

MECHANISM

SPECIFICATION

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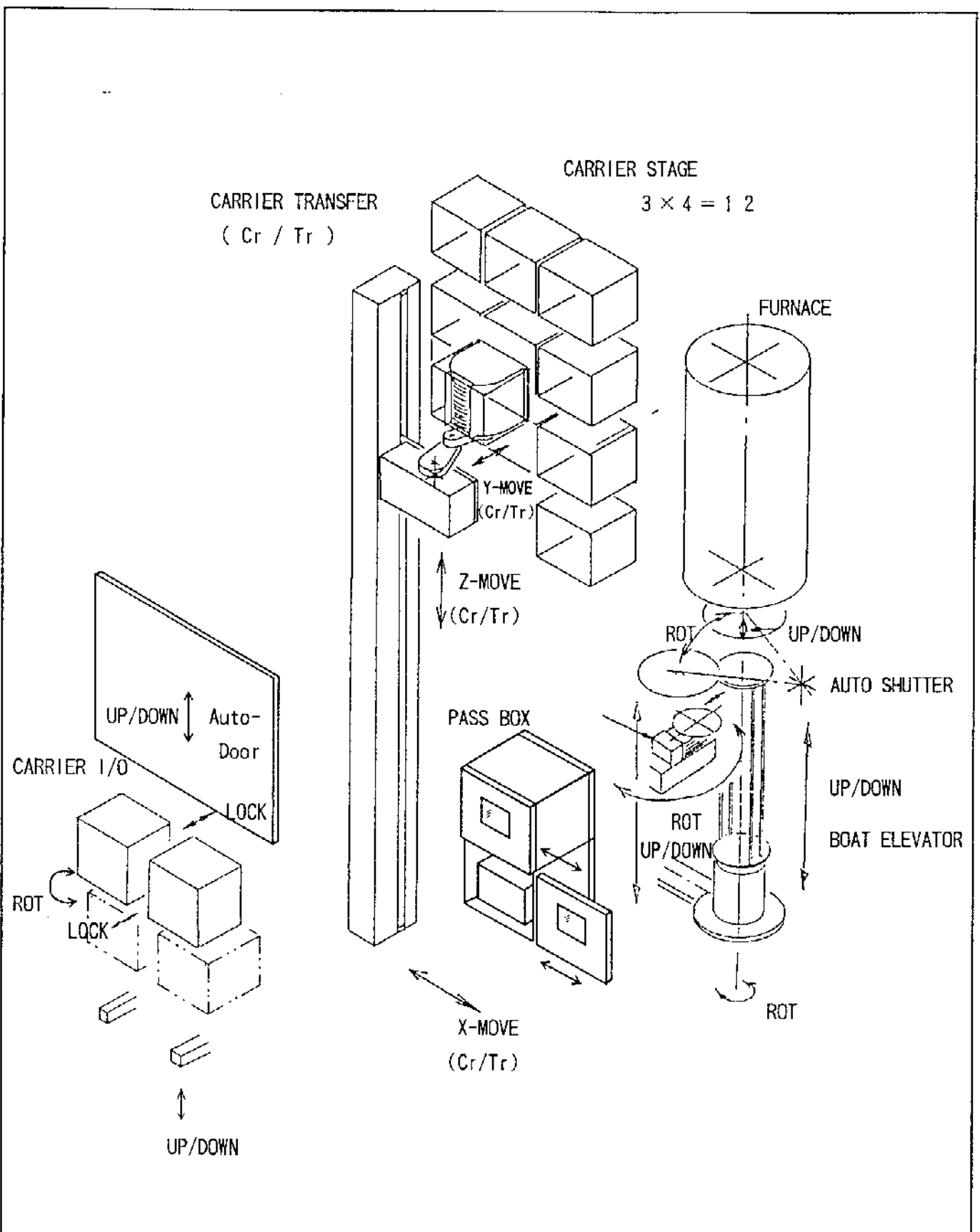
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BLOCK DIAGRAM OF AUTO-MECHANISM UNITS OPERATING RELATIONS
(N₂ BOX TYPE)

1. Auto-door

An auto-door is installed at the front of the system for opening and closing when a carrier is entered or exited.

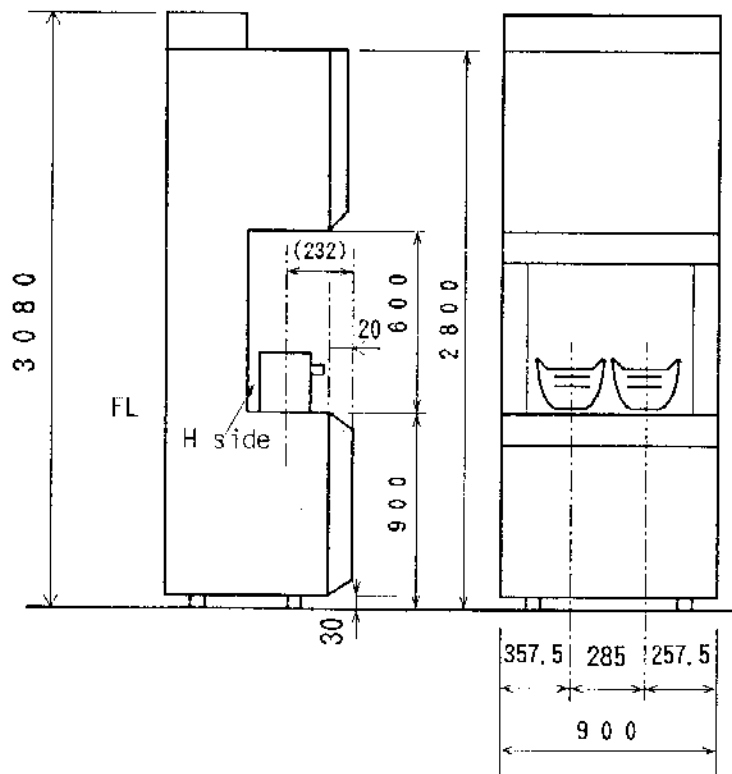
- (1) Driving means : Air cylinder
- (2) Stroke : 600 mm
- (3) Normal operating speed : 100mm/sec.
- (4) Door material : PVC(incombustibility flame resistance) treated
- (5) Special note : The door has its home position at "closed."

2. Carrier I/O Port

A carrier I/O port enters or exits a carrier into or out of the system, confirming the number of the wafers in the carrier, and changing the posture of it.

(1) Carrier I/O port

- 1) Number of carriers : 2 (commonly used for entry and exit) loadable on the port
- 2) Direction of the carriers : Its "H" facing is on the furnace side and "U" facing is on the operator's side.
- 3) Surface contacting a carrier is made of : Teflon
- 4) Carrier placement position :



5) Standard specifications

- (a) A carrier presence confirmation sensor is installed on the I/O stage to prevent operating errors resulting from misplacement of an carrier. (A carrier locking function is also provided.)
- (b) At the front of the I/O stage, there is a carrier indicator LED which shows the sequence of the carrier entry.
- (c) A carrier is exited through the same port from which it has been entered.
- (d) A carrier is entered or exited from the system by means of the port's entry/exit switch.

(2) Wafer counter

Wafer counter counts the number of wafers in the carrier when the carrier is entered into the system. For the details, refer to the transfer specifications.

- 1) Number of counters : 2
- 2) Numbers counted : 25 wafers by a lot
- 3) Method of counting : No-contact sensing by means of an optical sensor

(3) Carrier posture changing mechanism

The carrier posture changing mechanism tilts a carrier loaded on the carrier I/O port toward the furnace.

(4) Notch Aligner

Not available

3. Carrier Transfer Mechanism

A carrier transfer mechanism transports a carrier between the carrier I/O port \longleftrightarrow carrier stage \longleftrightarrow transfer stage.

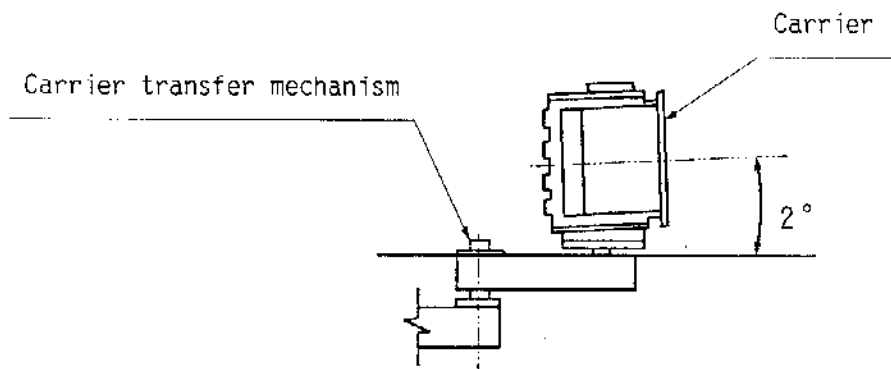
(1) Driving method

	Unit movement	Stroke length	Speed	Drive means	Positioning means
Z-axis	up/down	1922 mm	60mm/sec.	5-ph stepping motor	rotary encoder + photosensor
Handling mechanism (1arm)	rotation \rightarrow straight	\rightarrow 510mm	50deg/sec.	5-ph stepping motor	rotary encoder + photosensor
X-axis	left/right	490 mm	50mm/sec.	5-ph stepping motor	rotary encoder + photosensor

(2) The surface contacting a carrier is made of PTFE.

(3) Special notes:

- ① A carrier is transported in the posture with its H-facing laying at the bottom (the wafers are thus in almost horizontal position). For preventing the wafers from getting out of the position, the carrier's top opening is tilted by about 2° upward during the transportation.



4. Carrier Stage

A carrier stage stores pre-process wafers or post-process wafers.

(1) Number of stages: 3 lines \times 4 tiers = 12 stages

(2) Carrier layout :

	A	B	C
1			
2			
3			
4			

(3) Material directly contacting with the carrier is
made of : PTFE

5. Transfer Stages

The transfer stage accommodates a carrier of which wafers are being transferred to or from a boat.

(1) Number of carrier stages: 2 (upper and lower stages)

① carrier lock drive method : AC motor

(2) The protruding wafer detect mechanism is provided.

6. Wafer Transfer Mechanism

Wafer transfer mechanism transfers the wafers between the carrier on the transfer stage and the quartz boat on the boat elevator by means of a fork which is able to lay the wafers flat.

(1) Driving method:

	Unit motion	Stroke	Speed	Driving system	Positioning means
Z-axis	up/down	879 mm	250mm/sec	AC servomotor	rotary encoder + photosensor
θ -axis	rotation	184deg	130deg/sec	5-ph. stepping motor	rotary encoder + photosensor
FR-axis	4-wafer fork	253 mm	215 mm/sec	5-ph. stepping motor	rotary encoder + photosensor
	1-wafer fork	↑	↑	↑	↑
Pitch Change-axis	expansion reduction	6.35→15mm 6.35→5.2mm	300mm/min	5-ph servomot encoder	rotary encoder + photosensor

(2) Transfer mechanism: 1 wafer fork + 4 wafers forks
(5.2mm ~ 15mm Variable pitch)

(3) Fork material : High purity SiC
: Thickness ; 1.85mm

(4) The wafer presence detect mechanism on the fork is provided.

(5) The wafer pitch changer is provided.

7. Boat Elevator

The boat elevator is to load or unload a quartz boat to or from a reactor tube. During the maintenance work, it is enabled to move the manifold and reactor tube as well.

(1) Driving method:

	Unit motion	Stroke	Max. Speed	Driving system	Positioning means
Z-axis	up/down	1448 mm max	700mm/min max.	5-ph. stepping motor	rotary encoder
θ -axis	rotation	360°	10rpm max.	5-ph. stepping motor	photo sensor

(2) Capping flange

- ① A temperature measuring port is attached to the capping flange to enable to measure the temperature while wafers are mounted.
- ② It is so structured that the fine tuning adjustment of the horizontal surface and slant is enabled.
- ③ The seal on the furnace opening shall be the metal seal and evacuated.

8. Auto-shutter (full-closed type)

An auto-shutter, being located near the furnace opening, closes the opening while the boat elevator is at wafer transfer position and shield the heat radiation from heating the elevator.

- | | | |
|------------------------|---|--------------------------|
| | (rotary) | (up/down) |
| (1) Driving means | : Aircylinder | : Aircylinder |
| (2) Stroke (rotation) | : 60 ° | : 5mm |
| (3) Positioning sensor | : heatproof micro switch | : heatproof micro switch |
| (4) Special notes: | | |
| ① | Rotary axis should be fixed the position by mechanical stopper. | |
| ② | Cooling water is applied to the auto-shutter while it closes the opening in order to prevent its temperature from rising excessively. | |

9. Wafer and Wafer Carrier Specifications

(1) Wafer

	Process wafer
Type	NOTCH Type
Diameter	200 ± 0.5 mm
Thickness	0.725 ± 0.025 mm

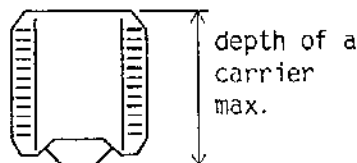
(2) Carrier

	(A)
Type	PA192-80M-61C02
Material	P.P
Manufacturer	Fluoroware
Pitch	1/4" (6.35 mm)

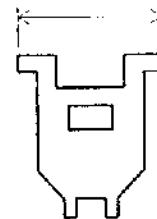
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- Notes 1. Carriers for 8" used in this equipment shall be satisfactory with 「The regulations of dimensions size finenes for using on α-8」
2. You are requested to loan out the detail drawing and actual carriers for our dry run.
3. Carrier width : Max 241mm

4. The depth of a carrier shall be 227mm at the maximum.



Carrier width max.



10. Wafer Transfer Procedure

(1) Designation of carriers:

- P : production carrier (process wafer carrier)
- M : monitor carrier (test or check wafer carrier)
- SD : side dummy carrier (dummy wafer carrier)
- ED : extra dummy carrier (carrier filled with process wafers for refilling the shortage.)

(2) Layout of the carriers on carrier stage

	A	B	C
1	P1	P2	ED
2	P1	P2	M1
3	P1	P2	M2
4	P1	P2	SD

① Terms of Layout

- a) P-carriers will be able to put on A, B lane.
- b) The SD carrier can be enabled to move on the transfer stage without layout on the stage in advance, however, it cannot be unloaded automatically.

(3) The sequence of the carrier entry/exit.

- ① Entry First batch : A1, A2, A3, A4, C2
Second batch : B1, B2, B3, B4, C3
- ② Exit First batch : C2, A1, A2, A3, A4
Second batch : C3, B1, B2, B3, B4

(4) Monitor carrier

Monitor carriers shall be entried and exited every time.

(5) Side dummy carrier

- ① dummy loading : entry of wafer-filled carrier
- ② dummy charging : dummy wafer charged
- ③ dummy unloading : exit of the filled carrier
- ④ dummy discharging : dummy wafer discharged.

(6) Extra dummy carrier

- ① entry : The extra dummy carrier must be entered before the process wafer carriers are entered.
- ② exit : The extra dummy carrier must be exited after the process wafer carriers are exited.

(7) Definition of a lot and a batch

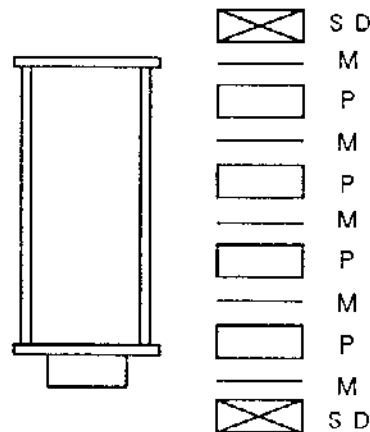
- ① lot : one lot = one carrier load = 25 wafers at the maximum
- ② batch: one batch = 4 lots (max.100pcs)

(8) Handling of process wafers

- ① When the wafer lot is less than 25:
 - a) Supplement from the extra dummy wafers to make up a 25-wafer lot.
 - b) Should more than 5 wafer slots be left vacant, the boat will be refilled with such vacant slots by means of the 5-wafer fork.
- ② When the number of lots are found short:
 - a) If the shortage is 1 lots (25 wafers) or less, supplement with extra dummy wafers.
 - b) Should the lot shortage be found to be more than 1 lots, alarm signal is generated to call up the operator.

(9) Handling of monitor wafers

- ① The monitor wafers are to be located as illustrated below, and the maximum number allowed to set is 5.



- ② The processing may be done without monitor wafers.

(10) Handling of side dummy wafers

- ① Total number of wafers : A total of 25 wafers at the top and bottom may be accommodated.
- ② The utilization frequency count function (0 ~99) is provided, and the alarm signal is generated when that count is exceeded. The alarm may be disregarded to continue the process.
- ③ For the work procedure of handling the dummy wafer, refer to the (5) of the preceding page.

(11) Handling of extra dummy wafers

- ① Number of wafers: 25 at the maximum
- ② For the extra dummy wafers, refer to the (8) of the preceding page.
- ③ The utilized process cycle counting function (0 ~99) is provided, and the alarm signal is generated when that count is exceeded. The alarm may be disregarded to continue the process.
- ④ The ED carrier storage time alarm is provided to count the duration of time from entering an ED carrier. It outputs an alarm when the set time (9999 hours at the maximum) gets expired.

(12) Wafer transfer procedure

- ① Sequence of wafer transfer:
extra dummy wafer → production → monitor wafer
- ② Charging wafers from a carrier to the boat:
Remove wafers from the bottom of a carrier and charge at the top side of the boat.
- ③ Discharging wafers from the boat to a carrier:
Remove wafers from the bottom side of the boat and charge onto the top side of a carrier.

(13) Evaluation operating mode

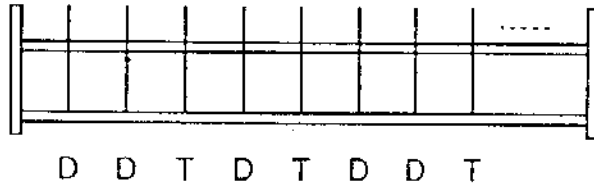
This mode is to determine the best processing conditions by transferring wafers in various patterns onto the boat.

- ① Wafers used : dummy wafers and test wafers
- ② Number of wafers used: dummy wafers = loads of 7 carriers at the maximum
test wafers = one carrier load at the maximum
- ③ Carrier layout :

	A	B	C
1	D		D
2	D		D
3	D		D
4	D		T

- ④ Pattern of wafer transfer:
- a) You can place the wafers in any pattern you prefer.
 - b) A wafer transfer pattern may be memorized in the area called MAP.

Example: MAP1



Up to 5 types of the patterns may be memorized.

- c) The charging and discharging can be executed by using monitor wafers only.
- d) A MAP may be specified by entering such input on a recipe of a host controller (a tube controller), and can be operated in ONLINE status.