circular Wafer size: ***25 mm to 310 mm diameter***
- (2) Square Wafer: ***25 mm to 210 mm diagonal***

3-2 Applicable Frame Size
- (1) Frame for ***8-inch- to 12-inch-diameter*** wafer

3-3 Spindle
- (1) Spindle type: Air spindle with built-in brushless DC motor
- (2) Rotation: 20,000 to 60,000 /min
- (3) Continuous output power: 1200 W
- (4) Cooling: Water cooling (with flow sensor)
- (5) Sensor: Interlocked with thermo sensor
- (6) Applicable blade type: 2-inch-diameter blade (3-inch-dia.:factory option)

3-4 X-axis
- (1) Cutting stroke: ***330 mm***
- (2) Driving method: ***linear motor*** + Air guide
- (4) Cutting feed rate: ***0.1 mm/sec to 600 mm/sec***
- (5) Positioning resolution: 0.002 mm
- (6) Straightness: 0.0015 mm / 330 mm (both horizontal and vertical)

3-5 Y-axis
- (1) Stroke: ***320 mm***
- (2) Driving: ***stepping motor + ball screw(Linear motion guide)***
  linear motor or Ball screw
- (3) Driving speed: ***Max. 100 mm/sec***
- (4) Positioning resolution: 0.0002 mm (closed-loop control)
- (5) Straightness: ***0.003 mm / 320 mm***
- (6) Positioning accuracy: 0.002 mm / ***320 mm***

3-6 Z-axis
- (1) Stroke: ***35 mm***
- (2) Driving method: ***stepping motor + ball screw(Linear motion guide)***
- (3) Driving speed: Max. 40 mm/sec
- (4) Positioning resolution: 0.0002 mm
- (5) Straightness: ***0.005 mm / 35 mm***
- (6) Repeatability: ***0.0015 mm***
- (7) Positioning accuracy: 0.003 mm ***/ 1 mm***

3-7 T-axis
- (1) Rotation range: ***Max 380 degree***
- (2) Driving: ***direct drive motor***
- (3) 90-degree rotation time: ***0.5 sec***
- (5) Positioning resolution: ***1 arc-sec***
- (6) Repeatability: ***+/-1arc-sec***

3-8 Microscope Unit

(1) Optical system: Switchable, high/low magnifications

(2) Performance:

	Low	High
Optical magnification	x2	x8
Image magnification	4.93 μm/Pixcel	1.23 μm/Pixcel
Field of view	2.4x3.2mm	0.6x0.8mm

(3) Camera: CCD type ***(1/3-inch)***

(4) Illumination intensity: Variable

(5) Illumination: Coaxial/***oblique or ring-type*** / both coaxial and oblique

(6) Focusing: Automatic focusing by Image processing

3-9 Alignment System

(1) Alignment method: Pattern recognition

(2) Alignment time: Within ***15 seconds*** (for standard wafers)

(3) Target pattern hit rate: Over 99 % (for standard wafers)

3-10 Total Accuracy

0.004 mm

3-11 Kerf Inspection Function

(1) Inspection method: Image processing

(2) Inspection time: Within 4 seconds (for standard pattern)

3-12 Spinner

(1) Rotation speed: ***30 to 2,500 /min***

(2) Cleaning nozzlws: 0.28mm diameter fan-type

(3) Cleaning program: High pressure cleaning /(low pressure cleaning)/ rinsing/ drying: 0 to 300 sec

3-13 Nozzle on Flange Cover Unit

(1) Nozzle for cutting water (with flow meter)

(2) Two nozzle for blade coolant (with flow meter)

(3) ***Nozzle for cleaning water (with flow meter)***

3-14 Loader Unit

(1) Feeding pitch: ***3/16-inch to 1-inch (multiple setting available)***

(2) Driving speed: 150 mm/sec

(3) Unit component: ***Inspection stage, cassette base x n, cassette base for dressing***

3-15 Requirements

3-15-1 Power Supply

(1) Power supply:	200V AC ±10%, 3 phase, 50/60Hz
(2) Power consumption:	4.0kva(Max)
(3) Power cable connection:	Terminals (size M5) with transformer and breaker built-in machine

3-15-2 Air Supply

(1) Pressure:	0.5 to 0.7 MPa
(2) Consumption:	250 liter/min.(average, excluding the amount of air blow)
(3) Air tube connection:	Rc (PT) 3/8-inch female plug
(4) Temperature:	20 to 25 degree C
(5) Dew point:	-15 degree C or below
(6) Oil residue:	0.1 PPM Wt/Wt

3-15-3 N2 Gas

(1) Pressure:	0.5 to 0.7 MPa
(2) Consumption:	100 liter/min.(average)
(3) Air tube connection:	Rc (PT) 3/8-inch female plug

3-15-4 Spindle Coolant

(1) Pressure:	0.2 MPa
(2) Consumption:	3.0 liter/min (tap water applicable)
(3) Water tube connection:	Rc (PT) 3/8-inch female plug
(4) Temperature:	20 to 25 degree C

3-15-5 Cutting Water

(1) Pressure:	0.4 MPa to 0.5 MPa
(2) Consumption:	***Max. 12 liter/min (adjusted with valve)***
(3) Water tube connection:	Rc (PT) 3/8-inch female plug
(4) Temperature:	20 to 25 degree C

3-15-6 Rinsing

(1) Pressure:	0.4 MPa
(2) Consumption:	Max. 5 liter/min (adjusted by a valve)
(3) Water tube connection:	Rc (PT) 3/8-inch female plug

3-15-7 Exhaust

(1) Exhaust capacity:	5 cubic-meter/min and over
(2) Junction:	For nominal 100mm-diameter duct hose

3-15-8 Dimensions

Load ports type:1685(W)x1500(D)x1350(H)
cassette storage type:1550(W)x1500(D)x1350(H)
(Excluding the monitor and the protruding objects)

3-15-9 Weight

1700 kg

3-15-10 Painted Color

Stainless steel Finish Line (unpainted)

3-15-11 Operation Condition

(1) Temperature: 25 degree C ±5 degree C

(2) Humidity: 50% ±20% (non-condensing)

(3) Others: Least external vibration or electrical noise

3-17-12 Allowable Temperature Variation for Accuracy Guarantee

(1) Room, air supply, spindle coolant, cutting water:

Within ±1 degree C

(2)Temperature difference between spindle coolant and cutting water:

Within ±2 degree C

3. Optional Functions

(1)Optical Blade Breakage Detection System
The mechanism with LED and photoreceptor which alerts the operator detection of the blade breakage on real-time basis.

(2)Optical Blade Height Calibration System
The mechanism with LED and photoreceptor which calibrate the height of the blade without contacting chuck table. Height calibration is automatically executed after cutting of pre-set number of cut line or cut length.

(3)High pressure pump unit
This unit supplies high pressure cleaning water to the spinner. This unit is to be built-in at the front part of the main unit.
1)Ejection pressure: 3-10MPa
2)Ejection rate: Approx.0.2 liter/min
3)Air consumption: Max.50 liter/min

(4)Water Pressure-up Pump Unit
The unit rises pressure of DI water for cutting water and blade coolant to secure quantity of flow.
1)Power supply: AC100V 0.5KVA
2)Ejection pressure: 0.4 ~ 0.5 MPa
3)Ejection rate: 5~7 liter/min

(5)Uninterruptive Power Supply Unit
The unit protects the machine against power failure because of thunderbolts or unstable power supply. The unit also supports interlock function upon power failure. The machine is kept running for power failures within 2 seconds, while the machine is interlocked and stays in idle mode for failures exceeding 2 seconds.

(6)Thermo Regulator for Water
The unit is useful when temperature of cutting water and blade coolant varies significantly or the pressure of water supply is low.

(7) Built-in UV Unit
This unit applies ultraviolet ray to dicing tape (Common name: UV tape) to deteriorate its adhesion after wafer cutting.
After cutting and spinner cleaning, Work is transferred to this UV irradiation unit. And after irradiated for specified time, the Work is unloaded to its original cassette.

(8)Shape recognition system

This system measures shape of such device as GaAs, that is apt to be broken or cracked, by image processing, and selects an optimum cutting range for high throughput, minimum blade wear. With back-light, it provides stable shape recognition.

Applicable wafer size is 6-inch max.

The system measures exterior shape of broken wafer of great diameter using line sensor

(9) Production management system software

This software monitors such status as the machine running and wafer production, and automatically logs the data into a hard disk.

(10) Automatic device data change-over by bar-code reading

Device data can be automatically changed by reading the bar-code device ID on each wafer or cassette.

(11)Automatic machine condition data acquisition function

The system with various kinds of sensors monitors the running status of the machine quantitatively and collects the data to allow determining an optimum cutting condition easily. The applicable items are as follows. (Available in the customization only.)

- Volume of water : blade coolant / cooling water 1 / cooling water 2
- Temperature of blade coolant and cooling water
- Resistance of blade coolant and cooling water
- Resistance of spinner cleaning and rinse water
- Temperature of spindle cooling water
- Rotation speed and current variation of spindle
- Inside machine temperature

(12)Cassette for auto-dressing

The cassette, which uses the third stack of cassette storage, stores in advance dressing plates and/or dressing-specific wafers for the automatic dressing.

TSK can provide the cassette for 8-inch, 12-inch frames. Please contact us for other frame sizes.

(13)Running status data transfer

This unit outputs signals indicating the machine's running status such as idling, error state and dicing in progress. Please contact us for details on the signal.

(14)Melody alarm

The alarm indicates an error or operator call with a melody sound.

(15)Cover-open interlock

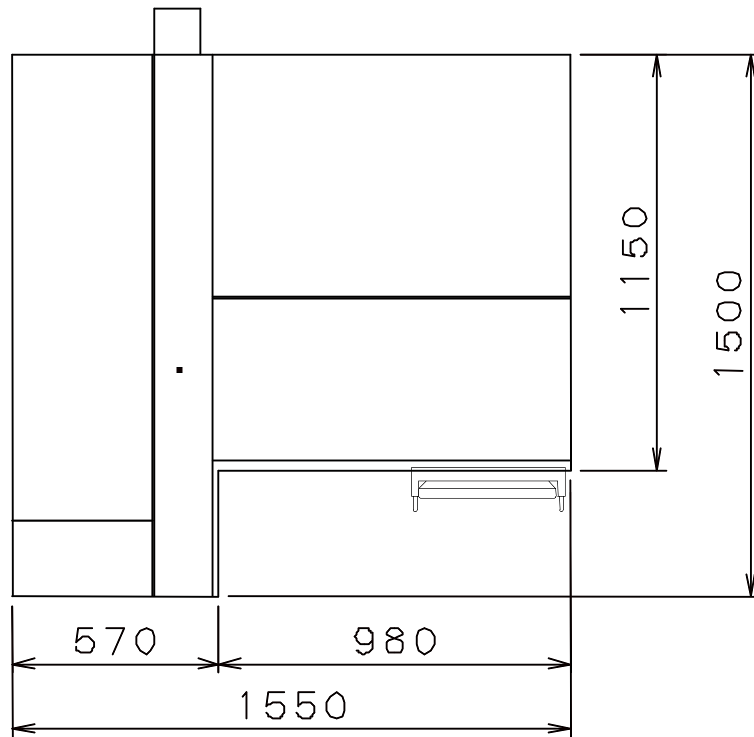
The safety-interlock mechanism that prevents the mist cover or the loader cover opening while operating the machine.

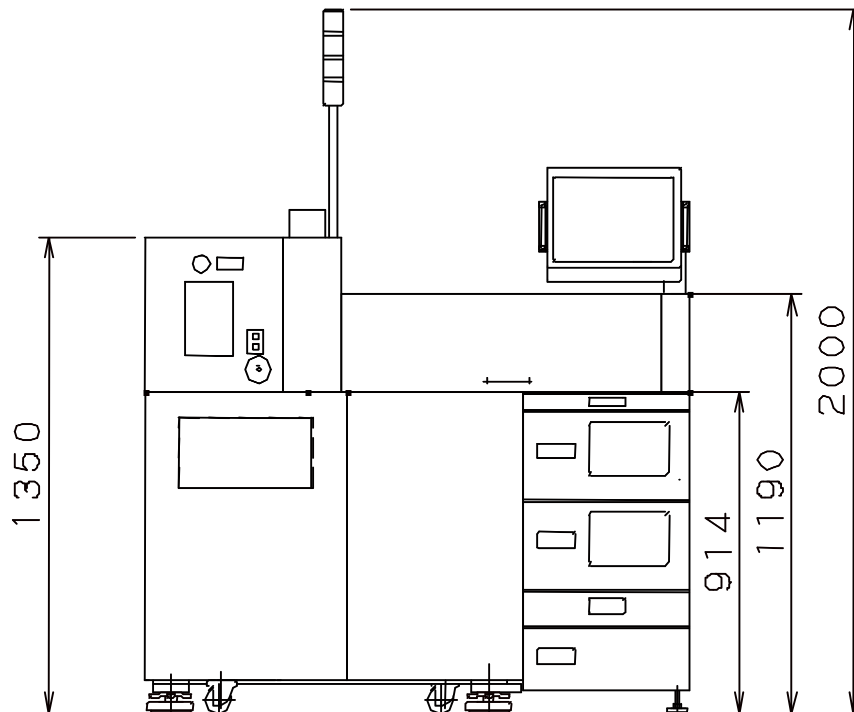
(16)Maintenance tool kit

Hex. Wrench set
Monkey wrench set
Screwdriver set
Tool bag

4 Externai View

4-1. ***Standard type***





4-2. ***Load ports type （１ Load Port for Frame Cassete）***