



(Model EasyDEP-3)

PLASMA IMMERSION ION IMPLANTATION

IMPULSE-100

ULTECH Co., Ltd.

Introduction

(Model EasyDEP-3)

System Picture



Process

- 1) Application :
- 2) Process : P-type doping
- 3) Dose : $5 \times 10^{12} \text{ cm}^{-2} \sim 1 \times 10^{14} \text{ cm}^{-2}$
- 4) Sample size : 4inch wafer
- 5) Product yield : 1 sample/run
- 6) Ultimate pressure : $7.0 \times 10^{-7} \text{ Torr}$

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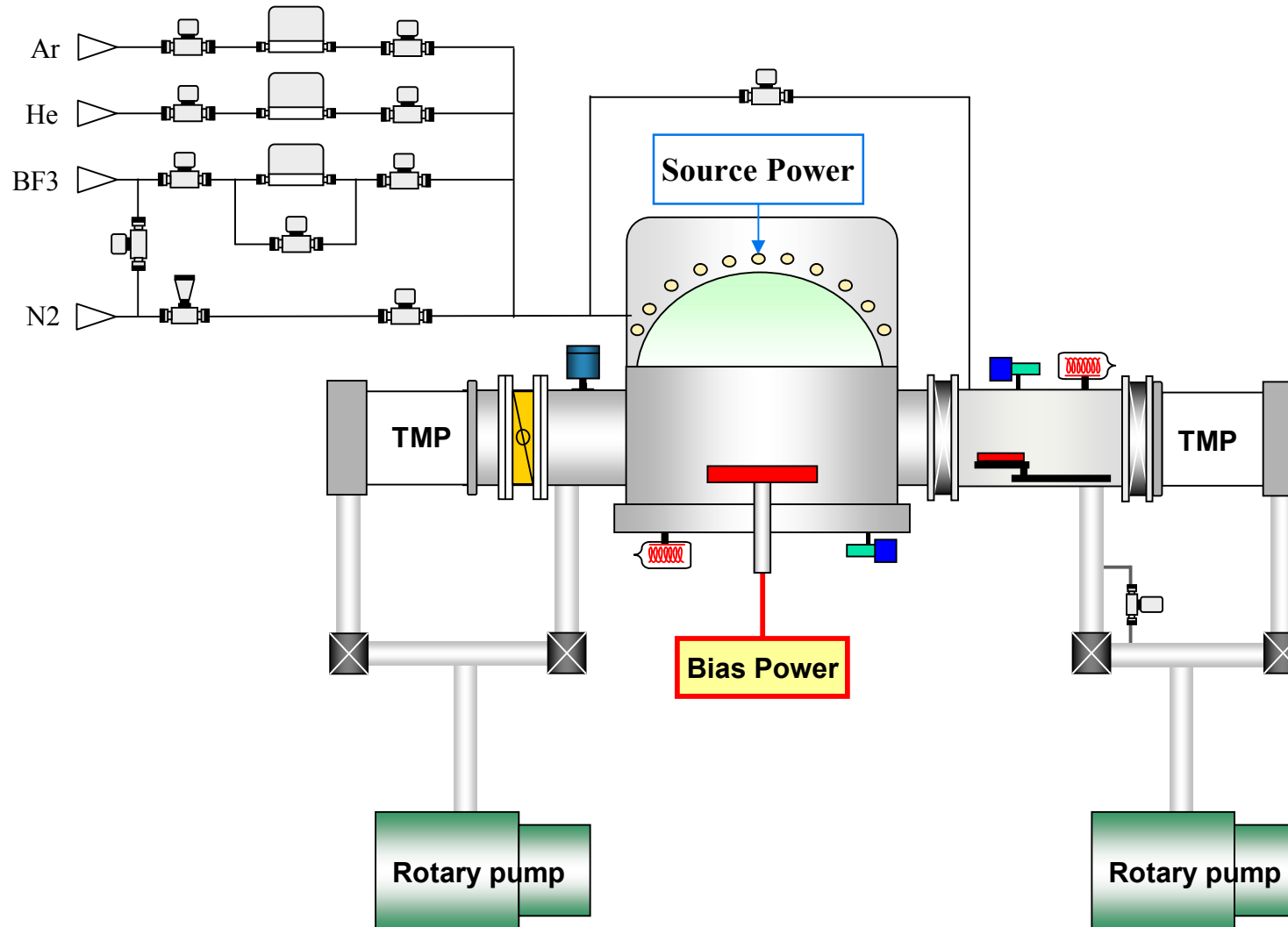
Configuration

(Model EasyDEP-3)

- Substrate size : 4inch wafer
- Load capacity : 1 wafer/run
- Substrate loading/unloading : Automatic loading/unloading by Loadlock
- Dose : $5 \times 10^{12} \text{ cm}^{-2} \sim 1 \times 10^{14} \text{ cm}^{-2}$
- ICP source unit for uniform high density plasma
- Ion accelerating power : - 500V ~ - 5kV
- TMP + Dry pump, for process chamber
- TMP + Rotary pump, for loadlock chamber
- pressure control by throttle valve & automatic pressure controller
- MFC : BF₃, Ar, He
- Manual control (switch panel)

Schematic

(Model: MNP-BAS-DEP-13)





Specifications

(Model EasyDEP-3)

Process Chamber Module

- Process chamber
 - Chamber material : Aluminum
 - Substrate loading/unloading : Automatic loading/unloading by Loadlock
 - View port with shutter
 - Cleaning cover
 - Process gas is injected the gas distributor unit.

- Substrate unit
 - Wafer size & capacity : 4 inch , 1(one) wafer
 - Ion accelerating power : Negative pulsed high voltage power (-500V~-5kV)
 - Pin up & down by air-cylinder
 - Water is cooled by Chiller

- ICP (Inductive Coupled Plasma) source unit
 - Uniform High density plasma Source & Dome structure
 - ICP source RF power : 600W , 13.56MHz & Auto-matching network

Specifications

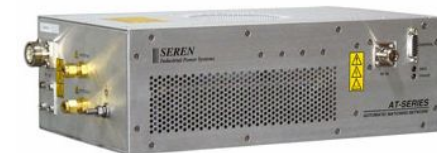
(Model EasyDEP-3)

Source power supply Module

- RF power
 - Frequency/stability : 13.56MHz
 - Output power : 600W in a 50Ω
 - Digital RF power meter
 - Cooling : Forced air cooling
- Matching unit
 - Operation type : Automatic type
 - Cooling : Forced air cooling



< RF Power supply >



< RF matching box & controller >



Specifications

(Model EasyDEP-3)

Bias power supply Module

- Negative Pulsed High Voltage Power Unit
 - Output Voltage : - 500 ~ -5kV
 - Output Current : 2.5 A, average
 - Pulse width : 10 ~ 100 [μ sec]
 - Output Frequency : 0 ~ 1 KHz Max.
 - High Voltage Protection : Over load, Over voltage, Over heat
 - Cooling : Water cooling
 - Electricity (Power) : 380V, 70A, 3phase

Specifications

(Model EasyDEP-3)

Vacuum Module

- Vacuum pump
 - Dry pump : 1,717L/min
 - Turbo pump : 450L/sec
 - Ultimate pressure : 7.0×10^{-7} Torr
- Pressure gauge
 - Low vacuum gauge : Convectron gauge
 - High vacuum gauge : Hot cathode ion gauge
 - Pressure readout & cable kit
- Pressure control
 - APC (Automatic Pressure Controller)
 - Electrical Throttle valve
 - Baratron gauge : Full scale 1Torr
- Vacuum valves & lines
 - Main valve : Pneumatic type gate valve
 - Roughing line valve : Pneumatic type angle valve
 - Foreline valve : Pneumatic type angle valve
 - Soft start pumping line : 1/2inch pneumatic type valve
 - Stainless steel hard line and flexible bellows line



< Dry pump >



< TMP >



< Pressure gauge set >



< APC & Throttle valve >

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Specifications

(Model EasyDEP-3)

Gas Delivery Module

- Used gases & flow control

- Process :

Ar :	MFC
He :	MFC
BF3 :	MFC
- Purge & vent :

N2 :	Metering valve
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< Gas Delivery Module >

- Gas valves & gas line

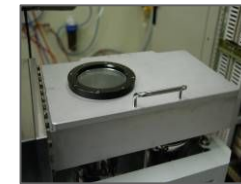
- Pneumatically operated diaphragm valve
- Metering valve for N2 purge & vent
- Tubing of 316L stainless steel, electro-polished
- All gas lines are welded by auto-welding method with VCR fitting
- The gas line is helium-leak tested to 10^{-8} Torr·L/sec.

Specifications

(Model EasyDEP-3)

Loadlock Module

- Loadlock chamber
 - Substrate tray capacity : One(1) wafer
 - Automatic transfer operation
- Vacuum unit
 - Turbo pump : 350 L/sec @N₂
 - Rotary pump : 250L/min
 - Ultimate pressure : 5×10^{-6} Torr
- Pressure gauge
 - High vacuum gauge : Cold cathode ion gauge
 - Low vacuum gauge : Convectron gauge
 - Pressure readout & cable kit
- Vacuum valves & lines
 - Main valve : Pneumatic gate valve
 - Fore line valve : Pneumatic type angle valve
 - Roughing line valve : Pneumatic type angle valve
 - Soft pumping line
 - Auto vent line
 - Stainless steel hard line and flexible bellows line



< Loadlock module >



< Loadlock inside view >



< Rotary pump >



< TMP >

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Specifications

(Model EasyDEP-3)

Control Module

- System control
 - System is controlled manually
- 19" standard rack with electrical contact mechanism
 - Electrical power drive panel (ON/OFF/Emergency switch)
 - System schematic panel
 - Thermal power control panel
 - Thickness controller panel
 - Vacuum gauge controller panel
 - Shutter open/close operation panel
 - MFC controller panel
 - RF power supply controller panel
 - Negative Pulsed High Voltage Power controller panel



< Control rack >



Specifications

(Model EasyDEP-3)

Frame Module

- System frame
 - System frame is mild steel
 - White & Blue colored panels & frame covers
 - 19inch control panel mountable
 - Easily movable casters & leveling foots



Specifications

(Model EasyDEP-3)

Warranty

Manufacturer warrants for a period of one(1) year from the final acceptance.

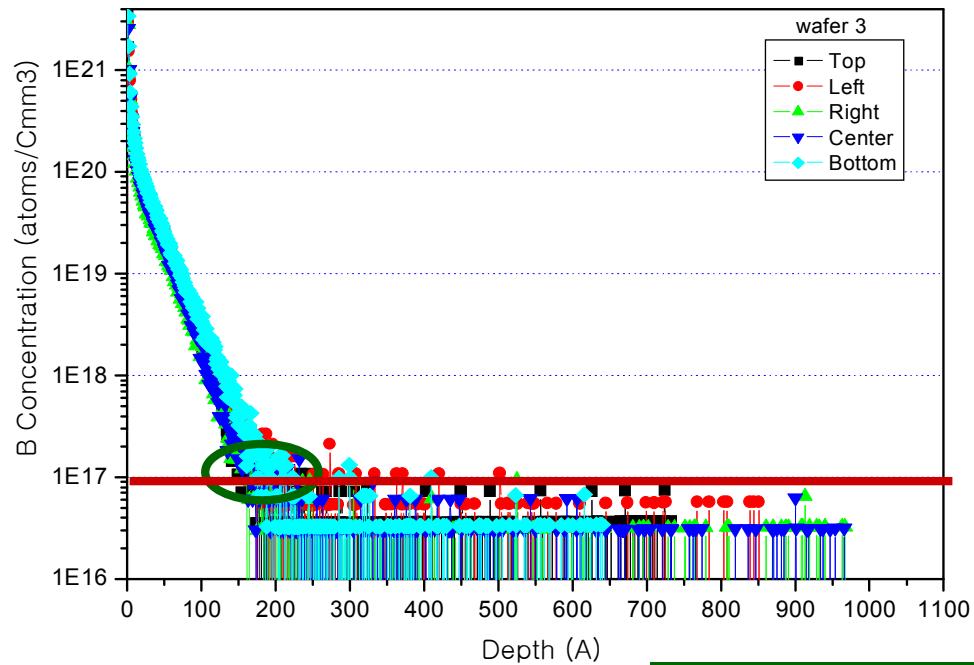
This warranty shall become null and void upon any modification and/or improper service performed to the equipment by the customer. This warranty shall not be extended to those defects caused by improper operation, maintenance and handling by the customer.

All consumable, such as O-rings, CF gasket, thermocouples, view port glasses, gauge sensors and others, are entirely excluded from warranty.

Process Data

(Model EasyDEP-3)

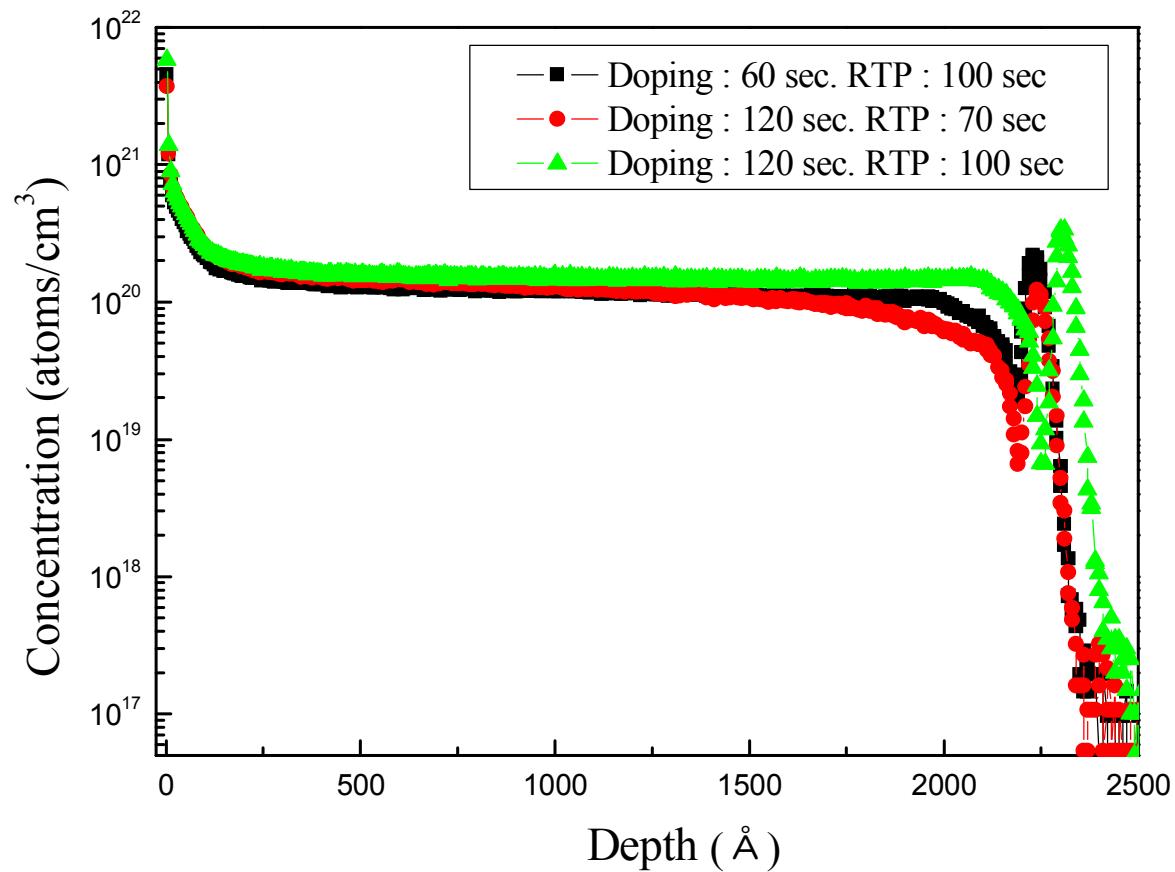
P-type doping test (BF3)



Uniformity : ±0.9 %

ITEM	Top	Right	Left	Center	Bottom
Dose (atoms / cm ²)	1.09 × 10¹⁴	8.14 × 10¹³	1.03 × 10¹⁴	7.89 × 10¹³	1.06 × 10¹⁴

Anneal temperature / time



Both the annealing temperature and annealing time are critical!

Sheet resistance

