Issued in OCT. 23, 1995

For. I B M

EAST FISHKILL

Mr. Frank V.Liucci

TEL PO. NO.	A 2 — 4 1 0 4 9		
TTL NO.	B 5 1 0 1 1 6	R/N	

Customer Approval Specifications

Equipment : α-858SCF (LOW TEMP)

Your Signatures for Approval				
Frank V. Liucci William D Hicks		4/4/96	K. C. Chang	
/ /	/ /	/ /	/ /	/ /

TOKYO ELECTRON LTD., SHIRATANI

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I OBJECTIVE OF THE SPECIFICATION

The specifications stated here in are to describe the standard, alternate, and optional specifications of the Low pressure Anneal Processing system for 8" wafers.

Note 1: For any extra specifications you desire but not included here, please consult with us.

2: The communication with a host is not described here since that is compatible with an optional item.

1. Wafers to Process:

   (1) Size : 200 mm±0.5 (Notch Type)
   (2) Number of wafers : 100 at the maximum (+~~25~~ 9 dummy wafers) ⚠

2. Specified Temperature range / process

   Normal specified temperature range : 150 ~~600~~ 625 ℃ ⚠

3. Transfer of wafers:

   (1) Wafer transfer : 5 wafer forks or 1 wafer fork (4 wafer forks +1 wafer fork)
   (2) Wafer transfer unit comprises:
      ① Carrier port
      ② Carrier stage
      ③ Transfer stage
      ④ Wafer transfer mechanism
      ⑤ Boat elevator
      ⑥ Auto Shutter
   (3) The wafers are transferred between a carrier and a quartz boat either by a unit of 5 wafers or single wafer according to a program specified.

4. Control system:

   A system controller (TS-4000ZC) compiles recipes for film-forming, and monitors the status of the system.

5. Clean environment specifications:

   (1) Wafers, while in the system, shall have their mirror surface in parallel with clean air flow regardless of their posture.
   (2) The inside of the system is made into a perfect and independent clean room almost free from outside elements. (This is on condition that the differential pressure between your clean room and utility room is below 0.5 mm H_2O.)
   (3) We recommend the differential pressure to be 0.3 ~ 0.5 mm H_2O between clean room and utility room.

6. Safety ⚠

   Seller will guarantee the safety of the product when used under normal operating conditions as written in the System Operations Manual.

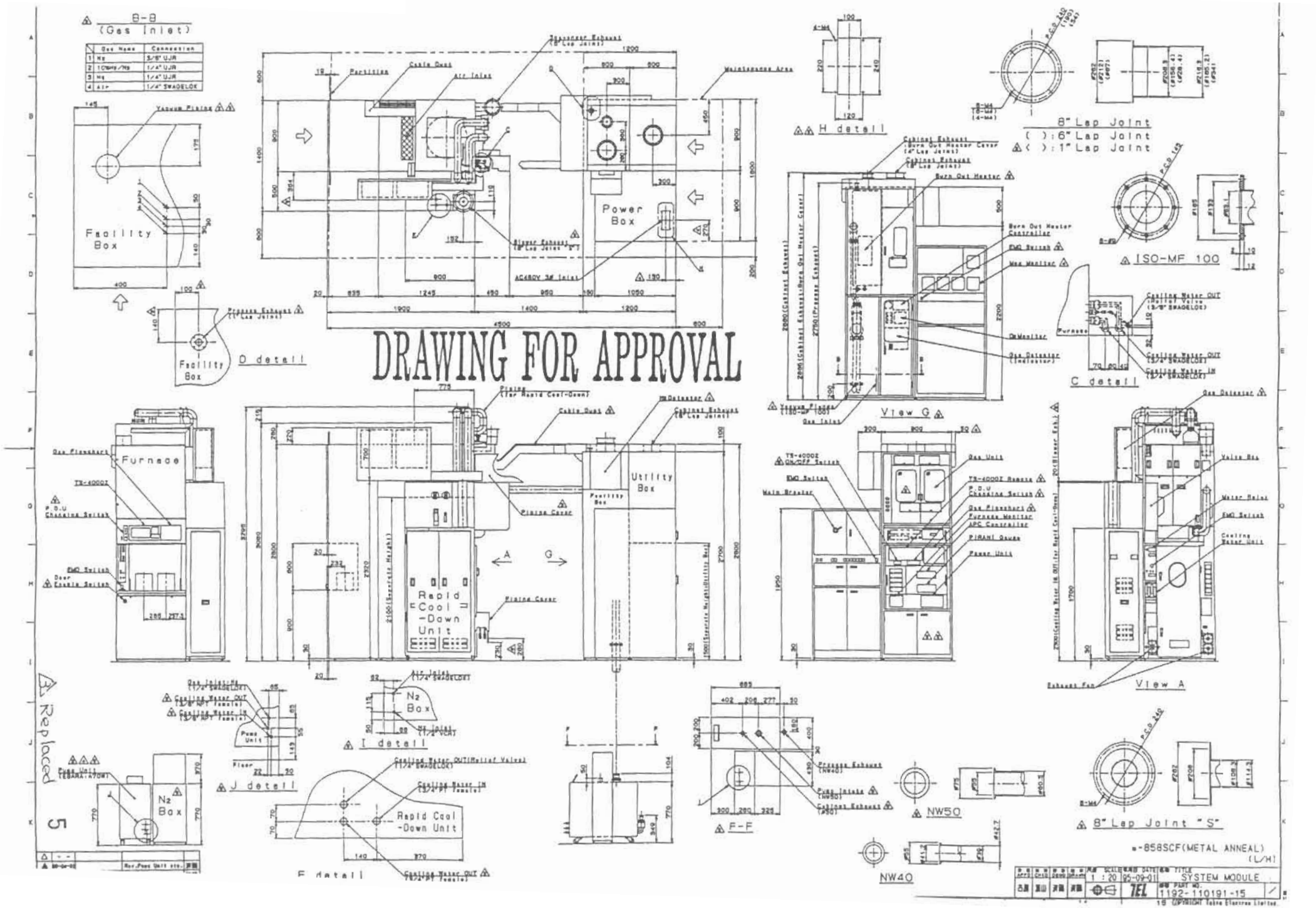
   The Seller is not liable for any hazard in the event of a natural disaster such as an earthquake, typhoon, tornado, etc.

   This statement does not void or over-ride the Warranty section paragraph(d) of the Terms and Conditions of the Sale contract.

2-1 System Configuration Table

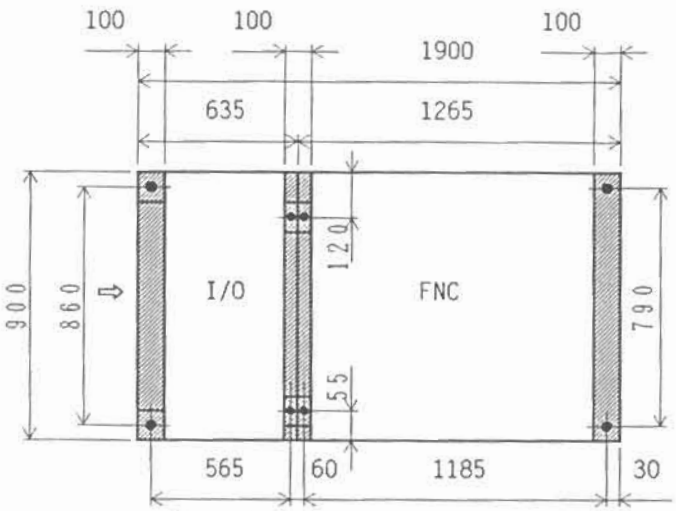
No.	Component name	Type/Model	Qty	Remarks	
1.	Furnace related items				
	(1) Furnace mount frame		1		
	(2) Heater chamber	VOS-40-014	1	1150mmL	
	(3) Cooling water pipe		1	on heaters, water cooled flange, etc.	
	(4) Scavenger		1		
	(5) Rapid cooing unit		1		
2.	Automechanism related items				
	(1) Carrier port		1	2 carrier I/O Port	
	(2) Boat elevator	8" VEL rotated	1	up/down	
	(3) Auto-shutter		1	full-closed	
	(4) T-BAWL	12 carrier stage	1	4-wafer forks and 1-wafer fork with pitch changer	⚠1
3.	Gas system related items				
	(1) Gas system	Anneal	1		
	(2) Utility Box		1		
	(3) Facility Box		1		
	(4) Manifold unit		1		
	(5) Vacuum exhaust line		1		
	(6) Gas detector		~~2~~ 6	H_2	⚠2
	(7) O_2 Dens Meter		1		
	(8) Dry pump		1	EBARA ~~A70W~~ ~~AA10~~ A70W	⚠2⚠4
	(9) Burn out heater		1		

No.	Component name	Type/Model	Qty	Remarks
4.	Controller related items			
(1)	Process controller	TS 4000ZC	1	
(2)	Transfer unit controller	TB-0800-PV1	1	
(3)	Temperature controller	Model 120 phase	1	
(4)	Gas flow chart		1	
(5)	Furnace monitor		1	
(6)	Power box		1	
(7)	TS-4000Z Remote		1	Including Gas flow chart
(8)	HCT		1	
(9)	Step Down Trans		~~1~~ 4	⚠2
5.	Quartz related items			
(1)	Process jigs		1set	
(2)	Loading jigs		1set	
6.	Quartz jigs for temperature			
(1)	Ratio T/C		1	
(2)	Flat Zone Measurement T/C		1	
7.	Others jig related items			
(1)	Tube Cart		1	
(2)	Flat Zone Measurement jig		1	TM-1200
(3)	Fork gage		1	
~~(4)~~	~~4 C/S Maint Cover~~		~~1~~	⚠2
8.	Others jig related items			
(1)	Base plate		1	
(2)	Instruction Manual	Cleaned paper Normal paper Floppy disk	1 3 1	

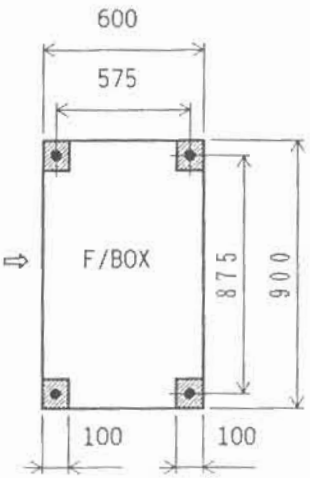

B-B
(Gas Inlet)
Gas Name
Connection
Facility Box
Power Box
Utility Box
Furnace
Rapid Cool -Down Unit
N2 Box
Plasma Cover
Cable Duct
Partition
Air Inlet
Maintenance Area
Vacuum Pipe
Pressure Exhaust
Blower Exhaust
Cabinet Exhaust
Burn Out Heater
Burn Out Heater Controller
EMO Switch
Gas Detector
Gas Flowback
Gas Inlet
Ceiling Water OUT
Ceiling Water IN
Pump Unit
Floor
D detail
H detail
I detail
J detail
F detail
F-F
View G
View A
NW50
NW40
ISO-MF 100
8" Lap Joint
( ):6" Lap Joint
( ):1" Lap Joint
8" Lap Joint "S"
DRAWING FOR APPROVAL
Replaced 5
SYSTEM MODULE
1192-110191-15
1 : 20
95-09-01
TEL

1. Layout of base plates

(1) Furnace unit

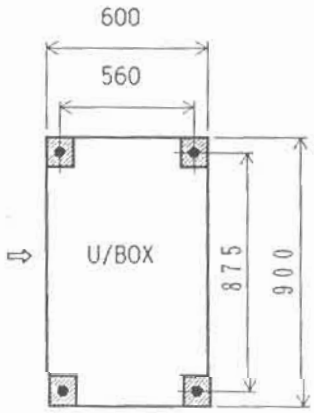


(2) Facility box

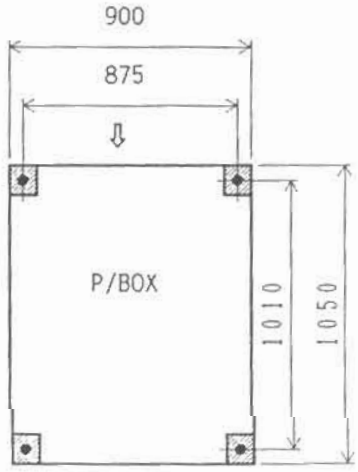


Base plate : t=10mm, W=100mm

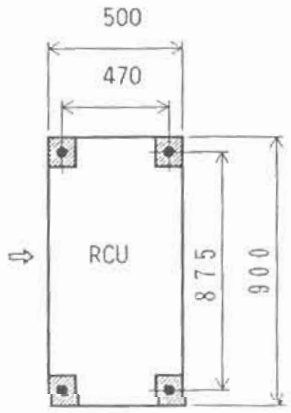
(3) Utility box



(4) Power box



(5) Rapid cooling down unit

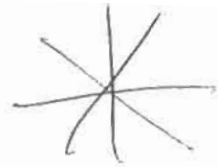


Base plate : t=5mm, W=75mm

Remarks : (a) ⇨ indicates the operational flow.

2. Weight of Units

	Name	Weight	Remarks
1	Furnace	approx. 1750 kg	Includes the carrier I/O port.
2	Facility box	〃 350 kg	
3	Utility box	〃 400 kg	
4	Power box	〃 800 kg	
5	Rapid cooling down unit	〃 250 kg	



2-4 Utility list

No.	Item		Spec.	Capacity	Fitting	Connection	Remarks
1	Power Supply	Heater, RCU, CTL, Pump	AC 480V φ3 60Hz	~~78.4~~ 124.7 kVA	Breaker (150A)	Power Box	
2	Gas	P-N_2	5~7 kg/cm²	190 ℓ/min	3/8" VCR	F/BOX BTM	
		H_2	2 kg/cm²	10 ℓ/min	1/4" VCR	F/BOX BTM	
		10% H_2/N_2	2 kg/cm²	20 ℓ/min	1/4" VCR	F/BOX BTM	
		N_2	5~7 kg/cm²	300 ℓ/min	1/2" VCR	N_2 BOX TOP	
		Air	5~7 kg/cm²	——	1/4" SWG	N_2 BOX TOP	
		Air	5~7 kg/cm²	——	1/4" SWG	F/BOX BTM	
3	Water	Furnace	△ 3kg/cm²	~~13.0~~ 18 20 ℓ/min	3/4" SWG	FNC. lower rear	
		RCU	△ 3kg/cm²	~~30.0~~ ℓ/min	3/4" PT FEMALE	Ceiling	
		Pump	△ 3kg/cm²	5 ℓ/min	3/8"NPT FEMALE	Pump unit	
		F/Box	△ 3kg/cm²	3 ℓ/min	3/8" SWG	Ceiling	
4	Exhaust	Heat Exh.	——	4.5 m³/min	φ6" Lap Joint	FNC. upper rear	
		Process Exh.	——	0.1 m³/min	φ1" Lap Joint	F/BOX TOP	
		Process Exh.	——	0.3 m³/min	NW40	Pump TOP	
		General Exh.	——	6 m³/min	φ8" Lap Joint	U/BOX TOP	
		General Exh.	——	4 m³/min	φ8" Lap Joint	F/BOX TOP	
		Heat Exh.	——	2 m³/min	φ4" Lap Joint	F/BOX TOP	BOH Exh
		Heat Exh.	——	8 m³/min	φ8" Lap Joint	RCU (TOP)	
		General Exh.	——	0.5 m³/min	φ50mm pipe	Pump (TOP)	
5	Resistance	Ground	<100Ω				
		Insulation	~~<100MΩ~~ <10 MΩ				
6	Drain	Furnace	——	——	3/8" SWG	FNC. lower rear	Relief line
		RCU	——	——	1/4" SWG	Ceiling	Relief line
7	Vacuum line	Pump Down	——	——	ISOMF100 Flange		

[Note] (※) RCU : Rapid cooling down unit

Special Note

(1) The capacity indicated is for one tube.

(2) Every lap joint shall have a mating flange(with the packing manufactured by Viton Co. attached.)

(3) Every gas fitting shall have a mating fitting and pipe(100mmL).

(4) There is no dedicated pressure ~~machine~~ regulator and filter for the cooling water supply. △

(5) The quality of cooling water must be on the level of city water.
○ Please attach the filter (100 μm>) on your water line.

PH	M Alkalinity	HARD-NESS	Fe^{2+}	Cu^{+}	Zn^{2+}	SO_4^{2-}	Cl^{-}	NH_4^{+}	resitance
7~8	<50ppm	<50ppm	<0.3 ppm	<1.0 ppm	<1.0 ppm	<20ppm	<15ppm	<0.1 ppm	~~6.5~10~~ MΩ cm

(6) Since the scavenger exhaust becomes very hot at the time of loading and unloading(80~100℃), the interface must be made with a stainless steel duct.

(7) Electric power Wiring indicated by the dashed lines will be suplied by your company.

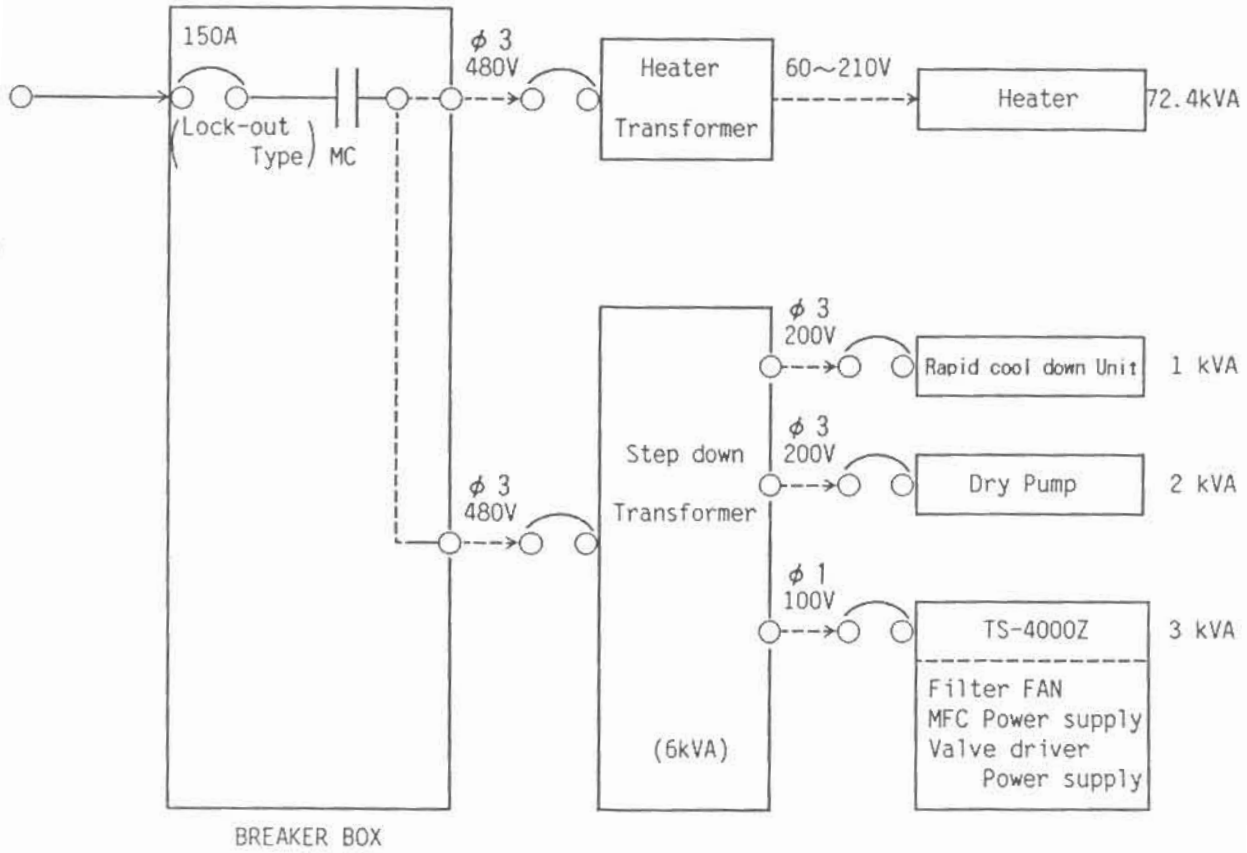
(8) Electric power Wiring indicated by the solid lines will be fabricated at our facilities.

2-5 Power Supply System Diagram

1. Flow chart

AC 480V [TOTAL 78.4kVA]

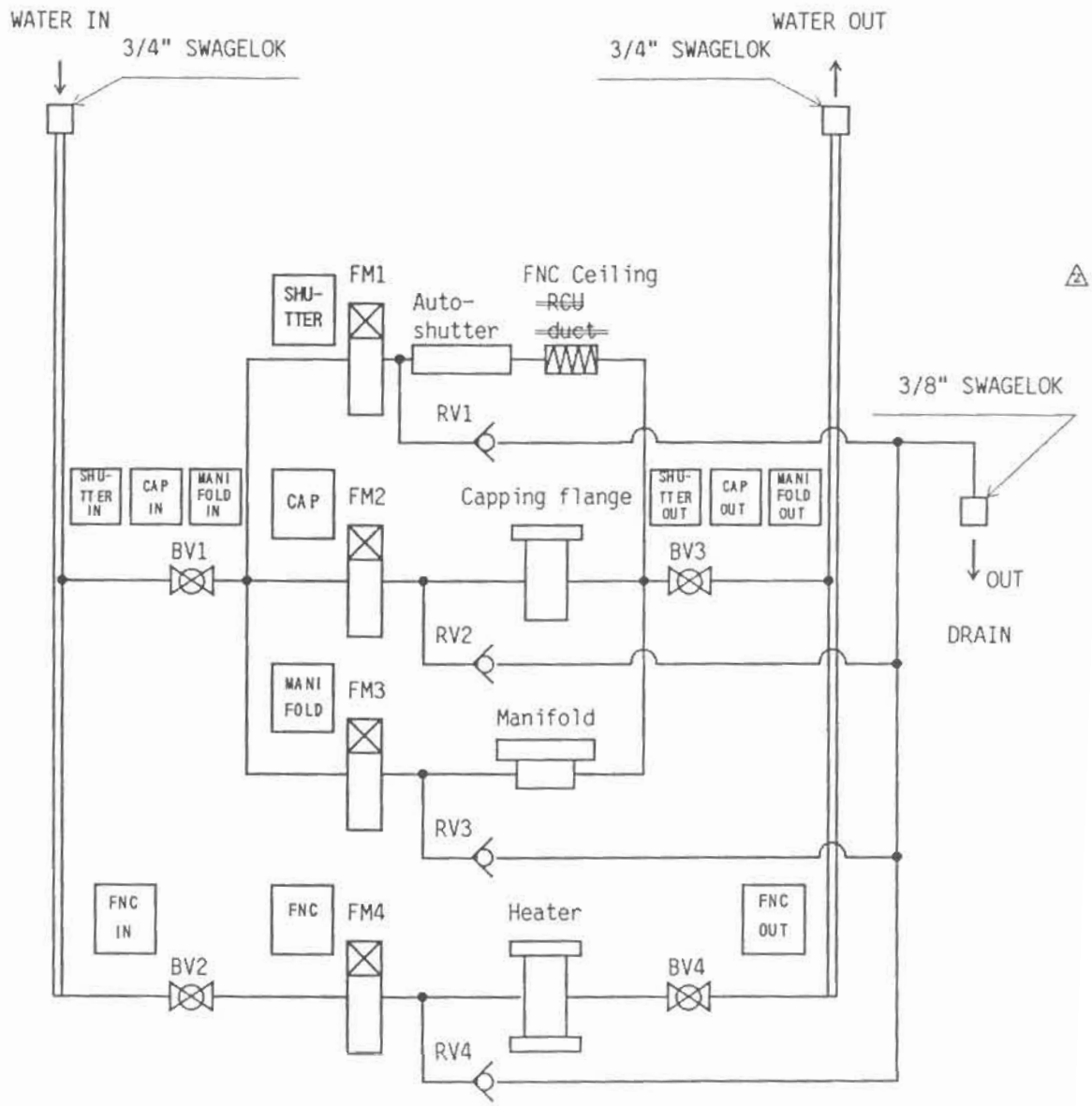
ϕ3 60Hz



Special Notes:

(1) Wiring indicated by the solid lines will be supplied by your company. (Dry pump unit ⟷ Power box)
(2) Wiring indicated by the dashed lines will be fabricated at our facilities.
(3) EMO SW cut off the Magnetic conductor.
(4) The Step down Transformer second side is provided Meg Monitor. (use; Heater~4sets, Rapid cool down unit FAN ~ 1set)
(5) The Lock-out type Breaker will be supplied by our company.

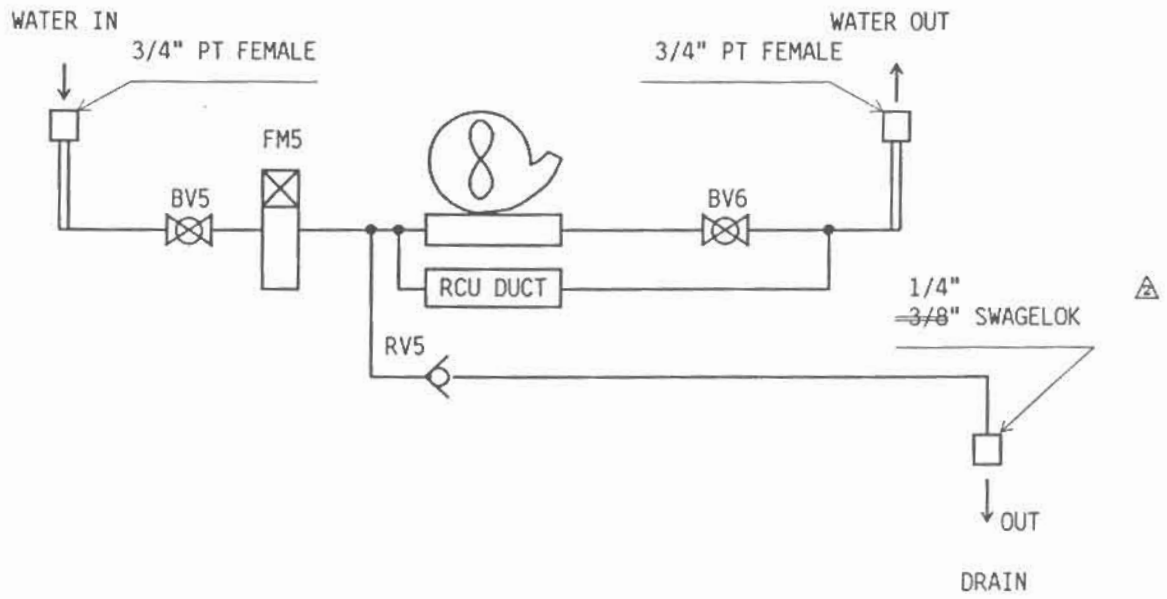
1. FURNACE



	Normal flow rate	full scale flow rate	Lower limit for alarm
FM1	2～3 ℓ/min	5 ℓ/min	1.6 ℓ/min (REED SWITCH)
FM2	0.5～0.6 ℓ/min	1.2 ℓ/min	0.4 ℓ/min (REED SWITCH)
FM3	0.9～1.0 ℓ/min	1.2 ℓ/min	0.4 ℓ/min (REED SWITCH)
FM4	2～3 ℓ/min	5 ℓ/min	1.6 ℓ/min (REED SWITCH)

	NAME	TYPE	Qty	Remarks
BV 1,3	BALL VALVE	UBV-14D-BU	2	FUJIKIN
BV 2,4	BALL VALVE	UBV-14C-BU	2	FUJIKIN
FM 1,4	FLOW METER	P-600-2UA-5L-6S-L-NO	2	TOKYO KEISO
FM 2,3	FLOW METER	P-600-2UA-1.2L-6S-L-NO	2	TOKYO KEISO
RV 1～4	RELIEF VALVE	SS-4CA-50	5	NUPRO

2. RAPID COOL DOWN UNIT

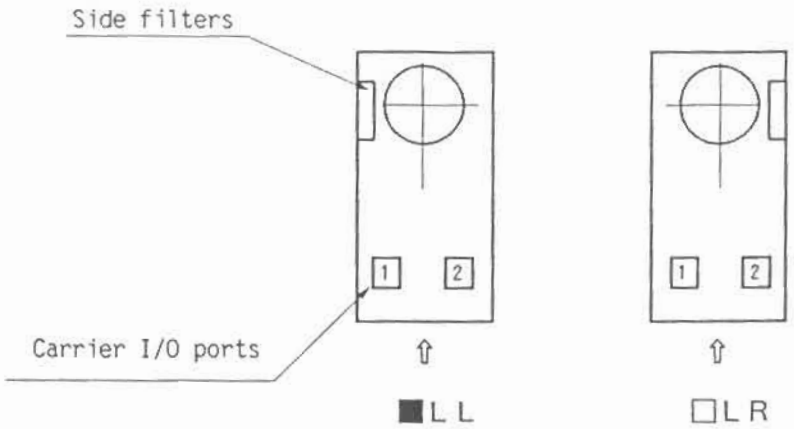


	Normal flow rate	full scale flow rate	Lower limit for alarm
FM 5	2 0 ℓ/min	3 0 ℓ/min	1 0 ℓ/min (REED SWITCH)

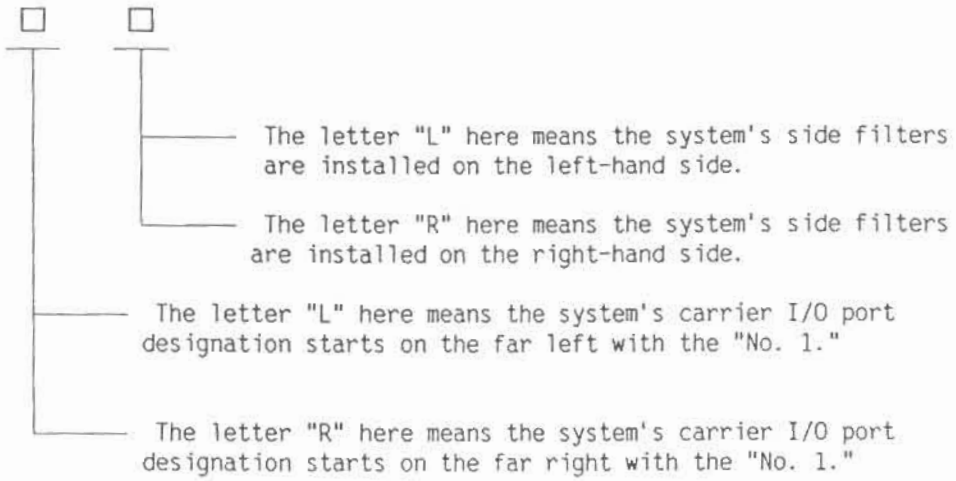
	NAME	TYPE	Qty	Remarks
BV 5,6	BALL VALVE	UBV-14D-BU	2	FUJIKIN
FM 6	FLOW METER	FM-PR60S	1	TOKYO FLOW METER
RV 5	RELIEF VALVE	SS-4CA-50	1	NUPRO

1. Coated colors of the system:

	Unit	Color	Munsell No. (approx.)	
1	Furnace unit			
	(1) Frame	White	~~10Y~~ 2.5PB 9/1	⚠2
	(2) Door panel	White	~~10Y~~ 2.5PB 9/1	⚠2
	(3) Operating box	White	~~10Y~~ 2.5PB 9/1	⚠2
	(4) Side filter	White	~~10Y~~ 2.5PB 9/1	⚠2
2	Utility box			
	(1) Frame	White	~~10Y~~ 2.5PB 9/1	⚠2
	(2) Door, Panel	White	~~10Y~~ 2.5PB 9/1	⚠2
3	Rapid Cool Down Unit			
	(1) Frame	White	~~10Y~~ 2.5PB 9/1	⚠2
	(2) Door, Panel	White	~~10Y~~ 2.5PB 9/1	⚠2
4	Facility Box			
	(1) Frame	White	~~10Y~~ 2.5PB 9/1	⚠2
	(2) Door, Panel	White	~~10Y~~ 2.5PB 9/1	⚠2
5	Power Box			
	(1) Frame	White	~~10Y~~ 2.5PB 9/1	⚠2
	(2) Door, Panel	White	~~10Y~~ 2.5PB 9/1	⚠2



How the directional orientation is defined:



FURNACE

SPECIFICATION

3-1 Furnace Unit

1-1 Furnace mount frame

(1) Type/Model No. : VFA-090
(2) External dimensions : 900mmW × 1900mmD × 3080mmH
(Please refer to the drawing)

1-2 Front panel contents

(1) TS-4000ZC Operation panel
(2) Gas Flow Chart
(3) Mechanical switches
(only the pause switches are located at both the front and rear side.)
(4) EMO switches
(5) Connector for HCT

1-3 Furnace mount rear section contents:

(1) Cooling water unit
(2) Mechanical switches (pause switch)
(3) EMO switches
(4) Furnace mount temp. controller
(5) Exhaust fan (Electrical Equipment Exhaust)

1-4 Basic specifications

(1) The furnace unit shall be so structured that it may be divided at its height of 2100 mm.

(2) The furnace is provided with a heater chamber cooling mechanism in order to prevent the rise of ambient temperature because of the furnace heat radiation.

(3) The heater chamber is so structured that it may be removed from the rear side of the furnace for maintenance and repair works.

(4) A heat insulating blanket shall be attached to the furnace ceiling providing the protection against high temperature.

(5) A safety cover is provided at the front of the heater terminal.

(6) The interlock is provided at the back door.

(7) A connector port for the handy communication terminal(HCT) is provided on the lower section of the furnace unit rear side.

(8) The connection of the cooling water shall be made at the lower portion of the furnace unit rear facing, and joined by means of a 3/4" SWAGELOK.

(9) A temperature measuring connector (branched from the internal T/C) will be provided on the furnace unit rear facing.

(10) The each door switches (open/close and enable sw) distance must be 650mm. ⚠

2. Heater specifications

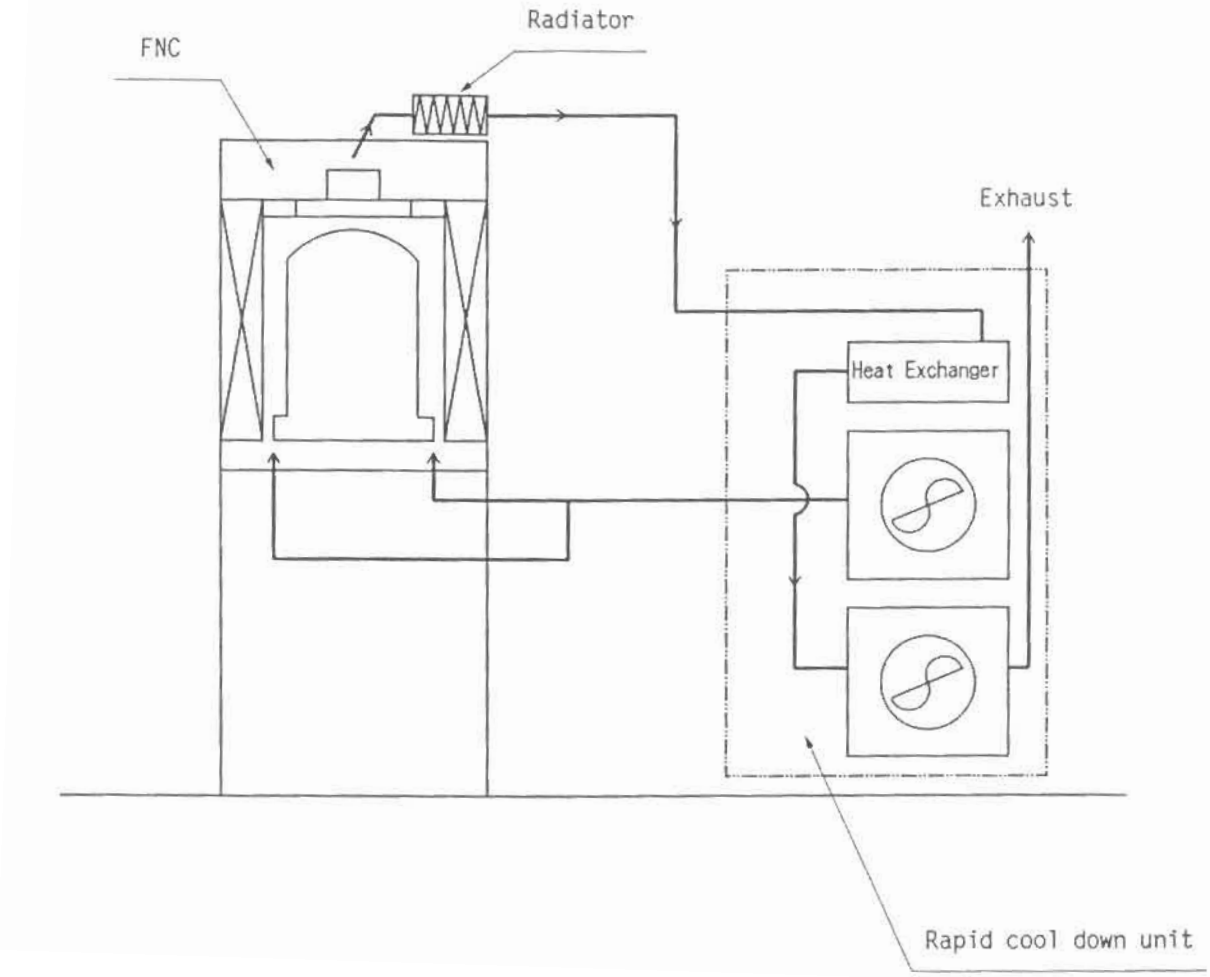
(1)	Heater type/model	:	VOS-40-014	
(2)	Effective inner diameter	:	320 mm	
(3)	Outer diameter	:	500 mm	
(4)	Heater length	:	~~1146~~ 1161mm(except Air Blow)	⚠2
(5)	Zone control	:	4 zones	
(6)	Flat heat zone length	:	~~600mm±1℃(@1000℃,Wafers equipment NO GAS)~~ 600mm(±1℃)(@625℃,No Wafers,No Gas)	⚠2
(7)	Normal specified temperature range	:	150~~~550℃~~ 600℃	
(8)	Maximum operating temperature range	:	~~580~~ 625℃	⚠2
(9)	Maximum electric power rating	:	67.9kw	
~~(10)~~	~~Stable state of electric power consumption~~	~~:~~	~~4.1kw (600℃)~~	⚠2

3. Auxiliary components

(1) Scavengers
- ① Scavengers are installed between the ceiling of the mount and heater, base plate and loading area to exhaust the hot ambience generate by the heaters.
- ② They shall be made of stainless steel, SUS 316.
- ③ A manually operable damper shall be installed on the scavenger.
- ④ The scavenger at the furnace opening is made dividable into two sections, so that it may be removed even when the elevator is moved up.
- ⑤ A manostat gage(~~0~~~~20~~ 30mm H_2O) shall be installed on the exhaust duct. ⚠2 A manostat switch(2~12mm H_2O) shall be installed, then an alarm shall be input to controller.
- ⑥ Gas sampling port shall be installed inside the scavengers.

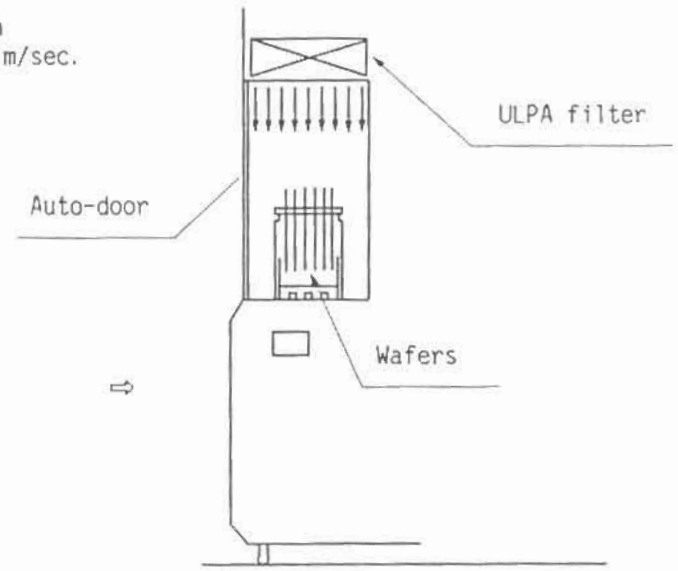
(2) Rapid cooling down unit
- ① Outer dimension : 900mmW × 500mmD × 1700mmH
- ② Air Blower Flow Schematic
  * Refer to next page

Air Blower Flow schematic

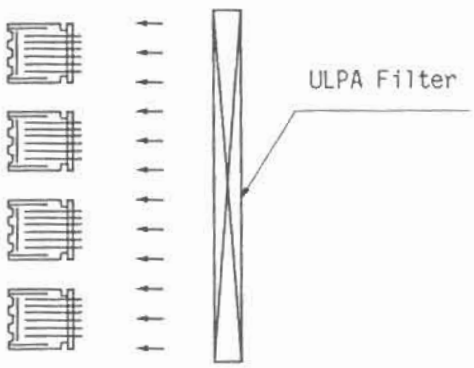


4. Clean air flow specifications
Filters are provided with the system in such a way that clean air flow paralled to the wafer facing while a wafer is at the carrier I/O port, carrier stage, or loading area. (The differential pressure shall be less than 0.5 mm H_2O between the clean room and utility room.)

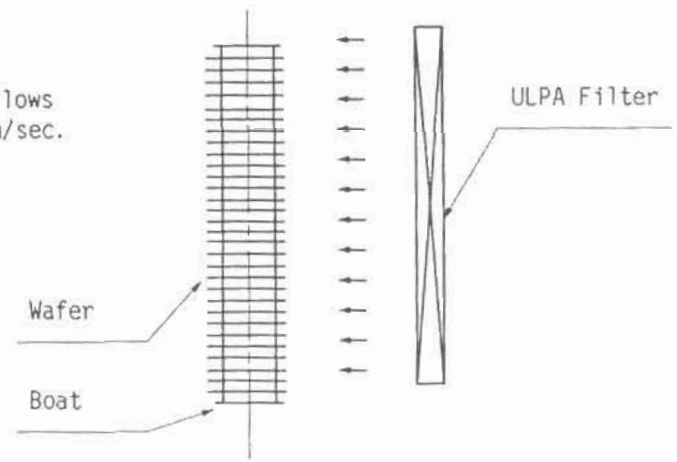
(1) Carrier I/O port
1) Flow direction: Down
2) Flow rate : 0.5 m/sec.



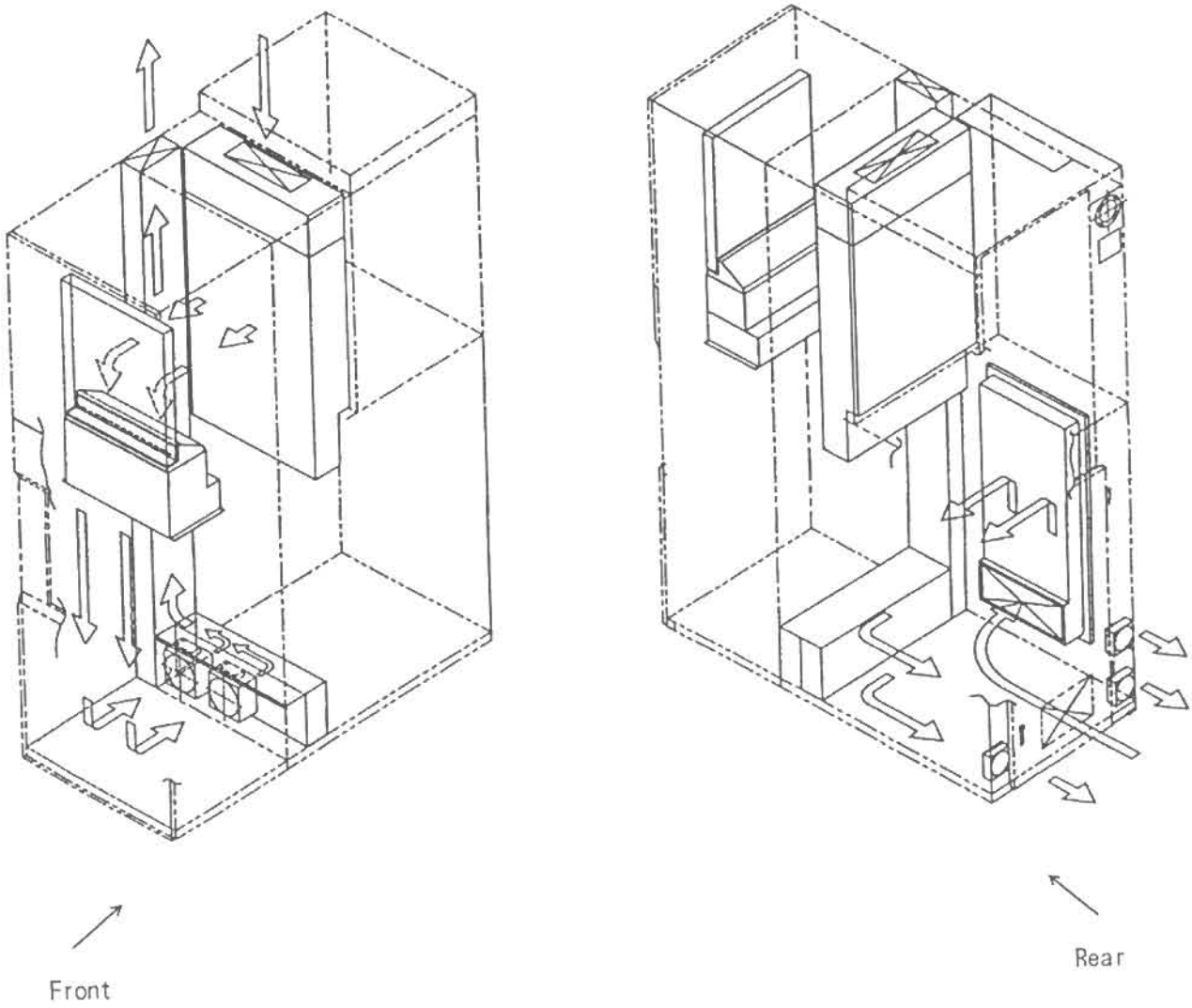
(2) Carrier stage
1) Flow direction: Side flow
2) Flow rate : 0.3 m/sec.



(3) Loading area
1) Flow direction: Sideflows
2) Flow rate : 0.3 m/sec.



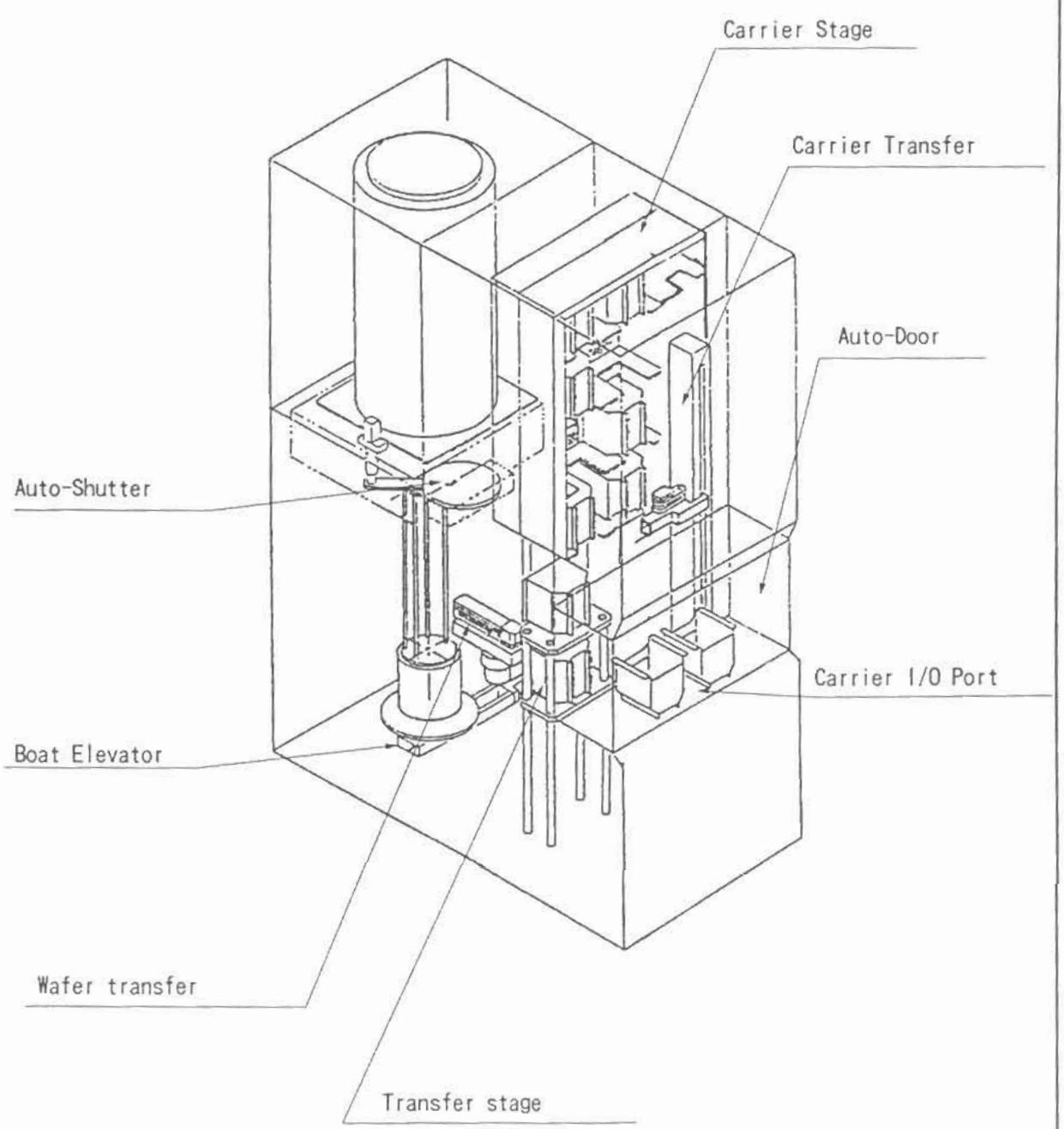
(4) Special notes:
1) Each filter has flow rate adjustment mechanism.
2) The flow rate adjustment mechanism is installed inside the furnace unit upper door.



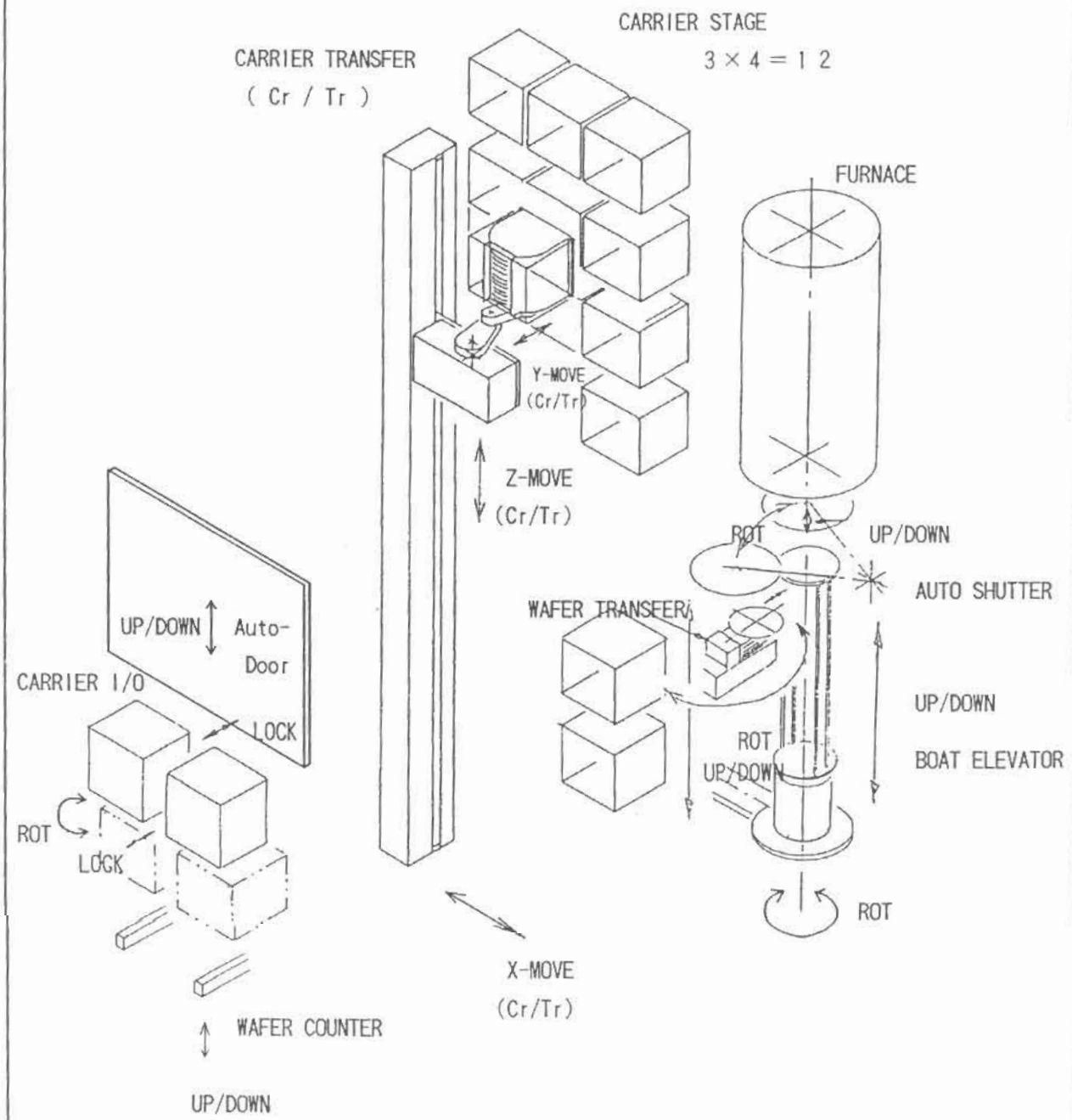
AIR FLOW

MECHANISM

SPECIFICATION



LAYOUT AND BLOCK DIAGRAM OF AUTO MECHANISM SYSTEM



BLOCK DIAGRAM OF AUTO-MECHANISM UNITS OPERATING RELATIONS

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.

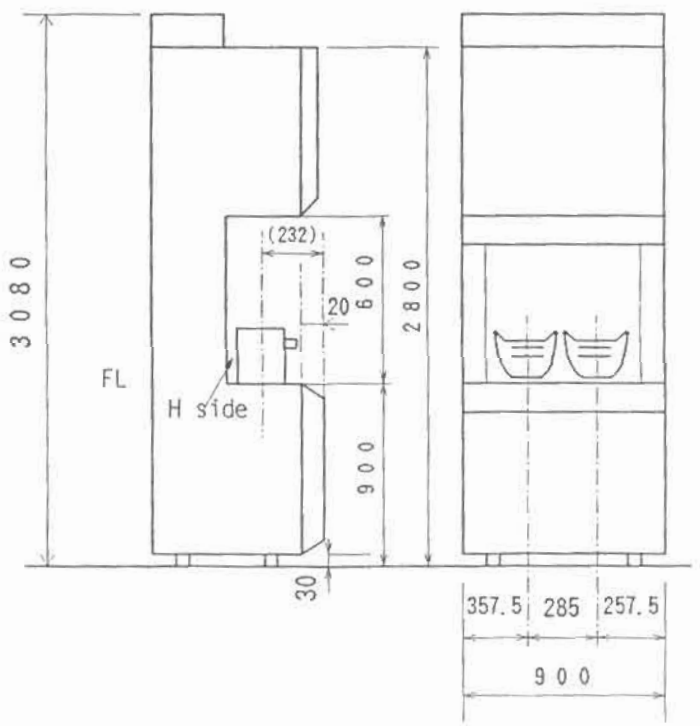
(1)	Driving means	:	Air cylinder
(2)	Stroke	:	600 mm
(3)	Normal operating speed	:	100mm/sec.
(4)	Door material	:	PVC(incombustibility flame resistance) treated
(5)	Special note	:	The door has its home position at "closed."

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 loadable on the port	:	2 (commonly used for entry and exit)
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 ⟷ carrier stage ⟷ transfer stage.

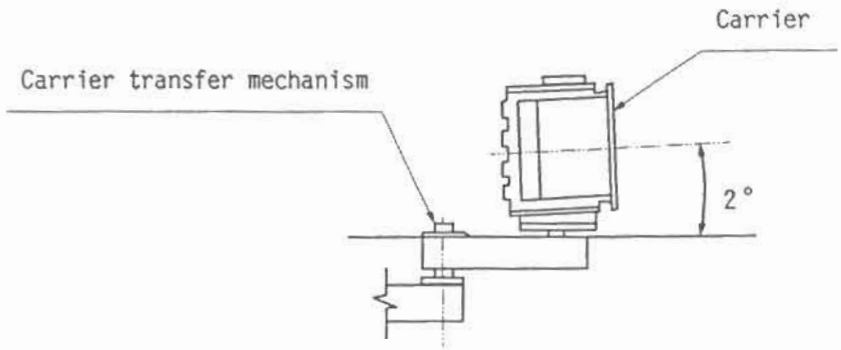
(1) Driving method

	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 → straight	→ 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.

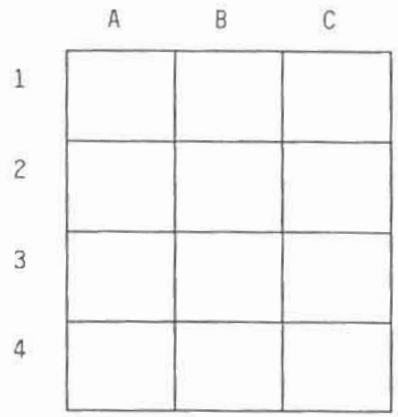


4. Carrier Stage

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

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

(2) Carrier layout :



(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	5-wafer fork	253 mm	215 mm/sec	5-ph. stepping motor	rotary encoder + photosensor
	1-wafer fork	↑	↑	↑	↑

(2) Transfer mechanism: 1 wafer fork + 4 wafers forks

(3) Fork material : High purity Al_2O_3 (99.5%)
: 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 double o-ring(VITON) 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

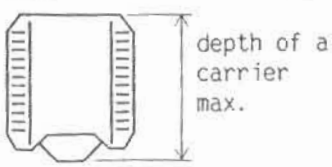
	Process wafer
Type	NOTCH Type
Diameter	200 ± 0.5 mm
Thickness	0.725 ± 0.025 mm

(2) Carrier

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

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.



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	—	—	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, C2
		Second batch	: B1, B2, B3, C3
②	Exit	First batch	: C2, A1, A2, A3
		Second batch	: C3, B1, B2, B3

(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

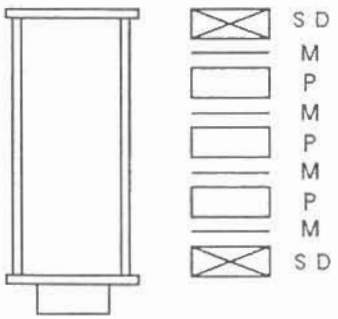
① lot : one lot = one carrier load = 25 wafers at the maximum
② batch: one batch = 3lots (max.75pcs)

(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 2 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 4.



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 :

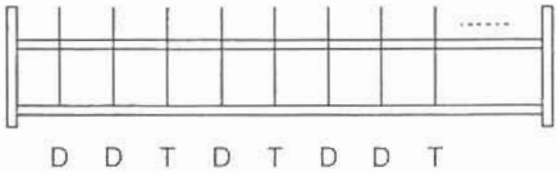
	A	B	C
1	D		D
2	D		D
3	D		D
4	D		T

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.

GAS SYSTEM

SPECIFICATION

1. Pressurized gas system

(1) Types of process : Please refer to the Gas Flow Chart

(2) Main specified components:

① Filter		: TOSHIBA	; CERAMIC
② Air operation valve		: FUJIKIN	; Diaphragm type
③ Mass Flow Controller		: STEC	; SEC-7300 series
④ Check valve			
	• Process gas, purge N_2	: FUJIKIN	; Disc poppet type (Diaphragm type)
	• Vent line	: FUJIKIN	; Spring type
⑤ Hand valve		: FUJIKIN	; Diaphragm type
⑥ Regulator		: VERIFLO	; SQ series
⑦ Pressure transducer		: NAGANO	; ZT series

(3) Fitting : Gasket joint
(Air lines and vent lines shall be excepted)
*pure nickel type using

(4) Piping material : SUMIKIN STAINLESS TUBE (EP)
(Air lines and vent lines shall be excepted)

(5) Piping working method : bending type(90° ↓)

(6) Welding method : Automatic-welding

(7) Special Notes:
① For shipping from our factory, the unit shall have N_2 gas sealed in.
② A label identifying the gas name and flow direction shall be placed on all the gas inlet and vent valves, air valves, check valves, and like items.
③ A gas inlet shall have a mating fitting.
④ The joint sections of the gas inlet, outlet, vent, etc., shall all be housed inside the boxes.

2. Gas Exhaust System Related Items

(1) Major components ~~AA10~~ A70W ⚠
① Dry pump : ~~A70W~~ (EBARA) ⚠
② Main valve : Angle Valve
③ Vacuum gage : Baratron
④ Joint : gasket and NW method
⑤ Piping material : SUS 316 BA (stainless steel)

(2) Pressure control
① The pressure will be controled by the Conductance valve and Baratron sensor.
② control method:
- BS1(0～1000Torr) : Used to control pressure in the reactor tube.
- PS1 : Used to monitor pressure in the pump capacity monitor.
- P.SW1 : Detection of atmospheric pressure recovery.
- P.SW2 : Detection of atmospheric over pressure recovery.
- P.SW3 : Detection of atmospheric pressure recovery.(for Cap flange)

(3) Special notes

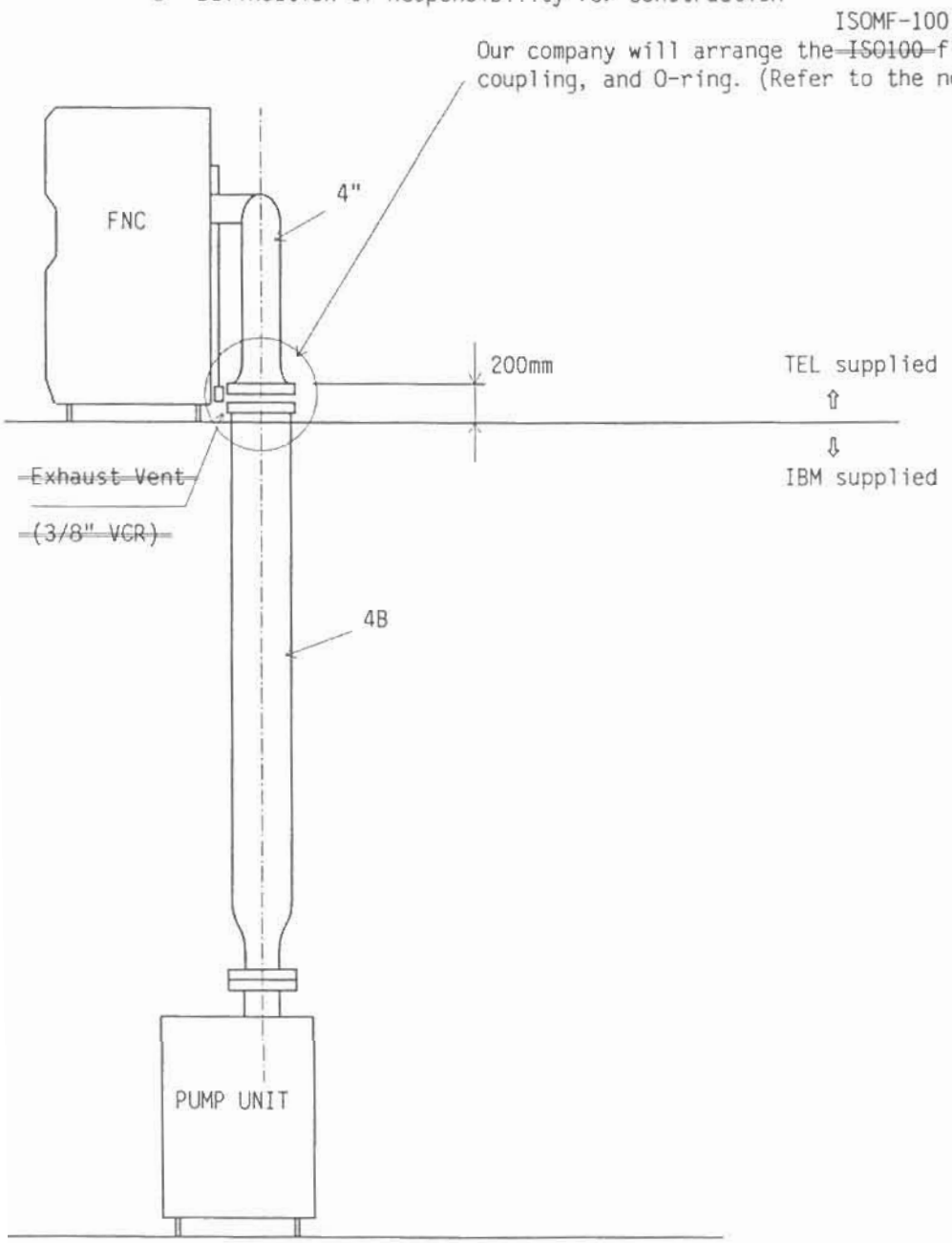
① The pump package are to be arranged by ~~customer side~~. our company

② The 4" piping ~~and Vacuum vent line~~ preparing and works from furnace floor to pump unit shall be done by customer side.

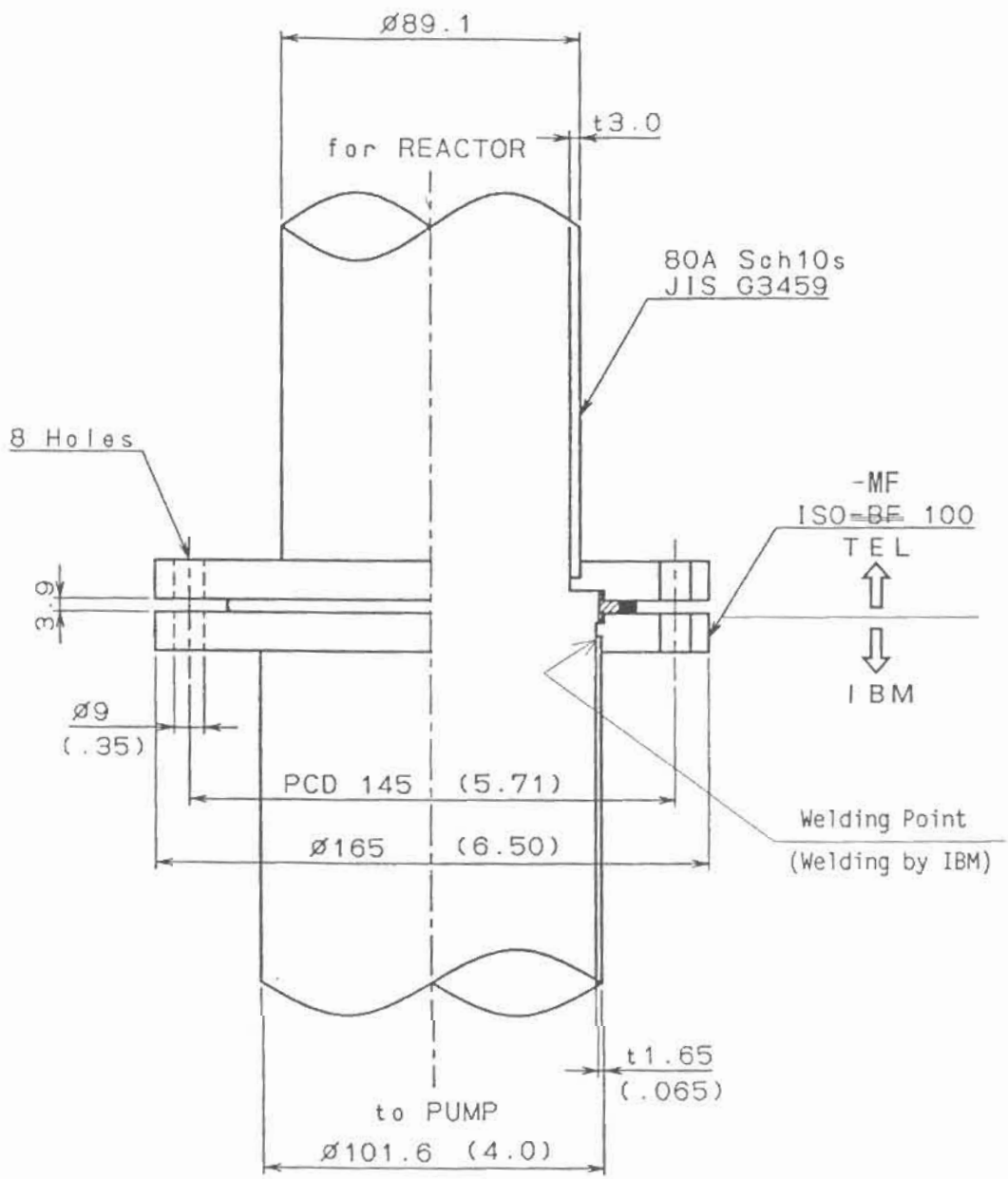
③ Pirani gauge shall be installed at the U/BOX.

~~④ The length of the vacuum tubing will be 650mm(MAX).~~

○ Delineation of Responsibility for construction



Schematic of ISO-~~BF~~-MF-100 (Claw clamp type)



Note : Dimensions (inches)

MATERIAL : SUS316L

3. Manifold

(1) Sealing method : end-face sealing (Double o-ring + evacuated)
(2) Material : SUS 316L stainless steel
(3) Gas port
  ① Gas port : 3/8" Ultra Torr
  ② Inner T/C port : 20 DIA Ultra Torr
(4) Exhaust port : 3" DIA
(5) Cooling method : water cooling
(6) Special Notes
  ① Installing and removing the manifold shall be possible by means of the Tube Cart and the Elevator. The structural design shall provide and easy means for positioning during installation.
  ② Manifold is water cooled to prevent O-ring damage.

4. Utility box

(1) External dimensions : 900mmW × 600mmD × 2800mmH

(2) Items housed in the box
  ① Gas system
  ② Various circuit breakers, etc.
  ③ Gas detector indicator
  ④ Model-120 phase
  ⑤ TS-4000Z Main part
  ⑥ TS-4000Z operation panel
  ⑦ Gas flow chart panel
  ⑧ PDU change switch

(3) Basic Specification
  ① The maintenance door will be provided with wire glass.
  ② The manostor gage and manostor switch will be installed on the exhaust duct and will output the alarm signal to the TS-4000Z.
  ③ Covers will be provided on the switches and controls of the 100/200VAC power supply panels circuit breakers.
  ④ The cover should be installed at the various electrical unit.
  ⑤ The door interlock is provided at front door.

5. Facility box

(1) External dimensions : 900 mmW × 600 mmD × 2800 mmH

(2) Items housed in the box
  ① Exhaust piping
  ② APC controller
  ③ ATM sensor
  ④ ~~Firm Ware I/L unit~~ Hard ware I/L unit △
  ⑤ Gas detector
  ⑥ Burn out heater

(3) Special Notes
  ① The maintenance door will be provided with wire glass.
  ② The manostor gage and manostor switch will be installed on the exhaust duct and will output the alarm signal to the TS-4000Z.
  ③ The door interlock is provided at the front door.

6. H_2 Burn out system

(1) System Specification

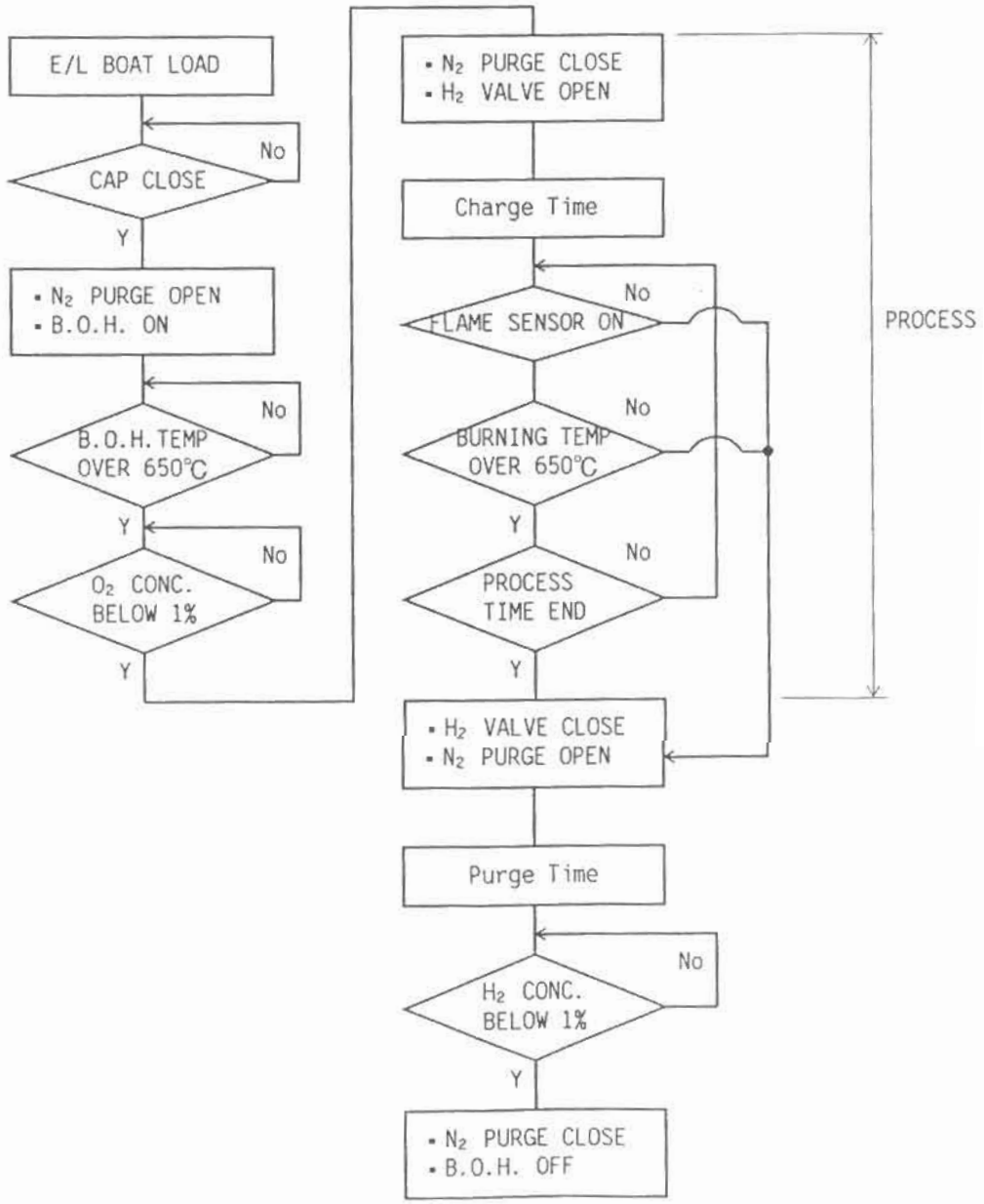
①	Burning method	:	Ignition heater and air intake type
②	Gas	:	H_2 10～100% (Including N_2)
③	Flow rate	:	3～10 ℓ/min (100% H_2)
④	Dimension	:	434mmW × 600mmD × 1200mmH (Cover size)

(2) Safety Device

① Heater Temp monitor
② Flame sensor ×2
③ O_2 Concentration monitor
④ H_2 Concentration monitor
⑤ Exhaust pressure monitor

(3) Basic Sequence

① Flow diagram



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7. Gas Detector Specifications

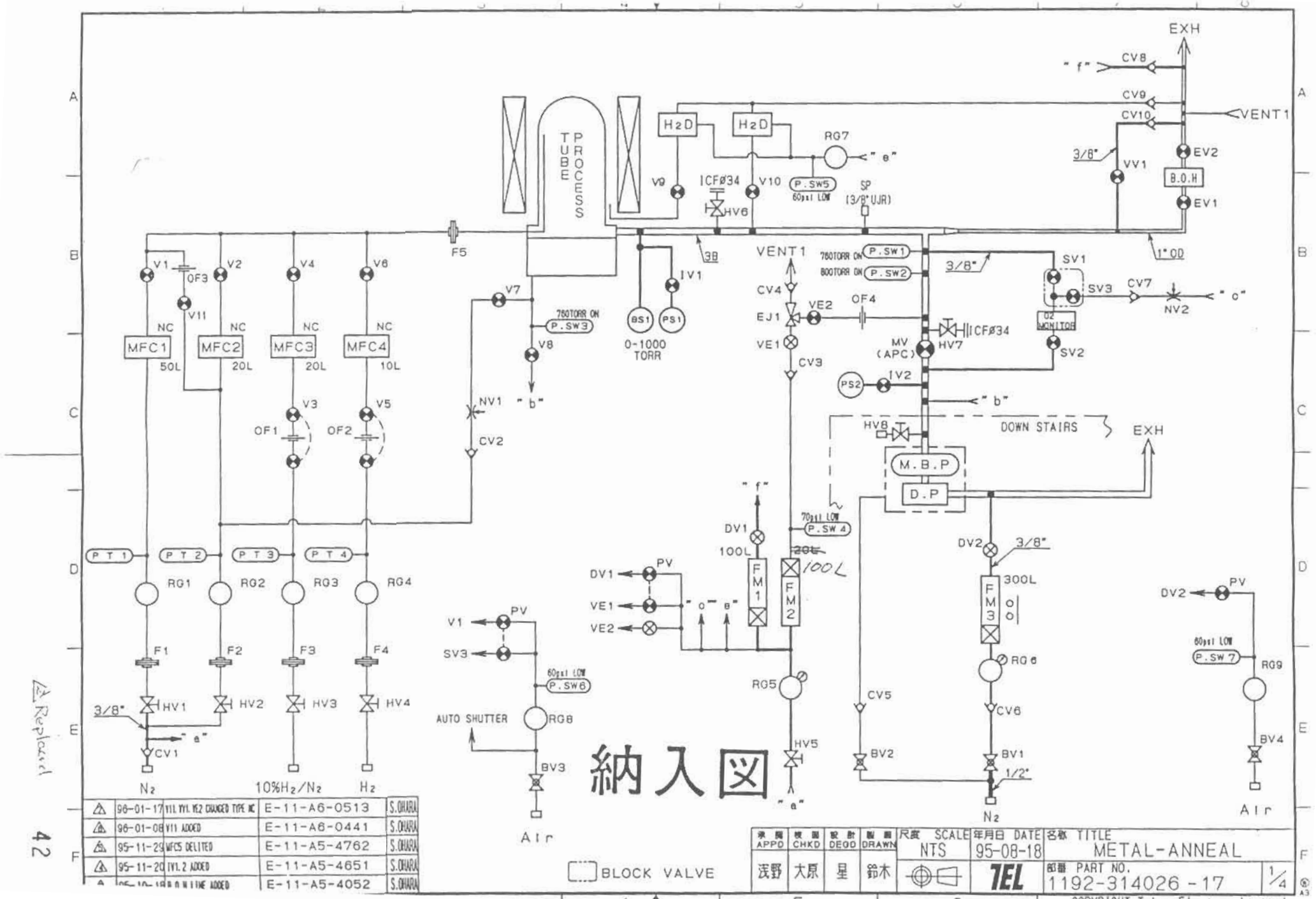
(1) General

Sense point	Sensor type	Purpose
Scavenger	Absorbent	Leak detect
Gas box	Diffusion	Leak detect
Facility box	Diffusion	Leak detect
Burnout box	Diffusion	Leak detect
Heater room	Absorbent	Leak detect
Process chamber	Absorbent	Seaquence step up

(2) Notes

① The diffusion type sensor must be installed inside the cabinet (Not exhaust duct).

② The alarm signal shuld be send to the external terminal.



⚠	96-01-17	V11, V9, V12 CHANGED TYPE NC	E-11-A6-0513	S.OHARA
⚠	96-01-08	V11 ADDED	E-11-A6-0441	S.OHARA
⚠	95-11-29	MFC5 DELITED	E-11-A5-4762	S.OHARA
⚠	95-11-20	V9, L2 ADDED	E-11-A5-4651	S.OHARA
⚠		[illegible] ADDED	E-11-A5-4052	S.OHARA

承認 APPD	検図 CHKD	設計 DESD	製図 DRAWN	尺度 SCALE	年月日 DATE	名称 TITLE
浅野	大原	星	鈴木	NTS	95-08-18	METAL-ANNEAL

TEL

部番 PART NO. 1192-314026-17 1/4

Z Replaced

No.	ITEM NO.	PARTS DISCRIPTION	MFG PARTS NO. OR TYPE	MFG	Q'TY	CONNECTOR	NOTES
1	HV1～4	DIAPHRAGM VALVE	FUDDFL−71−6.35−2−UP	FUJIKIN	4	UJR	
2	HV5	SWITCH BELLOW VALVE	FUBFL−71−9.52	FUJIKIN	1	UJR	
3	HV6,7	SWITCH BELLOW VALVE	FUBFL−71−9.52	FUJIKIN	2	UJR	
4	HV8	SWITCH BELLOW VALVE	FUBFL−71−6.35	FUJIKIN	1	UJR	
5	F1,5	FILTER	CEP−TM1L−VR−02P	TOSHIBA CERAMICS	2	VCR	
6	F2～4	FILTER	CEP−TM1S−VR−02P	TOSHIBA CERAMICS	3	VCR	
7	RG1～4	REGULATOR	SQ140−30−2P−FS−MM−FV	VERIFLO	4	VCR	
8	RG5	REGULATOR	HFR900S	VERIFLO	1	VCR	100psi GAUGE
9	RG6	REGULATOR	HFR901S	VERIFLO	1	VCR	100psi GAUGE
10	RG7～9	REGULATOR	R364−02G−0−7.5PSI	KURODA	3	SWAGELOK	
11	V1～6	AIR OPERATE VALVE	FPR−UDDF−71−6.35−2−UP	FUJIKIN	8	UJR	
12	V7～10	AIR OPERATE VALVE	FPR−71−6.35	FUJIKIN	4	UJR	
13	V11	AIR OPERATE VALVE	FPR−UDDF−71−6.35−2−UP	FUJIKIN	1	UJR	
14	CV1	CHECK VALVE	FUCL−715−9.52−0.023−UP	FUJIKIN	1	UJR	
15	CV2	CHECK VALVE	FUCL−715−6.35−0.023−UP	FUJIKIN	1	UJR	
16	CV 3～5,7,9	CHECK VALVE	FUCL−715−6.35−0.023	FUJIKIN	5	UJR	
17	CV 6, 8, 10	CHECK VALVE	FUCL−715−9.52−0.023	FUJIKIN	3	UJR	

Parts List	PO# : A2−	Customer : IBM		Name : METAL−ANNEAL		
[1／3]	No. : B	Charge :	Recognition :	DWG No. : 11923140261 7	Date : '95.08.19.	2／4

TOKYO ELECTRON TOHOKU LIMITED

様式No. SA−16 REV. 0

No.	ITEM NO.	PARTS DISCRIPTION	MFG PARTS NO. OR TYPE	MFG	Q'TY	CONNECTOR	NOTES
18	FM1	FLOW METER	P-500-1LPA-N_2-100ℓ-6V	TOKYO KEISO	1	VCR	
19	FM2	FLOW METER	P-800ST-4UNM-N_2-20ℓ-4V	TOKYO KEISO	1	VCR	
20	FM3	FLOW METER	P-500-1LPA-N_2-300ℓ-6V-L-NO-N	TOKYO KEISO	1	VCR	
21	VE1	AIR OPERATE VALVE	FP-71-6.35-2-BR	FUJIKIN	1	UJR	
22	VE2	AIR OPERATE VALVE	FPR-71-6.35-2-BR	FUJIKIN	1	UJR	
23	SV2	AIR OPERATE VALVE	FPR-71-6.35-2-BR	FUJIKIN	1	UJR	
24	BS1	BARATRON SENSOR	625A13TBE	MKS	1	VCR	
25	VV1	AIR OPERATE VALVE	FPR-71-9.52	FUJIKIN	1	UJR	
26	DV1,2	AIR OPERATE VALVE	FP-71-9.52-2-BR	FUJIKIN	2	UJR	
27	IV1,2	AIR OPERATE VALVE	FPR-71-9.52	FUJIKIN	2	UJR	
28	SV1-3	BLOCK VALVE	FBDV-6.35-2B3-ADY	FUJIKIN	1	UJR	
29	PT1～4	PRESSURE TRANSMITTER	ZT15-1G6/GC96	NAGANO KEIKI	4	VCR	PSI
30	NV1	NEEDLE VALVE	FUBFN-71M-6.35-2-BR	FUJIKIN	1	UJR	
31	NV2	NEEDLE VALVE	FUBFN-71M-6.35-2-BR	FUJIKIN	1	UJR	
32	BV1	BALL VALVE	FUBV-715-9.52	FUJIKIN	1	UJR	
33	BV3,4	BALL VALVE	FUBV-915-6.35	FUJIKIN	2	FINELOK	
34	P.SW1,3	PRESSURE SWITCH	PS10V 760TORR ON	SIGMA MELTEC	2	VCR	

Parts List	PO# : A2-	Customer : IBM		Name : METAL-ANNEAL		
(2/3)	No. : B	Charge :	Recognition :	DWG No. : 11923140261 7	Date : '95.08.19.	3/4

TOKYO ELECTRON TOHOKU LIMITED

様式No. SA-16 REV. 0

No.	ITEM NO.	PARTS DISCRIPTION	MFG PARTS NO. OR TYPE	MFG	Q'TY	CONNECTOR	NOTES
35	P.SW2	PRESSURE SWITCH	PS10V 800TORR ON	SIGMA MELTEC	1	VCR	
36	P.SW4～7	PRESSURE SWITCH	ISE4E	SMC	4	SWAGELOK	
37	MFC1	MASS FLOW CONTROLLER	SEC-4550MC-4CR-UC N_2 50SLM	S-TEC	1	VCR	
38	MFC2	MASS FLOW CONTROLLER	SEC-7350MC-4CR-UC N_2 20SLM	S-TEC	1	VCR	
39	MFC3	MASS FLOW CONTROLLER	SEC-7350MC-4CR-UC 10%H_2/N_2 20SLM	S-TEC	1	VCR	
40	MFC4	MASS FLOW CONTROLLER	SEC-7340MC-4CR-UC H_2 10SLM	S-TEC	1	VCR	
41	MV	CYLINDER VALVE		CKD	1	NW80	APC TYPE
42	EJ1	EJECTER		CKD	1	VCR	
43	OF1	ORIFICE	UJR-F-6.35-1.5-UP	FUJIKIN	1	UJR	
44	OF2	ORIFICE	UJR-F-6.35-0.4-UP	FUJIKIN	1	UJR	
45	OF3	ORIFICE	UJR-F-6.35-0.4-UP	FUJIKIN	1	UJR	
46	OF4	ORIFICE	UJR-F-6.35-0.2	FUJIKIN	1	UJR	
47	BV2	BALL VALVE	FUBV-715-6.35	FUJIKIN	1	UJR	
48	O_2 MONITOR	O_2 MONITOR	TB-IICF	TOKEN	1	VCR	
49	H_2D	H_2 DETECTOR		RIKEN KEIKI	2	—	
50	PS1.2	PIRANI SENSOR	WP-01/GP-2ARY	ULVAC	1	—	
51	MBP/DP	DRY PUMP UNIT	~~AA10~~ A70W	EBARA.CO	1	—	

Parts List [3/3]	PO# : A2～	Customer : IBM	Name : METAL-ANNEAL		
	No. : B	Charge :	Recognition :	DWG No. : 1192314026 17	Date : '95.08.19. 4/4

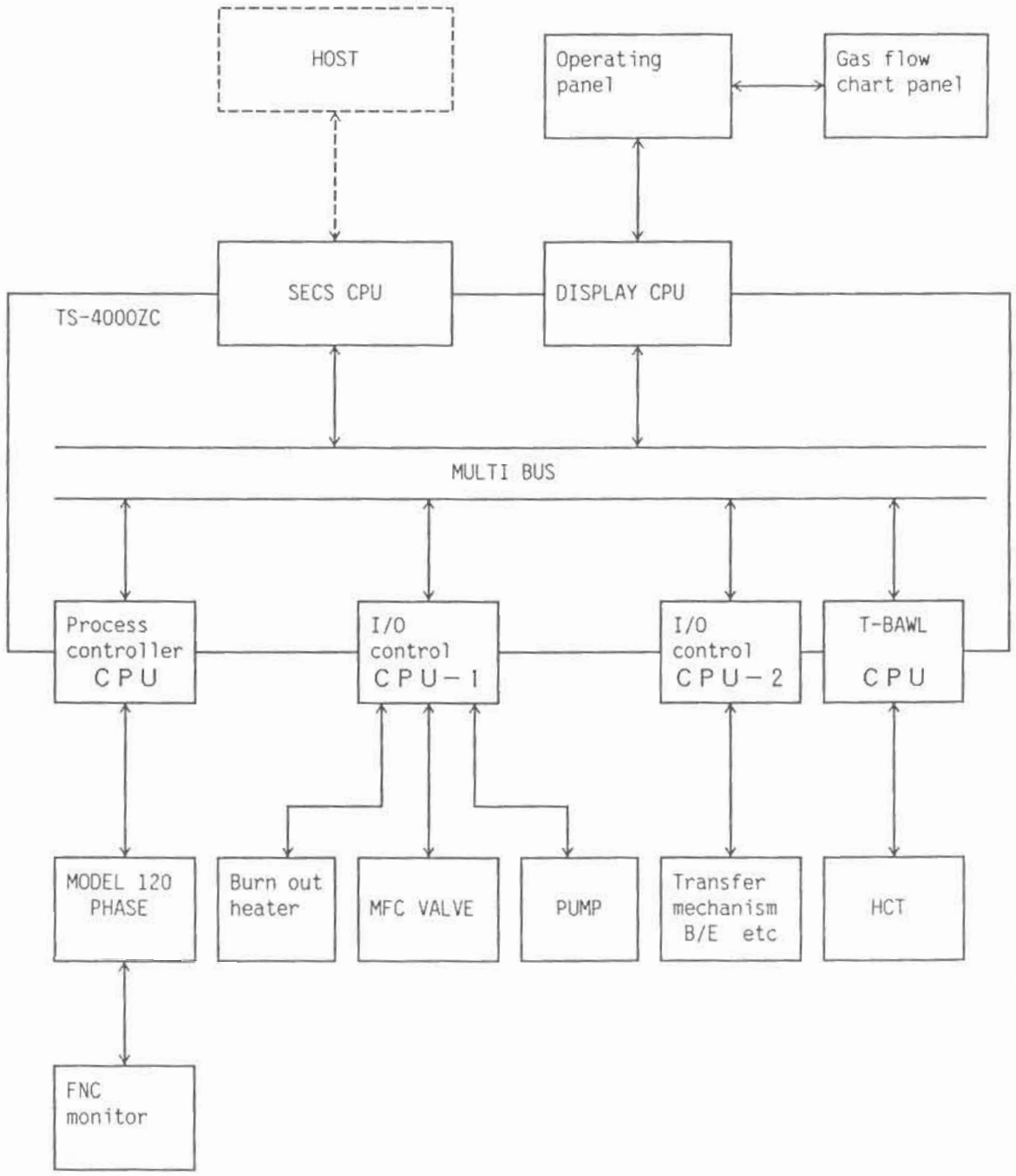
TOKYO ELECTRON TOHOKU LIMITED

様式No. SA-16 REV. 0

CONTROL SYSTEM

SPECIFICATION

1. System configuration diagram



(1) This system is optionally commuicable with your host controller.

(2) The TS-4000Z's standard specifications are listed in the following page.

2. TS 4000Z Standard Specifications

(1)	Temperature setting range	:	0℃ ～ 1399.9℃
(2)	Temperature control accuracy	:	0.1℃
(3)	Temp. rise/fall rate	:	0.0～255℃/min.
(4)	Number of profiles	:	25 (5 tables each comprising 5 temperature profiles.)
(5)	Number of MFC points controlable	:	8 (More points may be added depending on the system specifications.)
(6)	Number of valve control points	:	16 (〃)
(7)	Flow rate setting	:	0 ～ 50000SCCM or 0 ～ 99.9% /100 sec.
(8)	Number of pressure sensor	:	Max 4 point
(9)	Pressure setting range	:	0 ～ 999 TORR
(10)	Plasma Display screen	:	A plasma display of either 10 lines by 40 characters, or 20 lines by 53 characters
(11)	Method of input entry	:	Touch sensor panel Numerical key pad Valve switches (on the gas flow chart)
(12)	Recipes	:	Main recipes Sub-recipes Abort recipes } Max.60 recipes The total number of programmable steps of all the recipes has been increased to 800.
(13)	Number of storable recipe	:	60 at the maximum (total sum of main, sub-, and abort recipes)
(14)	Number of steps	:	100 at the maximum (The total number of 800 steps) (This does not imply that all the 60 storable recipes can have 100 steps. The total number of steps in the recipes vary depending on the way recipes are prepared.)
(15)	Communication with the host controller	:	RS232C, SECS conformed (optional)

※ The above value shows the possible setting range on the controller. Please acknowledge it shall be difference of actually processing.

(16) Special notes

① An external memory connector port provided on the furnace unit operation panel.

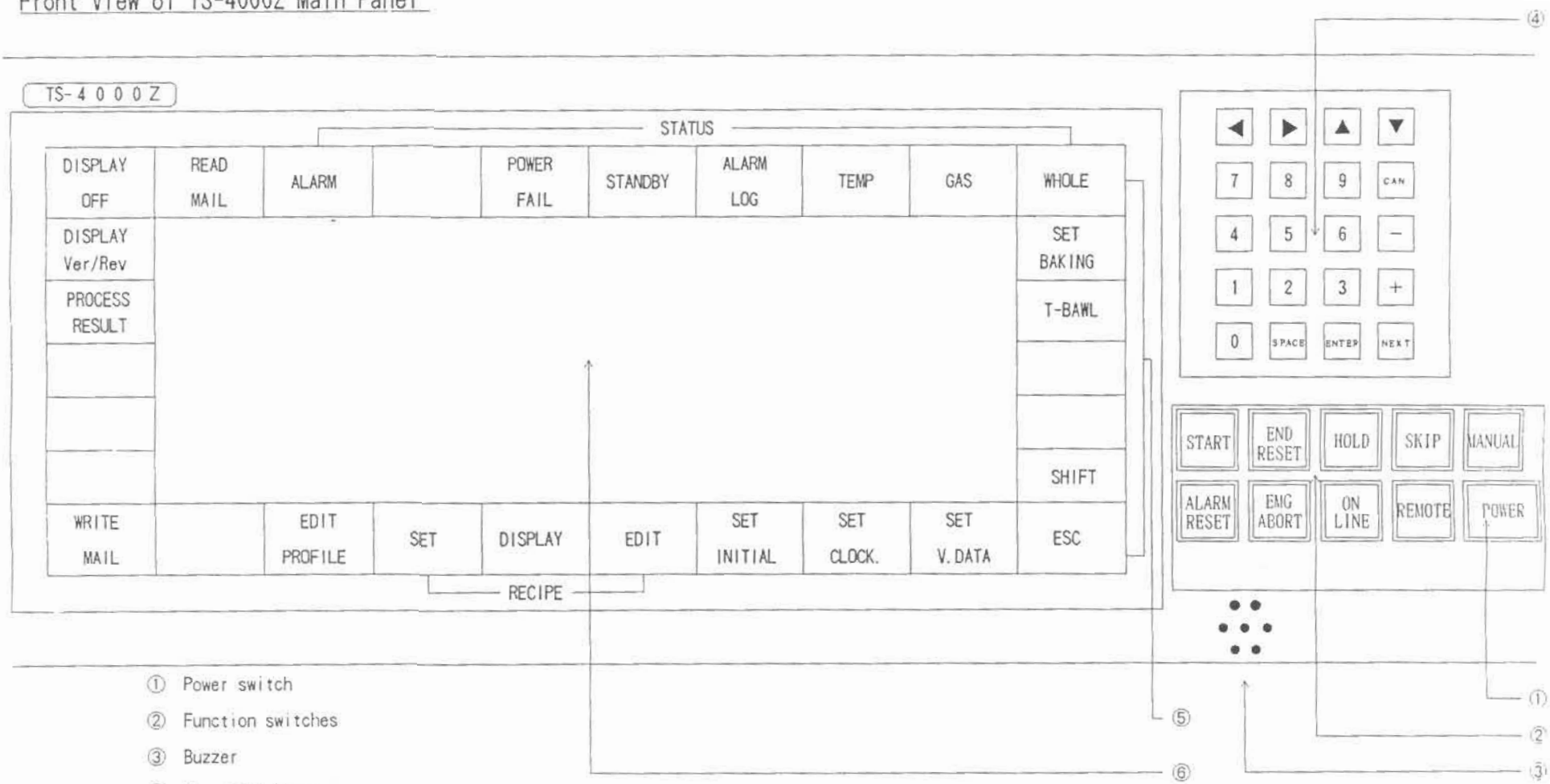
② The connector(D-sub) for communicating with the host computer will be provided on the top of U/Box.

③ The hard interlock should be able to cancel by "LATCH SW".

④ It should be put a cover made of acrylic resin on the PDU changer switch.

⑤ SECS Interface board shall be installed.

Front View of TS-4000Z Main Panel



① Power switch
② Function switches
③ Buzzer
④ Numerical key pad
⑤ Touch panel stationary keys
⑥ Display screen and touch panel keys

3. Temperature control specifications

(1)	Temp. controller	:	Model 120 Phase
(2)	Zone control	:	4 zones independently controlled
(3)	Control method	:	Outer thermocouples Ratio-mixing
(4)	Auto-profiling	:	For each zone, 5 profile tables each having 5 ramping temperature points are provided.
(5)	Thermocouple	:	Type-R-Japanese Industrial Standards 1981
(6)	Temp. control range	:	Room temperature～1399.9℃
(7)	Temp. setting range	:	0℃～1399.9℃
(8)	Temp. control accuracy	:	0.1℃
(9)	Ramping rate setting range	:	0.1～255℃/min
(10)	Long-term stability	:	Within 0.25℃ against the sum of the power supply variance±15%
(11)	Control parameter	:	Programmable P.I.D. (semi-fixed)
(12)	Control output	:	Phase control of 4～20mA within the range of 0～100%
(13)	Alarm input	:	8 dry contact points

4. Power box

(1) External dimensions : 900mmW × 1050mmD × 1950mmH

(2) Items housed in the box
- ① Heater transformer
- ② MC
- ③ Step down transformer
- ④ EMO SW
- ⑤ FNC alarm unit

(3) Special notes
- ① The lever of the main breaker would be exposure the out of box lock type : Pad lock Tagout
- ② The door of the breaker box coulde be locked.

SAFETY

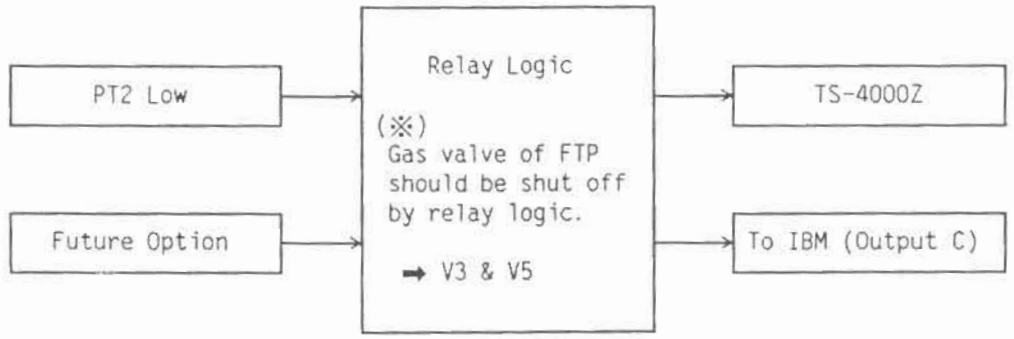
SPECIFICATIONS

1. Unconditional Interlock Table
   Following alarms turn off H_2 valves, etc. at anytime "fault" condition ~~occural~~. occure

Items	Contents	Disposal	Gas Vlv.	G.C.Elec	Output
PT2 Low Pres.	N_2 Pressure < 70 PSIG	Relay Logic	OFF	ON	C
H_2 Leak Alarm	H_2 < 1% (each location)	Relay Logic	OFF	OFF	B
User Input	Exhaust Flow within Range	Relay Logic	OFF	OFF	B

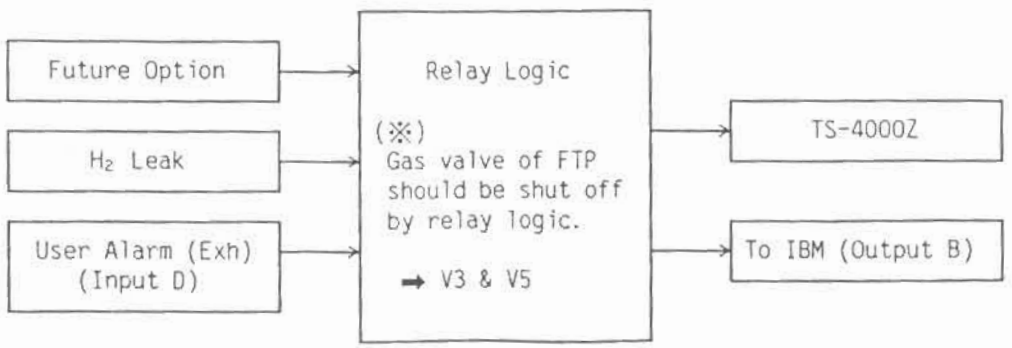
(1) When PT2 low alarm
   ➡ 100% H_2 and 10% H_2 gas valves should be shut off by hard wire (relay logic) and
   ➡ alarm signal should be sent to external output C.
   ➡ alarm condition to latch until operator reset
   This external signal is named "Except H_2 Alarm".

Schematic



(2) When H_2 Leak, User (Exhaust) Alarm
   ➡ 100% H_2 and 10% H_2 gas valves should be shut off by hard wire (relay logic),
   ➡ all electrical power to gas box (MFC's) should be shutoff by hard wire (relay logic) and
   ➡ the alarm signal should be sent to external output B.
   ➡ alarm condition to latch pending operator reset
   This external out signal is named "H_2 Alarm".

Schematic



ALARM I/O TABLE

[1] GAS

No.	Sign	Description	Heater Power Down	TS-4000Z	EXT OUT Relay Logic	OUTPUT Port Sign
1	PT 3, 4	H_2 Pressure High		○		
2	P.SW 6	Air Pressure Low (pneum.)		○		
3a	PT 1	House N_2 Pressure Low		○		
3b	PT 2	House N_2 Pressure Low		○	○	OUTPUT From C
4	Cap Water Low	Cap Flange H_2O Flow Low		○		
5	MANI Water	Man Flange H_2O Flow Low	○	○		
6	Cool Wait	Rapid Cool Down Unit Alarm		○		
7	Pump Alarm	Pump Alarm (Temp., H_2O, N_2 Flow)		○		
8	Pump N_2 Low	N_2 for Pump Flow Low		○		
9	H_2 Gas Leak	H_2 Leak from Gas Detector		○	○	OUTPUT From B
10	External INPUT D	User Alarm (open contact)		○	○	OUTPUT From B
11	FNC Door I/L	FNC Back Door Open		○		
12	Gas Box Door I/L	Gas Box Door Open		○		

[2] FNC

No.	Sign	Description	Heater Power Down	TS-4000Z	EXT OUT Relay Logic	OUTPUT Port Sign
1	CHAMBER OVERHEAT	Temp. >130℃ in heater cab.	○	○		
2	SCR OVERHEAT	Over Heat - SCR Unit	○	○		
3	TRANS	Over Heat - Heater Transformer	○	○		
4	EXCESS	Over Heat - Heater Element	○	○		
5	WATER	Heater Chamber Water Low Flow	○	○		
6	BLOWER	RCU Water Flow, Exhaust Low		○		
7	POWER DOWN	Heater Breaker Power Cut Off	○	○		
8	P-T/C (each)	Each Zone Paddle T/C Alarm		○		
9	C-T/C (each)	Each Zone Control T/C Alarm		○		
10	M-T/C (each)	Each Zone Monitor T/C Alarm		○		
11	A-120	M120 controller Hardware Alarm		○		
12	TMP-I	Initial Data Temp. Alarm		○		
13	TMP-R	Recipe Data Temp. Alarm		○		
14	Water Leak	RCU Unit Water Leak		○		
15	Meg Monitor	Ground Fault Condition		○		
16	S/D Trans Alarm	Over Heat - S/D Transformer		○		

[3] MECHANISM

No.	Sign	Description	Heater Power Down	TS-4000Z	EXT OUT Relay Logic	OUTPUT Port Sign
1	T-BAWL Alarm	Mechanism Related		○		

4 NOTE

Sign	INTER FACE	Name	FTP TOOL INPUT / ACTION
A	OUTPUT	FTP EMO	INPUT : EMO Button (2nd Contacts) ACTION : Tool Power Off (1st Contacts)
B	OUTPUT	H_2 Related Alarm	INPUT : H_2 Gas Leak, User Alarm (by Hardware) ACTION : Gas Valves Shut Off by Hardware Gas Box electrical Shut Off by Hardware
C	OUTPUT	Except H_2 Alarm	INPUT : PT2 (by Hardware) ACTION : Gas Valves Shut Off by Hardware
D	INPUT	User Alarm	INPUT : External from User ACTION : Gas Valves Shut Off by Hardware

(1) User can select the TS-4000Z alarm procedure of FTP by TS-4000Z as follows.

① ABORT

② STEP JUMP IN THE RECIPE

③ HOLD

④ ALARM ONLY

(2) INTER FACE

OUTPUT	FTP Tool (TEL) to Provide Dry Contact - OPEN Contact for Tool Power Off or Alarm Condition - CLOSED Contact for Tool Power On and No Alarm
INPUT	FTP Tool (TEL) to Provide DC 24V and Return (Signa˙) wire - Signal at 24VDC (from IBM) for No Alarm Condition - Signal "OPEN" (from IBM) for Alarm Condition

INTERLOCK TABLE

(1) H_2 Valve (V3,V5) "OPEN" (to flow) conditions

Items	Contents	Disposal	ATM	Vac	100% H_2	10% H_2
Pre. N_2 Purge Post N_2 Purge	Part of V3, V5 "Turn On" V3, V5 "CLOSED", V2 "OPEN" N_2 Flow =20SLM for 16min.	ROM Device	×	×	×	×
Boat Elevator Cap	Cap Closed Signal "ON"	Relay Logic	×	×	×	×
O_2 Conc. < 1%	O_2 Detector 1% signal	Relay Logic	×	×	×	×
FM3 N_2 Flow	FM3 Flow Switch > Setpoint	Relay Logic		×	×	
Burnout Heater	Filament Temperature > 625℃ EV1, EV2 "OPEN"	Relay Logic	×		×	
Dual Overtemp Sensor	Element Temp > 475℃ Element Temp < 625℃	Relay Logic Relay Logic	× ×	× ×	× 	 ×
Pump Status	Pump On and O.K.	Software		×	×	×
PT2	Pressure < 70PSIG	Relay Logic	×	×	×	×

(2) Emergency Disposal

1) Atmosphare 100% H_2 (Va=V5, Vb=V6)

2) Atmosphare 10% H_2 (Va=V3, Vb=V4)

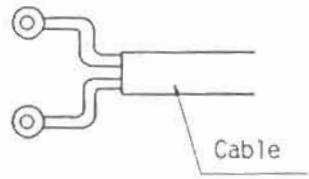
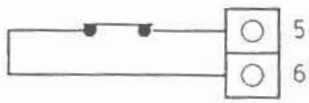
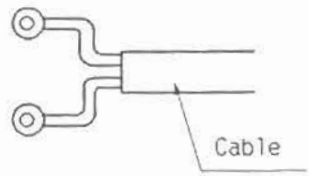
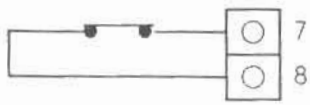
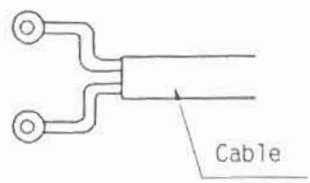
Situation	Disposal Method	Valve Action
Power Fail	Ejector Evacuation	Va, Vb, EV1, EV2 ➡ Close VE1(NO), DV1(NO) ➡ Open VE2(PV) & N_2 press ➡ Open VE2 V11(Closed) ➡ Closed
Exhaust Fail	N_2 Purge	Va, Vb ➡ Close V11 ➡ Open EV1-2(Open) ➡ Open VE1-2, DV1(Closed) ➡ Closed

3) Vacuum 100% H_2 (Va=V5, Vb=V6)

4) Vacuum 10% H_2 (Va=V3, Vb=V6)

Situation	Disposal Method	Valve Action
Power Fail	Ejector Evacuation	Va, Vb, MV ➡ Close VE2(PV) & N_2 press ➡ Open VE2 VE1(NO), DV1(NO) ➡ Open EV1-2(Closed) ➡ Closed PUMP(No Power) ➡ Off
Exhaust Fail	N_2 Purge	Va, Vb, MV ➡ Close V11, DV1, VV1(at 800Torr) ➡ Open EV1-2, VE1-2(Closed) ➡ Closed Pump powered off ➡ Off

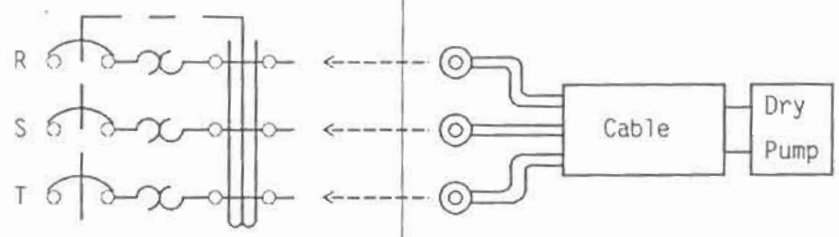
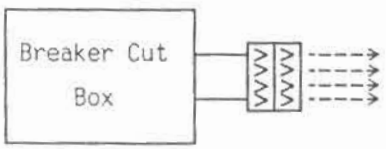
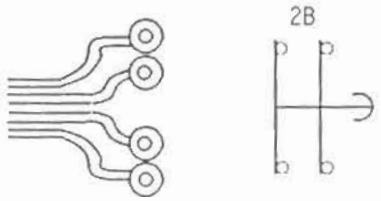
Signal Function (OUTPUT = TEL to IBM / INPUT = IBM to TEL)

FTP System	IBM Facility	directions
1. Inter Face (OUTPUT)		
FTP EMO OUTPUT A Dry Contact Terminal (B: Contact)  FTP disposal - EMO Button (2nd contacts)	M3 : Terminal Lugs  Cable supplied by IBM	TEL ➡ IBM
FTP H_2 Related Alarm OUTPUT B Dry Contact Terminal (B: Contact)  FTP disposal - H_2 Gas Leak - User (Exhaust) Alarm	M3 : Terminal Lugs  Cable supplied by IBM	TEL ➡ IBM
FTP Except H_2 Alarm OUTPUT C Dry Contact Terminal (B: Contact)  FTP disposal - PT2 Alarm	M3 : Terminal Lugs  Cable supplied by IBM	TEL ➡ IBM

Signal Function (OUTPUT = TEL to IBM / INPUT = IBM to TEL)

FTP System	IBM Facility	directions
2. Inter Face (INPUT)		
User Alarm INPUT D DC24V, 10mA (Terminal Block M3) DC24V ——○ 9 To FTP I/L ——○ 10	M3 : Terminal Lugs to Dry Contacts: - Open = Alarm - Closed = No Alarm  User disposal - Tool Exhausts	TEL ← IBM For Exsample EXHAUST Alarm Gas Leak

Dry Pump (To Pump Box) Signal Function

FTP System	IBM Facility	directions
1. Power Line		
Contact  in FTP Power BOX BTM	M5 : Terminal Lugs Cable supplied by IBM	FTP (TEL) → Pump (IBM)
2. EMO SW Line		
 in FTP Power BOX BTM	M4 : Terminal Lugs  Cable supplied by TEL (~~15~~meters-long) 20	FTP (TEL) → Pump (IBM)

B510116

2. Automated Operation

(1) After putting the carrier on the I/O port and pushing the start buttom the wafer handling and process is proceeded automatically according to the recipe in TS-4000Z controller.

3. Special Notes

(1) EMO SW install, as follows
   ① FNC Front and Rear
   ② Loading Area inside FNC
   ③ Pump Box (EMO SW should be provided by EBARA corp.)
   ④ Power Box Front

   (※) Head Type of SW is Mushroom type.

(2) EMO circuit is AC24 Voltage.

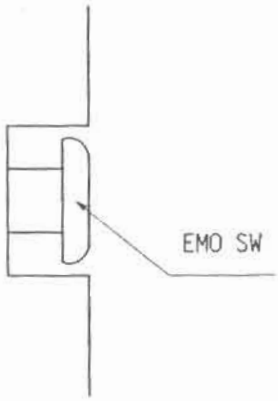
(3) A spot of the interface from customer signal is U/BOX Upper by the terminal. But the interface of Dry pump is Power box.

(4) EMO SW of P/BOX would be installed at the pump. We will be use it.

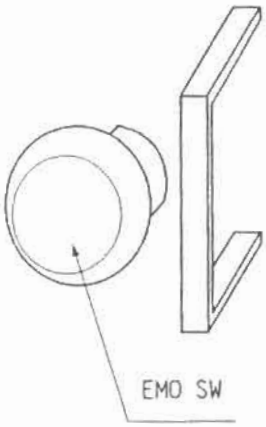
(5) The signal cable of Pump Box should be provided of the length ~~15~~ 20 meters. △2
   - EMO SW line for Pump Box
   - Signal line for Dry Pump

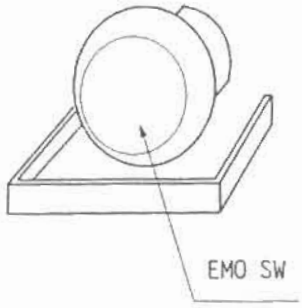
(6) EMO SW should be installed, as follows.

① Panel type



② Side Guard type





QUARTZ JIG

SPECIFICATION

This list is representative. In case of preparing quartz, we will provide customer approval drawing and reliable list.

The quartz ware should be prepared, as follows.

GE 214, TOSHIBA CERAMICS T-1630S,

SHIN-ETSU HX-ELA, or Equivalent

No.	Name of Part	Drawing No.	Quantity	Remarks	
1	Outer Tube (ID ϕ 270)	110530089811	1		
2	Quartz Boat ~~(100SL)~~ (109SL)	110510037213	1		⚠1
3	Pedestal (12fin)	110510053912	1		
4	Cap cover	110530109411	1		
5	T/C Port Cover	110540018211	1		
6	Injector (105 2L)	~~110530089611~~ 110540079511	1	H_2	⚠2
7	Quartz Shutter	110530117911	1		

ADDITIONAL PROVISIONS

1. Nature and Standards of Basic Performance Confirmation Tests (Source Inspection)

(1) Gas supply system leak check:

The N_2 gas sealed in at a pressure of about 2 kg/cm², must be confirmed that the pressure fall rate is less than 0.1% per hour over a period of 12 hours.

(2) Vacuum check : Base presure : less than 0.05torr(at Pirani sensor)
Leak rate : less than 0.5lusec(at room temp.)

(3) Operating tests of various actuators

The MFCs and valves shall be tested for their normal operation.

(4) Alarm input check

All the sensors shall be checked for their normal operation.

(5) Interlocked operation of the automechanism

Confirm that the transfer unit and the recipe make a coordinated movement.

2. Delivery to the installation site

(1) Ceiling height : 3400mmH
(Its height for building the I/O frame is 2900mmH)

(2) Entrance door size : (mmW × mmH × —— mmD)

(3) Floor condition : a) Furnace unit position ( )
U/BOX position ( )
P/BOX system position ( )

b) A step on the floor plane
(exist or not exist:
if exist at what height in mm)

(4) Elevator hight : mmH

(5) Furnace unit will be divided at delivery.
height : Furnace unit ; 2100mm
U/BOX ; mm
F/BOX ; mm
P/BOX ; mm
PW/BOX ; mm

(6) Others
In case of air transport delivery, the height shall be within 2910mm at the maximum including the crate.

3. Extent of the work shared between your company and ours upon the installation of the system on the site:

   (1) Tokyo Electron Ltd shall deliver and install the system.

   (2) The works related to the interfacing of primary source lines (power, water, gas, and exhaust, etc.) as well as the partition and sealing works shall be executed by your company.

4. Warranty

   (1) Period covered:

   The warranty is valid for a period of one full year from the date the equipment is accepted by your company.

   (2) TEL will not warrant a component or material supplied by your company for integration into the equipment, or consequence attributable to such an item.

   (3) TEL will not warrant a specific component or material you have instructed TEL to procure and build into the equipment, or consequence attributable to such an item.

   (4) TEL will not warrant any consequence resulting from the equipment retrofitted at your sole discretion without consulting with TEL.

   (5) The consumable articles such as quartz ware shall be exempted from the warranty.

   (6) For further details of the warranty clauses, please refer to the "Supplementary Conditions to the Estimates and Specifications" prepared by Tokyo Electron Ltd.

   (7) For Acceptance criteria, please consult with us.

(1) FNC ..... furnace

(2) F/U ..... filter unit

(3) E/L ..... elevator

(4) B/T ..... boat transfer

(5) A/D ..... auto-door

(6) A/S ..... auto-shutter

(7) T/C ..... thermocouple

(8) U/BOX ..... utility box

(9) PDU ..... plasma display unit

(10) EMO SW ..... emergency off switch

(11) C/R ..... clean room

(12) U/R ..... utility room

(13) H.C.T. ..... handy communication terminal

(14) RCU ..... rapid cool down unit

(15) P/BOX ..... pump box

4/4/96

Addendum to Customer Approval Specifications for
Alpha-858SCF (Low Temp)
Issued in Oct. 23, 1995 (Rev. #3 dated 4/01/96)

Signature on this specification by IBM employees indicates agreement with only those items covered by the document and related conversations. Further tool changes may be required based on review of detailed design drawings (for example, electrical schematics) and tool hardware both at at the vendor (source acceptance) or after installation in the ASTC.

Ultimately, IBM expects the vendor, at his expense, to make this tool meet all requirements as provided in the IBM process, hardware and safety specification documents that have been submitted to TEL in defining this tool.

William W Hicks 4/4/96
William W. Hicks, IBM

Frank V. Liucci
Frank Liucci, IBM

Jim Hamajima
TEL Electron America Inc.