MITSUBOSHI DIAMOND INDUSTRIAL CO.,LTD.

Standard Specifications

LCD Glass Scriber

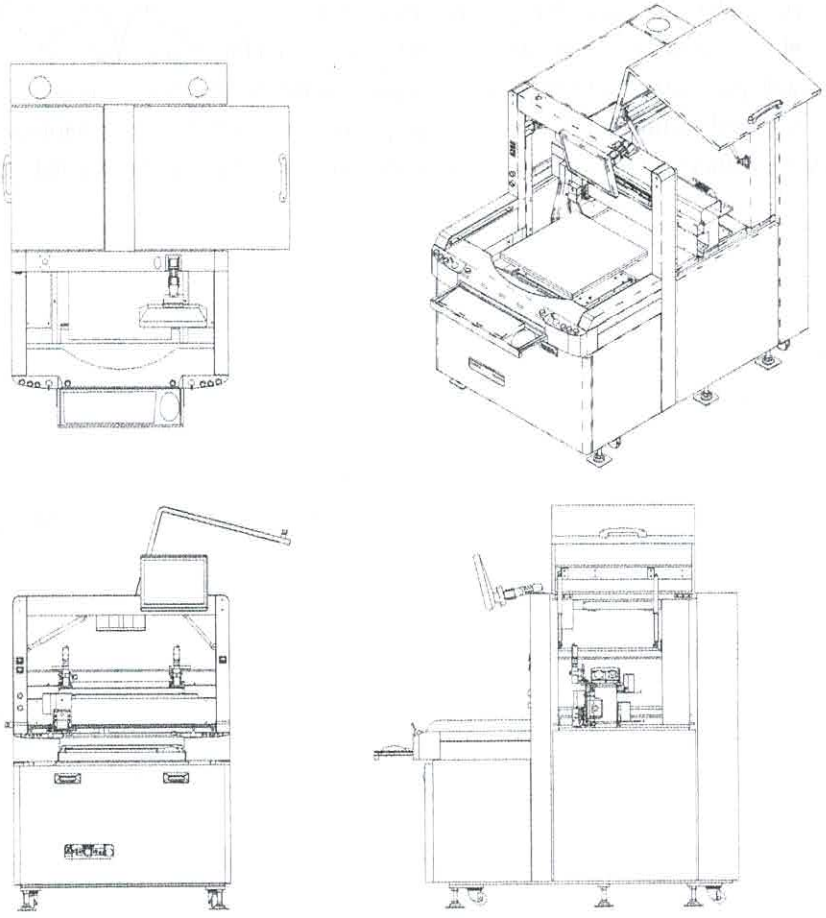
Model MS500 Series

Sales Dept.	Approved by	Examined by	Prepared by

Contents

1. Overview

This document describes the specifications of MDI's "Model MS500 Series."



When using this machine, there is a case where any of the following patents that MDI has in Japan has to be utilized. In such case, contact us beforehand for consultation.

Japanese Patent: **No. 1828096** **"Method for Cutting Glass"**
Japanese Patent: **No. 3042192** **"Method for Cutting Fitting Glass Substrate"**

For cutting glass, this machine uses the normal cutting wheel or the Deep Penetration Cutting Wheel Penett®, which MDI developed and patented as listed below.

Japanese Patent: **No. 3074143**
Korean Patent: **No. 279184**
Chinese Patent: **ZL96101939.5**
Taiwanese Patent: **Invention No. 87633**
US Patent: **No. 5836229**
European Patent: **No. 773194**

2. Features

This machine is designed to scribe glass for the electronic industry, such as display glass panels for LCD, with high precision. The table can scribe glass in 2 directions at an optional pitch by using its pitch-by-pitch feed function, 90-degree turn function and auto alignment function for more precise positioning. The scribe head has a variable pressurization function to enable pressure application change according to the line. Also, the auto glass surface detection function of this machine enables auto cutting by inputting the cutting depth data. Furthermore, through the PC control, the pitch data and parameters can be inputted easily on the LCD monitor.

3. Specifications

1) Basic composition

No	Unit	Item	Standards	Remarks
1	Basic specifications			
	Glass size	Standard glass size	W 500 x D 500mm	
		Glass thickness	Single: 0.4 – 1.1mm	
			Fitted: 0.8 – 2.2mm	
2	Machine specifications			
	Approx. dimensions		W1100 x D1650 x H1600 (Body dimensions)	
	Approx. weight		700kg or less	
	Path line		900mm	
	Table (feed)	Feed motor	AC servo motor	
		Stroke (Y-axis)	600mm	
		Feed rate	Max. 500mm/sec	
		Resolution	0.001mm	
	Table (rotation)	Rotation mechanism	DD servo motor	
		Rotation angle	±90°	
		Rotational position adjustment	Servo positioning	
		Resolution	90°/262144 pls (1.24s/pls)	
	Scribe (travel)	Feed motor	AC servo motor	
		Stroke (X-axis)	620mm	
		Scribe rate	Max. 500mm/sec	
		Resolution	0.001mm	
	Scribe (up/down)	Up/down motor	AC servo motor	
		Stroke (Z-axis)	10mm	
		Up/down scribe rate	Max. 50mm/sec	
		Resolution	0.001mm	
		Cutting depth after the zero level detection	Max. 0.3mm	
	Scribe head	Number of heads	1	
		Scribe pressurization method	Electro-pneumatic regulator: 0.05 – 0.4MPa	
			(Main pressure: 0.5MPa)	
		Pressure setting	Pressure change according to line	
		Scribe direction	1 direction	
		Cutter pressure	Step-less setting by air pressurization method	
	Number of scribes	PC-controlled pitch input	Max. 100	
	Camera shaft	Feed motor	AC servo motor	
		Min. stroke	Between right and left cameras: Min. 80mm	

No	Unit	Item	Standards	Remarks
		Feed rate	Max. 200mm/sec	
		Resolution	0.001mm	
	Glass loading	Loading method	Manual work by operator	
		Positioning	Glass floating type external reference pin pressing method	
		Contact surface	Resin material (Reference pin)	
	Glass unloading	Unloading method	Manual work by operator	
	Cullet disposition	Disposition method	Manual work by operator	
	Safety related	Door	Gull-wing type door (with door switch)	
		Area sensor	Façade (horizontal type)	
3	Machine precision			
		Positioning resolution	10μm	
		Table 90° turn precision	Absolute precision: ±45 sec	
			Repetitive precision: ±5 sec	
		Scribe pitch precision	±40μm (excluding glass pattern error)	
	Precision (break precision)*1	Shave	10% or less of glass thickness (single panel) to scribe line (cooperative target value)	
		Lateral crack	No occurrence	
		Chip	0.3mm or less (target value)	
		*1 The specification range of this break precision is based on the assumption that the deep penetration cutting wheel "Penett®" held by MDI is used.		
4	Control			
		PC control	For both monitor and operation	
			NC board control	
5	Utilities			
		Power supply	200VAC, 3-phase, 30A, voltage fluctuation:±10%	
			100VAC, single-phase, 10A (with ionizer installed)	
		Air supply	0.5MPa, 30L/min, RC: 1/4 No mist or moisture	
		Vacuum supply	-60kPa or more, 40L/min, RC: 1/4	
		Exhaust	RC: 1/4	
		Air conditioning	Temperature: 20±5°C	
			Humidity: 30 – 80%	
6	Mark reading			
		Camera	Transparent conductive thin film optical system ITV method	
			Moritex make	

No	Unit	Item	Standards	Remarks
			Magnification: Approx. 70 powers (35 powers without rear converter lens)	
			View: Approx. 2.0mm-square WD=240mm	
7	Foundation work			
		Endurance of floor	Average: 500kg/m^2	
			Leg: 250kg/100cm^2	
		Vibration of floor	Vibration-free floor, no subsidence	
		Grade of floor	5mm/1000mm or less	
8	Processing capability			
		Output tact	To be calculated from scribe pattern	

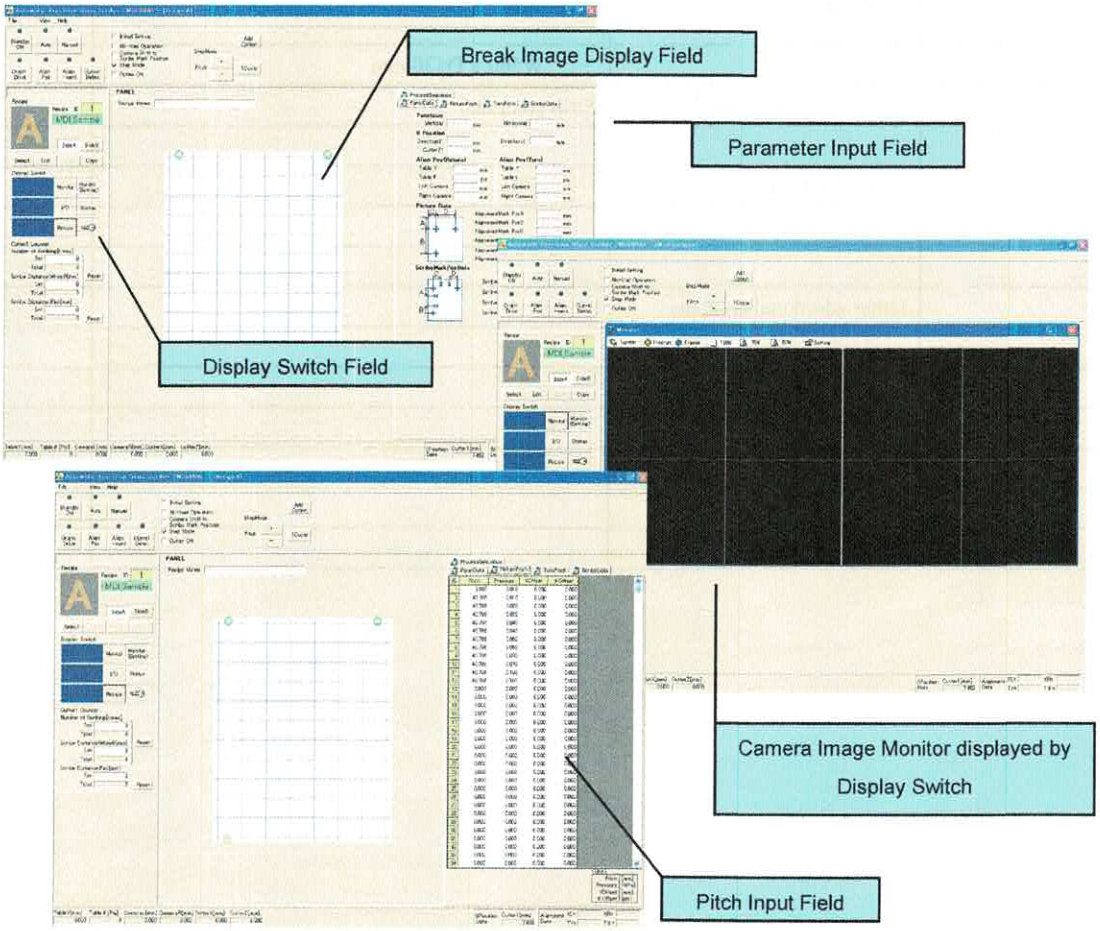
2) Option

No	Unit	Item	Standards	Choice
	Option	Ionizer	Model 410N1 bar type (Hugle make)	
			Model 20/20ACN blower type (Hugle make)	
			SJ-R bar type (Keyence make) recommendable	
			Others	
			Electrostatic volume: Not covered by warranty (Target:±300V)	
		Area sensor	Vertical type	
		Signal Tower	3 tiers (red-yellow-green)	
			4 tiers (red-yellow-blue-green)	
		Cullet shooter	Right side only	
			Left side only	
			Both sides	
		Data saving	Pitch input enabled from external PC (optional software complied)	
			(Data saved in FD or HD)	
			Side A + Side B = 1 recipe (integrated type) Max. 100 recipes	
			Side A + Side B = 1 recipe (distributed type) Max. 100 recipes	
		Max. number of heads	Number of heads in use: 2	
		Special software	Scribe direction selectable: Vertical or horizontal	
			Scribe-end-inside motion	
			Cross-scribe-end-inside motion	
			Panel strip complied	
			Chip blow	
			Head selection function	
			Application software for pitch input	
			Application software for recipe file integration	

3) Per-user specifications

No	Unit	Item	Standards	Remarks
	Per-user specifications	Work size	Max W540 x D540 mm	
			W560 x D530 mm	
			Strip complied	
		Special software		
		Other additional contents		

4. Specifications of the Operation Window



5. Special Notes (Not Covered by Warranty)

The following items shall be beyond the coverage of the warranty by MDI if they fall under the indicated event:

- Glass warp: When the glass is so warped as to disable the vacuum suction.
- Glass shave: The item "Shave" of the unit "Break precision" in the section "3. Specifications" shall not be warranted when it is at the part of the glass scribe start/end/intersection, or the filling ports or the seals are inconsistent.
- Auto alignment: When the alignment mark is out of the camera view (Approx. 2.0mm-square) due to the low quality of the glass edge, the displacement of the printing position or the displacement caused by operator's hand, or when the alignment mark is not recognized due to liquid crystal or dirt.
- Setting to reference pin: When the glass edge quality is low, or when the reference pin is worn or damaged.
- Fitting precision: When the fitting precision is low due to the low precision of the printed patterns or the inconsistency of the seals.

- About glass: When there is a panel for which the process setting is difficult in the item "Glass thickness," "Material," "Patterning" or "Seal condition" in the section "3. Specifications" – In this case, MDI will conduct the process setting to the cooperative extent.

- Machine manufacturing specification in general:
  Except for completely standard machine, the machine is manufactured based on the standard machine with required options according to the User's specifications. Although MDI tries to fulfill the User's specifications as much as possible, MDI may change some of the User's specifications that are difficult to be fulfilled and, in case of such change, fix to what extent MDI should be responsible through deliberations and agreement with the User.

6. Parts and Components

1) Drive system

Timing belt:	Wired urethane (or equivalent)		
Air cylinder:	Standard		
Motor:	Standard		
Valve related:	Standard		
Processed part:	Body – baking finish; Parts – Aluminum or Stainless processed		
Piping:	Standard	Color specification:	Air … Black N2 … Yellow (with ionizer in use) Vacuum … Green Exhaust … Orange
Fitting:	Primary side	One-touch or Stainless Swagelock	
	In-machine fitting	One-touch	

2) Cover

Face cover:	Baking finish (MDI specifications, Munsell color 4GY8/0/3)
Transparent cover for visual inspection:	Antistatic resin

3) Panel contact part

Pin related:	PEEK (polyether ketone) resin (or equivalent)

4) Coating color

Frame (body):	Black (matte)
Others:	Baking finish (MDI specifications, Munsell color 4GY8/0/3))

5) Electrical component

Relay:	Contact type as a rule, but noncontact type for high frequency applications
Motor:	Servo motor and linear servo motor
Sensor related:	Digital type for pressure related applications (e.g., pressure display) Analog gauge type for other applications
Service power supply:	One within the control panel (two-socket type) (Max. 2A for low-capacity application like PC)

7. Inter-Equipment Communication (Option)

8. Submission Documents

(1) Delivery Specifications
(2) Process Chart
(3) Drawing for Approval
(4) Inspection Sheet
(5) Electrical Drawing
(6) Accessories List
(7) Instruction Manual (Maintenance Manual)
(8) Parts Catalogs

For (4), (6) and (7), submit a copy printed on clean paper (dust-free paper).

9. Source Inspection

Before the delivery, MDI shall conduct the source inspection of this machine at MDI's factory.
The inspection shall be conducted based on the specifications in this document. It may not be required to have a third party witness in this inspection.
After the completion of this inspection, MDI shall prepare an inspection report for submission to the User at the time of delivery.
MDI shall notify the User of the schedule for this source inspection.
The User shall send MDI a necessary quantity of the glass panels for the adjustment inspection by at latest one month before the scheduled date of the source inspection. Additionally, the User shall send MDI a necessary quantity of the glass panels for the receiving inspection, which will also be used for the final adjustment inspection, by at latest two weeks before the scheduled date of the receiving inspection.

10. Installation and Adjustment at the User's Factory

MDI shall accept the schedule for the installation and adjustment at the time of delivery of this machine on the conditions specified below. (MDI will fix the date and time of this work through deliberations with the User, and accordingly, MDI will fix the schedule of sending MDI's engineers to the User's place.)

Installation and adjustment schedule:

1) Installation

The machine shall be installed by MDI's engineers.

↓

2) Connection of the utilities

The utilities shall be connected by the User.

↓

3) Adjustment of the machine

The machine shall be adjusted and its operation shall be checked with dummy LCD panels by MDI's engineers.

↓

4) Confirming the operation, and setting the conditions

The machine operation shall be confirmed by MDI's engineers with the actual LCD panels. The break conditions shall be continued by MDI's engineers until the specifications in this document are fulfilled, and then the machine shall be released to the User.

↓

5) Receiving inspection (witnessed by the User and MDI)

The continuous operation shall be checked. (If actual panels are not ready for this inspection, dummy panels may be used.)

↓

6) Instruction

Instruction for use shall be given to the User's engineers by MDI's engineers.

The time required for the steps 1) through 6) shall be limited to 4 days. The completion of the step 6) shall mark the end of the scope of these Specifications. The contents of the installation and adjustment shall be as far as the fulfillment of these Specifications, and any further contents related to the required equipment procured by the User and the LCD panels supplied by the User shall be beyond MDI's responsibility.

7) Setup and quality

If requested by the User after the completion of the step 6), MDI will be willing to cooperate with the User by sending MDI's engineers to the User for the purpose of quality improvement on condition that the time, expenses and others necessary for this arrangement shall be fixed through separate deliberations with the User.

11. Limited Warranty

1) Warranty period

The warranty period shall be up to 12 months after the completion of the installation at the place specified by the User.

2) Warranty coverage

If there is any fault caused to this machine during the warranty period and MDI determines that such fault should be attributable to any incompleteness of MDI's manufacturing process, MDI shall repair the faulty portion or supply the replacement parts to the User's factory on MDI's own responsibility on condition that the following conditions have been observed strictly and that the scope of MDI's responsibility is limited to this machine and its performance.

a) After the User found the fault of this machine, the User has notified MDI immediately of the contents of the fault in writing to give MDI a period long enough for MDI to diagnose the fault at the User's site.

b) After MDI delivered this machine to the User, the User has stored this machine immediately in an appropriate place in an appropriate manner before official installation or carried this machine to the installation site with no problem.

c) After MDI delivered this machine to the User, this machine has been installed at the User's installation place and adjusted there, both by MDI's engineers.

d) When the necessity of the relocation, reinstallation or carriage of this machine occurred on the User's side, the User has notified MDI well in advance. (When this machine is relocated, reinstalled or carried, the User and MDI shall fix this matter through deliberations whenever it is required.)

e) This machine has been equipped, operated and maintained within the scope specified in the instruction manual, layout plan and these Specifications, and handled by those engineers who have received relevant professional education and training.

When it is determined necessary to send MDI's engineers and/or workers to the User according to the contents and nature of the fault, MDI shall fix the arrangements through deliberations with the User. However, in order for MDI to troubleshoot the fault as much as possible before sending MDI's engineers and/or workers, MDI needs the User's cooperation in prior investigation.

3) Matters beyond the warranty coverage

a) Expendables, and components specified by MDI (specified in the Expendables List)

b) Fault attributable to any equipment or supplies in operation or use with this machine

c) Fault or damage of this machine due to sabotage, fire, flood, tempest, earthquake, ground change or any other force majeure

d) Sale, transfer, rental or lease of this machine to a third party

e) Fault attributable to any matter that could not be conceived by the source inspection or delivery

4) After the expiration of the warranty period

a) If any parts of this machine (excluding expendables) are failed

- The parts fee, the repair fee and the shipping fee shall be borne by the User.
- When the replacement parts are delivered to the User, the removal of the parts, the installation of the new parts and the reshipment of the removed parts shall be arranged by the User.

b) Expenses incurred by sending MDI's engineers

All the expenses incurred by MDI's engineer sent to the User (as per MDI's office regulations) shall be borne by the User. However, in order for MDI to troubleshoot the fault as much as possible before sending MDI's engineers, MDI needs the User's cooperation in prior investigation.

12. License of Software Programs for PC, NC, Sequencer and Others

MDI shall license the User to use the software programs provided together with the delivery of this machine (hereinafter referred to as "License Programs") and the program storage media that the User has purchased and their manuals (hereinafter referred to as "Products"), and the User shall agree with the following provisions:

1) Licensing

The User has a right to use the License Programs and the Products upon the delivery of this machine. Unless MDI has agreed in advance with the User in writing, the User shall not resell, license or transfer any of the License Programs or the Products to a third party.

2) Backup

In any case, the User shall not copy any or whole part of the reference materials supplied by us in relation to the License Programs for any purpose other than the backup upon the delivery of this machine without prior approval of MDI.

3) Duration

The duration of this license shall take effect on the day when the User receives the License Programs until this machine is disposed of, sold, transferred, rented or leased to a third party and the license is terminated:

4) Repair and waiver

MDI shall be entitled to improve or change the License Programs and all the reference materials related thereto on the specifications any time without prior notice. Furthermore, MDI shall not be liable at all to the User for the results from the use of the License Programs.

5) Confidentiality

The User shall be liable to maintain the confidentiality of the License Programs and all the reference materials related to them including manuals.

6) General matters

a) Invalidation

If any of the provisions of this agreement or its part is invalidated by law, such invalidated provision or part shall be deleted from the license.

7) Matters subject to deliberations

Any matter not specified by this agreement or doubt about this agreement shall be fixed through separate deliberations between the User and MDI.

13. Scope of Delivery

Based on the foregoing, the scope of delivery shall be as follows:

1) Glass Scriber/Breaker 1 unit

Components per unit:

- Body 1 unit
- Cullet shooter (Option) 1 set
- Area sensor (Option) 1 set
- Signal Tower (Option) 1 set
- Special software (Option) 1 set
- Machine cover 1 set
- Control panel / operation panel / accessorial electrical components 1 set
- Tools and tool box 1 set

2) Design and handling fee 1 set

3) Submission document fee 1 set

4) Packing and shipping fee 1 set

5) Initial installation and adjustment fee 1 set

14. Notes for Industrial Property Right

Wherever in these Specifications, the item to which the industrial property right number or the Patent Gazette number is referred is an object of the industrial property right. All the users of this machine purchased officially from MDI are entitled to the license of the relevant patented invention within the scope specified in these Specifications.

If this machine is transferred, rented or leased to a third party in the future, even if the license of the above industrial property right is within the scope specified in these Specifications, the license granted to the User shall lapse as of the transfer, rental or lease of this machine to the third party shall be defeased and the license shall not be transferred, rented or leased to such third party. If the third party transferred, rented or leased with this machine wishes the license, the third party shall deliberate with MDI separately.
Handling of the license by MDI is different between the patented invention of an object and the patented invention of a method. If the User has to use the patented invention beyond the scope specified in these Specifications, the User shall consult the matter with MDI.
It should be noted here that the deep penetration cutting wheel "Penett®" is sold only for use in MDI Glass Scriber, in principle. It is placed under planned production, that is, upon receiving an order for Glass Scriber, the production volume of "Penett®" is estimated and, if necessary, the "Penett®" production equipment is augmented.
The right of MDI to patent for "Penett®" covers a wide range of claims including "1. Tip shape," "2. Manual cutter equipped with such tip," "3. Scriber equipped with such manual cutter." Therefore, using "Penett®" for any non-MDI manual cutter or scriber may infringe the right of MDI to patent for "Penett®." In such case, contact MDI beforehand for consultation.
These Specifications are subject to change for improvement or through deliberations. If there is any change or the like to these Specifications, such change or the like shall be recorded in the minutes or the like, the User and MDI shall give priority to the contents of the minutes or the like thereafter and jointly check and approve the contents of such minutes or the like. Any matter beyond the scope of quotation shall be fixed through mutual separate deliberations.