ACCRETECH

GENERAL SPECIFICATIONS
FOR
SINGLE-SPINDLE
SEMI AUTOMATIC DICING MACHINE

MODEL: SS20PLUS

Make	Approval
鈴木 '15.5.20 (朋)	新井 '15/06/04 裕)

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TOKYO, JAPAN

Table of Contents

1. Designation, Outline and Features

1.1. Designation

1.1.1. Official Name:

Semi Automatic Dicing Machine SS20 4-and 5-inch blade mount type

1.1.2. Abbreviated Designation

SS20PLUS

1.2. Outline

The machine (hereinafter referred to as "SS20PLUS") employs 4- and 5-inch blade that is rotated by a precision air-spindle. It is the dicing machine of general-purpose type, which blade further cuts with precision and performs groove processing.

The machine incorporates image processing-type alignment functions.

With the alignment function running on pre-set data, the machine handles work piece automatically.

1.3. Features

1) Large-diameter blade up to 4- and 5-inch (φ100 ~ φ130mm) can be used.
2) Minimized foot print due to highly efficient components arrangement
3) It is equipped with the high rigidity and high output spindle with the rated output 2.5kw and the max rotation number 15,000min^{-1}.
4) Improved through-put
   - Increasing axes speeds
     X axis: 800 mm/sec, Y axis: 300 mm/sec, Z axis: 80 mm/sec
     * Maximum cutting speed of X axis is 300mm/sec
5) Microscopes suitable for cutting work can be chosen. (Options are contained)
6) Improved maintainability to access by front.
7) 17" LCD touch panel with new GUI (Graphic User Interface) using bigger buttons and interactive interface
8) Can store up to 10,000 device data in the HDD.
9) USB port as standard (USB memory can be used as external memory device).
10) Complied safety standard
    - CE marking (Machinery directive, EMC directive and low voltage directive)
    - SEMI (S2, and S8)

2. Components and Functionalities

2.1. Components

2.1.1. Components of Main Body
- Cutting part
  - X Axis (Cutting feeding axis)
  - Theta Axis (Theta positioning axis)
  - Y Axis (Cutting positioning axes)
  - Z Axis (Cutting height positioning axes)
- Microscope part
- Main body piping part
- Main body electrical part

2.2. Functionalities

2.2.1. Cutting Method
(1) Work fixing method: Tape fixing, wax fixing and direct work fixing
    (Table type may vary depending upon the method)
(2) Cutting form: Single cutting
(3) Cutting pattern: Circular work or rectangular work cutting
(4) Cutting mode: Single direction (down or up) cutting
                       Bi-directional (up and down) cutting
(5) Cutting depth: Single path cutting
                       Multiple-path cutting

2.2.2. Blade Dressing
(1) Dressing by specified dressing data
    Cutting feed rate and cutting depth are specified with number of cut lines.
(2) Dressing by Override function
    The cutting feed rate is continuously increased to a preset value while cutting work.

2.2.3. Auto-focus Function
Referring to the processing data of work thickness and tape thickness, the machine searches the range of +/-100 µm for the focus setting.

2.2.4. Alignment Function
Each work is aligned automatically by pattern matching with a built-in vision system. Target for alignment needs to be registered in each processing device data.

2.2.5. Kerf Check Function
(1) Method: Measuring by built-in vision system with CCD Camera
(2) Kerf checks Time: Max. 4 sec
                               (Standard work with 0.5 sec delay)
(3) Measuring items:
        Kerf center displacement from the target position
        Maximum kerf width (including chipping area)
        Minimum kerf width (excluding chipping area)
        Maximum distance of chipping edge from kerf center
        Maximum size of chipping in one side of kerf edge
        Ratio of chipping area
(4) Control functions:
        The kerf displacement can be automatically corrected.
        This function can stop machine operation and sound an alarm under the following conditions.
        i) Maximum size of chipping has exceeded a set limit.
        ii) Maximum kerf width has exceeded a set limit or the case if less than another set limit.
        iii) Kerf center displacement from the target position has exceeded a set limit.
        iv) Kerf width displacement has exceeded a set limit.

2.2.6. Operation Mode
(1) Full automatic mode: From auto alignment to cutting, automatic operation
(2) Semi automatic mode: Manual cutting only

2.2.7. Self-diagnosis Function
Indicates malfunctions in each unit.

2.2.8. Maintenance Program
Contains single unit drive procedures for performance check,
But spindle can't turn on for safety.

3. Hardware specifications

3.1. Applicable Wafer or Work Size
(1) Circular: 2inch to 8inch diameter
(2) Rectangular: 25 x 25 mm to 250 x 250 mm
                              (Cannot attach a frame. Shall be mounted directly to the jig table.)
                              * With the machine that is compliant with this specification, a blade
                                    cannot completely cut through the 250mm work piece.
(3)Thickness: 10mm (include tape thickness)
                              It is limited to 2mm depending upon the microscope specification.
                              (See "3.8 Microscope units" for details.)

3.2. Applicable Film Frame Size
(1) ACCRETECH Φ5" Frame
(2) ACCRETECH Φ6" Frame
(3) ACCRETECH Φ8" Frame
(4) ACCRETECH Φ12" Frame (Φ12" wafer can't be cut)
(5) Others – Able to customize configuration, according to drawing of the frame.

3.3. Spindle (4- and 5-inch Blade Specification)
(1) Rotation range: 5,000 to 15,000 min^{-1}
(2) Output: 2,500 W (Continuous)
                            3,800 W (Maximum)
(3) Cooling water: City Water (DI water is not allowed)
(4) Restrictions by the blade size:

	Blade diameter	Blade thickness	Permissible spindle rotation
4 inch	100～110mm	0.5mm or less	15,000 min^{-1} or less
5 inch	110～130mm	0.5mm or less	15,000 min^{-1} or less

    *Blades other than 100 ~ 130mm above cannot be used for this machine.
     (Neither 2- nor 3-inch blade cannot be used.)

3.4. X-axis
(1) Cutting stroke: 260 mm
(2) Move Speed: 0.1- 800 mm/sec
        * Maximum cutting speed is 300mm/sec
(3) Straightness: 0.003 mm / 260 mm (both horizontal and vertical)
(4) Driving method: Servo motor with ball screw and linear motion guide

3.5. Y-axes
(1) Cutting area: 260 mm
(2) Move Speed: Max. 300 mm/sec
(3) Straightness: 0.004 mm/260 mm (both horizontal and vertical)
(4) Positioning accuracy: 0.002 mm/260 mm
(5) Driving method: Servo motor with ball screw and linear motion guide

3.6. Z-axes
(1) Maximum stroke: 35 mm
(2) Move Speed: Max. 80 mm/sec
(3) Repeatability: 0.001 mm
(4) Driving method: Servo motor with ball screw and linear motion guide

3.7. Theta-axis
(1) Maximum rotation range: 380 degree
(2) 90-degree rotation time: 0.5 sec
(3) Repeatability: +/- 0.5 arc-secs
(4) Flatness of circular table: 0.003 mm/155 mm diameter
(5) Driving Method   Direct drive motor

3.8. Microscope Unit
(1) Optical system: High magnifications + coaxial illumination (Standard)
                                    Ring type (option)
(2) Performance: Optical Magnification: x4
                                    Work thickness 10mm (include tape thickness)
(3) Field of view: 0.8 x 0.6 mm (1/2" CCD)
(4) Limitations of visual field: Visible area is within 147mm in the X axis direction from the
                                    table center.
(5) Option lineup:
     ■ High magnification for wafer
        Optical Magnification: x8   Device thickness 2mm (include tape thickness)
           ・ Field of view: 0.45 x 0.34 mm (1/4" CCD)
           ・ Field of view: 0.6 x 0.45 mm (1/3" CCD)
           ・ Field of view: 0.8 x 0.6 mm (1/2" CCD)
     ■ High magnification for substrates
        Optical Magnification: x4   Device thickness 10mm (includes tape thickness)
           ・ Field of view: 0.9 x 0.68 mm (1/4" CCD)
           ・ Field of view: 1.2 x 0.9 mm (1/3" CCD)
           ・ Field of view: 1.6 x 1.2 mm (1/2" CCD)
     ■ Low magnification
        Optical Magnification: x1   Device thickness 10mm (includes tape thickness)
           ・ Field of view: 3.2 x 2.4 mm (1/4" CCD)
           ・ Field of view: 4.8 x 3.6 mm (1/3" CCD)

3.9. Optical Cutter-setting System (OPC) Option
OPC can detect edge of blades without contact by using LED and photoreceptor.
Cutting height can be maintained by periodically using the OPC pre-set distance.
(The blade protrusion is more than 100 mils.)

3.10. Other Built-in Items

(1) Manually open/close flange cover at blade replacement
(2) Nozzle for cutting water with manual flow rate adjustment
(3) Nozzle for work surface cleaning with manual flow rate adjustment
(4) Air curtain at cutting area
(5) Water curtain at cutting area (Option)
(6) BBD (Blade Breakage Detection System, Option)

4. Software specifications

4.1. Operation Mode

(1) Automatic operation
Work on the table can be processed automatically, and cutting positions are determined by using auto-alignment with index size and work size/shape in device data.
After all processing is finished the equipment sounds an alarm to the operator.

(2) Semi-automatic operation
Each Channel (CH) can be cut manually.
After each CH is completed, the equipment sounds an alarm to the operator.
Cutting range can also be determined.

4.2. Blade Management

Below items can be managed by proper procedure and cutter-setting functions.

(1) Management of blade life
Blade life can be controlled by exposure, wear amount, cutting line number, and cutting distance after blade replacement.
Alarm can be given when each item reaches a pre-set value.

(2) Management of cutting height
Correct cutting height can be maintained by periodically checking with the automatic cutter-setting.

4.3. Registration and Copy of Device Data

Device data (process parameter) can be saved into hard disk drive in built-in personal computer.
USB memory drive can be used for uploading/downloading of device data, and this device data can be copied to other equipment.

4.4. Network Function (Optional Function)

(1) SECS communication
This communication function is in compliance with SEMI standards. It controls equipment from host computers, assigns device data, and uploads process information.
Details of specifications need to be determined.

(2) AD-NET
This is our own net-working system, which can control all AD series dicing machines.

- Equipment status
All the equipment that is connected to the network can have status checked in operation by client computer (PC).
- Management of device data.
Master device data can be used on all equipment that is connected to network. Client computer can upload/download and edit device data.

4.5. Production Management System

This software monitors the status of the machine operation and work production, and is able to download this information to external memory devices.

5. Overall Accuracies

5.1. Guaranteed Overall Accuracies
(1) Cutting position accuracy on Y direction: +/- 0.003 mm
(2) Cutting height repeatability: 0.001 mm

5.2. Chuck table flatness (Accuracies on the machine)
(1) 5" Porous Table flatness: 0.004 mm
(2) 6" Porous Table flatness: 0.005 mm
(3) 8" Porous Table flatness: 0.007 mm

5.3. Allowable Temperature Variation for Accuracy Guarantee

	Range	Condition	Allowable variation
Room Temperature	20 to 25 degree C		+/- 1 degree C
Air Supply	20 to 25 degree C		
Cutting water	22 to 27 degree C	+2 degree C from Room Temperature	
Spindle coolant	20 to 25 degree C	Same as room temperature	

6. Utility Requirements

6.1. Power Supply
(1) Power supply: AC200-220 V AC ±10%, 3 phases, 50/60Hz
                                          (AC240, 380, and 415 V are available with optional transformer)
(2) Power consumption: 4.0 kVA (Max)
(3) Power cable connection: Terminals are built-in type on main breaker of machine.

6.2. Air Supply
(1) Incoming pressure: 0.55 to 0.7 MPa
(2) Consumption: 220 Liter/minutes (average at 0.55 MPa)
(3) Air tube connection: Rc (PT) 3/8-inch female plug
(4) Temperature: 20 to 25 degree C (Fluctuation range ±1 degree C)
(5) Dew point: -15 degree C or below
(6) Oil residue: 0.1 PPM Wt/Wt

6.3. N2 Gas
(1) Incoming pressure: 0.3 to 0.5 MPa
(2) Consumption: 33 Liter/minutes (at 0.5 MPa)
(3) Air tube connection: Rc (PT) 3/8-inch female plug

6.4. Coolant   **City water (DI water is not allowed)**
(1) Purpose: Cooling water for spindles and microscope
(2) Incoming pressure: 0.3 to 0.5 MPa
(3) Consumption: Min. 2.9 Liter/minutes
        (At 0.3Mpa: Spindle coolant 2.5Liter/minutes + Microscope coolant 0.4Liter/minutes)
(4) Water tube connection: Rc (PT) 3/8-inch female plug
(5) Temperature: 20 to 25 degree C (Fluctuation range ±1 degree C)
(6) Standard piping: Return water piping
(7) Other requirements: Water doesn't include any foreign material.
                                          City water (pH 6.6 – 7.4) can be used.

6.5. Cutting Water
(1) Incoming pressure: 0.3 to 0.5 Mpa
(2) Range for cutting water, cleaning water and other flow rate setting:
                                          0.2 to 2.0 Liter/minutes (DI water)
(3) Water tube connection: RC (PT 3/8-inch female plug
(4) Temperature: 20 to 25 degree C (Fluctuation range ±1 degree C)
(5) Others: DI water (less than 10 MΩcm can be used.
                                   Please ask us when DI water (more than 10 MΩcm) is used.
                                   When another type of water is used, the equipment is not covered under warranty.

6.6. Drain
    (1) Junction: For nominal 50mm-diameter duct hose
    (2) Drainage capability: Max. 17 Liter/minutes

6.7. Exhaust
    (1) Junction: For nominal 75mm-diameter duct hose
    (2) Required exhaust capacity: 5 cubic-meter/minutes

6.8. Dimensions
890(W) x 1,090(D) x 1,625(H) mm
(Excluding the monitor and the protruding objects)

6.9. Weight
832 kg (Excluding optional function)

6.10. Exterior Cover
    (1) Paint on steel plate: White + Dark gray
    (2) Stainless steel: SUS304

6.11. Operation Condition
    (1) Temperature: 20 to 25 degree C
                              (Without sudden temperature fluctuation)
    (2) Humidity: 50%±20% (non-condensing)
    (3) Floor vibration: Less than 1 cm/sec^2 (1 GAL)
    (4) Ozone: Less than 0.03 ppm

7. Optional Functions

7.1. Booster Pump Unit

This unit can increase pressure of DI water for cutting, and maintain enough flow rate of cutting water.
This unit is a standalone type.
(1) Power supply: AC200 V, 0.5 kVA (Supplied from SS20PLUS)
(2) Incoming water pressure: 0.3 MPa or below
(3) Outgoing water pressure: 0.4 to 0.5 MPa
(4) Outgoing water flow rate: 13 to 16 Liter/minutes (at 0.2 MPa of incoming water)
(5) Dimensions: 228(W) x520(D) x336(H) mm

7.2. Water Temperature Control Unit

The unit is useful when temperature of cutting water and blade coolant varies significantly or the water supply pressure is low.
This unit is able to control output temperature in the range of 20 to 25 degree C from an input temperature range of 18 to 28 degree C.
This unit is a standalone type. (Size: 400(W) x1,430(D) x 1,200(H) mm)
Power supply for this unit has the option of 3Phaze 200V and other voltages.

7.3. Exhaust Booster Fan Unit

This unit would be required for better cutting quality when exhaust capacity is less than 5 cubic- meters/minutes.
There are two types of exhaust fans. (Built-in type and Standalone type)

7.4. Automatic Flow Control Unit

All of the cutting water and blade coolant can be controlled automatically according to pre-set parameters.
This unit is required to use DI water. If another kind of water is used, it is not covered under warranty.

7.5. Automatic Utility Condition Data Logging Function

A system with various kinds of sensors monitors the operating status of the machine quantitatively. Data that is logged by this system would be referenced to optimize cutting conditions for better quality.

The applicable items are as follows. (Available for customization only)
1) Flow rate of cutting water and blade coolant
2) Temperature of cutting water and blade coolant
3) Resistivity of DI water for cutting and blade coolant
4) Temperature of spindle cooling water
5) Rotation speed and current variation of spindle.
6) Internal temperature of machine
7) Vacuum pressure on cutting table.

7.6. Running Status Data Transfer

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

7.7. Melody Alarm

The alarm indicates an error or operator call with a melody sound.
Discuss required for specification details.

7.8. Automatic Device Data Change-Over By Bar-code Reading

Device data can be automatically changed by reading the bar-code labeled on
each wafer.
Discuss required for specification details.

7.9. Built-in Transformer Unit for Main Power Supply

This unit would be required when voltage of main power supply is beyond the range of 200 to
220 V.
Specification of voltage to be supplied to machine must be specified.

7.10. Built-in CO_2 Bubbler

This option can combine carbon dioxide (CO_2) into DI water and reduce resistivity of DI water
in order to avoid electrostatic.
CO_2 gas cylinder is also available.

7.11. Maintenance Tool Kit

Hex. Wrench set
Adjustable wrench
Screwdriver set
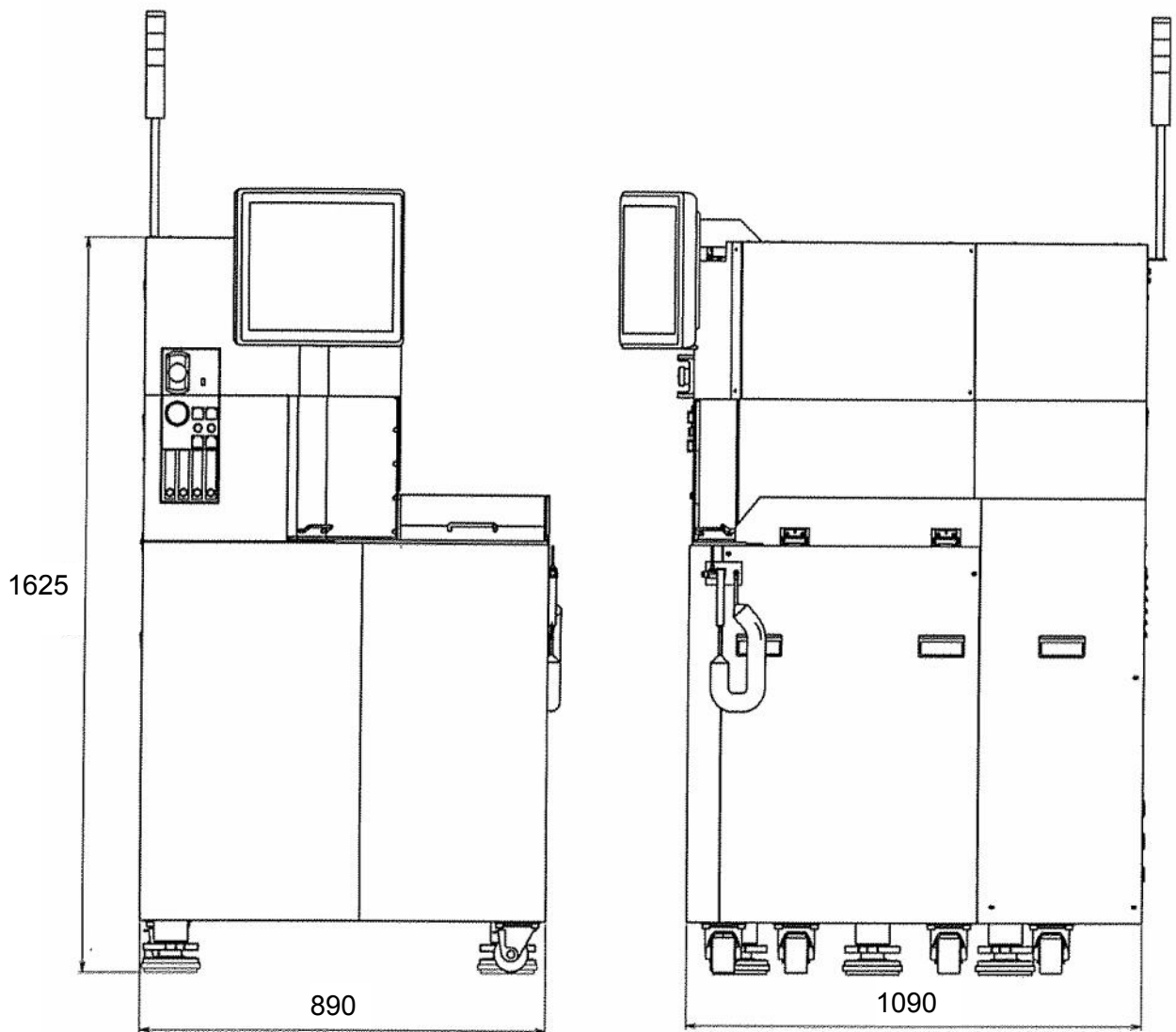Ruler

8. Warranty Period

8.1. Warranty Period

The unpaid warranty period shall be one (1) year from the date of completion of buy-off. During this period, ACCRETECH will repair free of charge any malfunction that is the responsibility of ACCRETECH.

8.2. General Policy

The paid warranty period shall be six (6) years from the end of the unpaid warranty period. Due to problems such as the procurement of spare parts, as a general rule the customer shall be responsible for any repairs needed after the end of the paid warranty period. For a fee, ACCRETECH will supply any and all documentation required for repair.

9. Appendix

9.1. External View

9.2. Utility Connections (Rear View)

SP coolant IN (Rc3/8)
SP coolant OUT (Rc3/8)
Air IN (Rc3/8)
N2 IN (Rc3/8)
D. I. Water IN (Rc3/8)

773 (Drain connector)

973 (Exhuast connector)

Power cable