

(Model EasyDEP-3)

# *THERMAL EVAPORATOR SYSTEM*

# **EasyDEP-3**

(Ref. #001)



上海载德半导体技术有限公司 SIDE SEMICONDUCTOR TECHNOLOGY LIMITED

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# Introduction

(Model EasyDEP-3)

## System Picture



## Process

- 1) Application : Metallization
- 2) Process : Au, Cr, Ni, Ti, Cu, Al, ...
- 3) Sample size : 4inch wafer
- 5) Product yield : Max. 3 wafers/run@4inch wafer
- 6) Ultimate pressure :  $\leq 7.0 \times 10^{-7}$  Torr

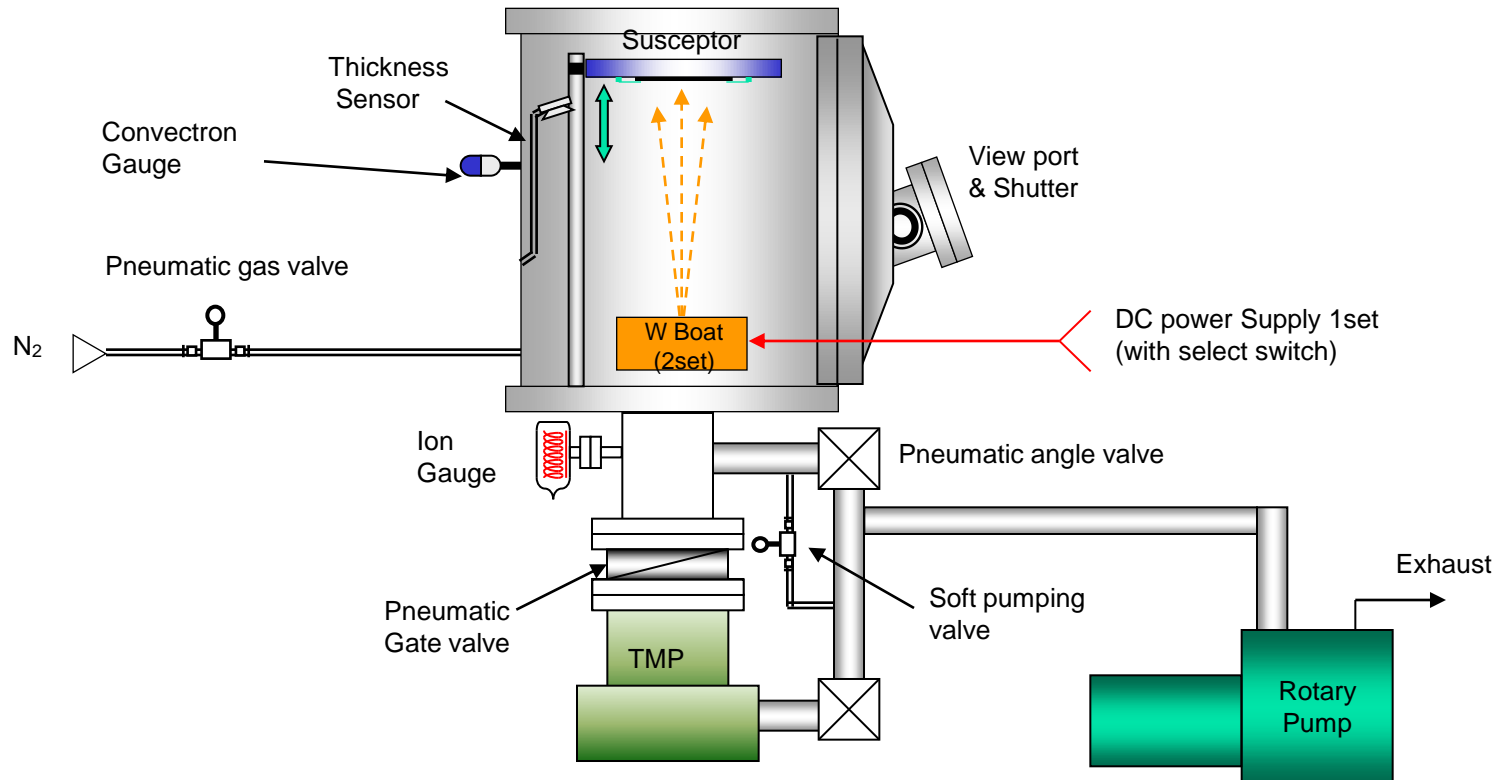
# Configuration

(Model EasyDEP-3)

- Substrate size : 4inch wafer
- Load capacity : Max. 3 wafers/run@4inch
- W boat 2ea
- P/S(5V/300A) 1ea + Select switch(2ch.)
- Thickness controller + Sensor 1ea
- TMP + Rotary pump
- Manual control (switch panel)

# System schematic

(Model EasyDEP-3)



## Process Chamber Module

- Process chamber
  - Manual front access door type SUS chamber
  - View port with shutter
  - Cleaning cover (SUS304)
  - Chamber purge & vent
  - Thermal source shutter open/close by air cylinder
  - Crystal sensor port
  
- Sample stage
  - Sample susceptor : 4inch wafer
  - Product yield : Max.3 wafers/run@4inch



< Process chamber view >

# Specifications

(Model EasyDEP-3)

## Thermal Source Module

- Thermal power supply (1set)
  - Maximum power : 2kW
  - Output voltage : 0 ~ 5V
  - Output current : 0 ~ 300A
  - Current regulation :  $\pm 2\%$  of full scale
- Thermal boat
  - 2 tungsten boat and spirals filaments
  - Separately pneumatically controlled Shutter for thermal boat
  - High current isolation feedthrough



< Thermal power supply >



< Thermal boat view >



< Select switch >

## Thickness Control Module

- Thickness controller
  - 0.0013 Å Thickness Resolution
  - 0.133 Å/sec. Rate Resolution
  - Fundamental frequency : 6 MHz
- Oscillator package
- Thickness sensor
  - Standard sensor
  - Water feedthrough : 2.75"CF flange



< Thickness sensor >

## Vacuum Module

- Vacuum pump
  - Turbo pump : 450 L/sec @N2 (Maker: OSAKA vacuum, TG450F)
  - Rotary pump : 650 L/min (Maker: KODIVAC, GHP550)
  - Ultimate pressure :  $7 \times 10^{-7}$  Torr
- Pressure gauge
  - High vacuum gauge : Hot 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 start pumping line : 1/2inch pneumatic type valve
  - Auto vent line
  - Stainless steel hard line and flexible bellows line



Turbo pump



Rotary pump



Gate valve



## Gas Delivery Module

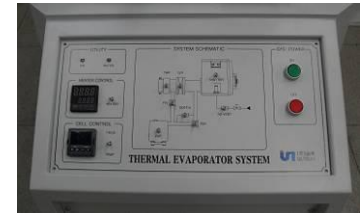
- Used gases & flow control
  - Purge & vent : N2 : Metering valve
- Gas valves & gas line
  - Pneumatically operated diaphragm valve
  - Metering valve for N2 purge & vent
  - Tubing of 316L stainless steel, electro-polished
  - All gas lines are welded by auto-welding method with VCR fitting
  - The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



< Gas Delivery Module >

## Control Module

- System control
  - System is controlled manually
- Main Frame 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
  - Gas valve open/close operation panel
  - Pump on/off operation panel
- Heater temperature control unit
  - Thermocouple : K-type
  - Temperature controller
  - SCR unit : Electrical power control



< Control panel >



< System frame >

## Frame Module

- System frame
  - Aluminum profile made system frame
  - Easily movable casters & leveling foots
  - 19inch control panel mountable



# Specifications

(Model EasyDEP-3)

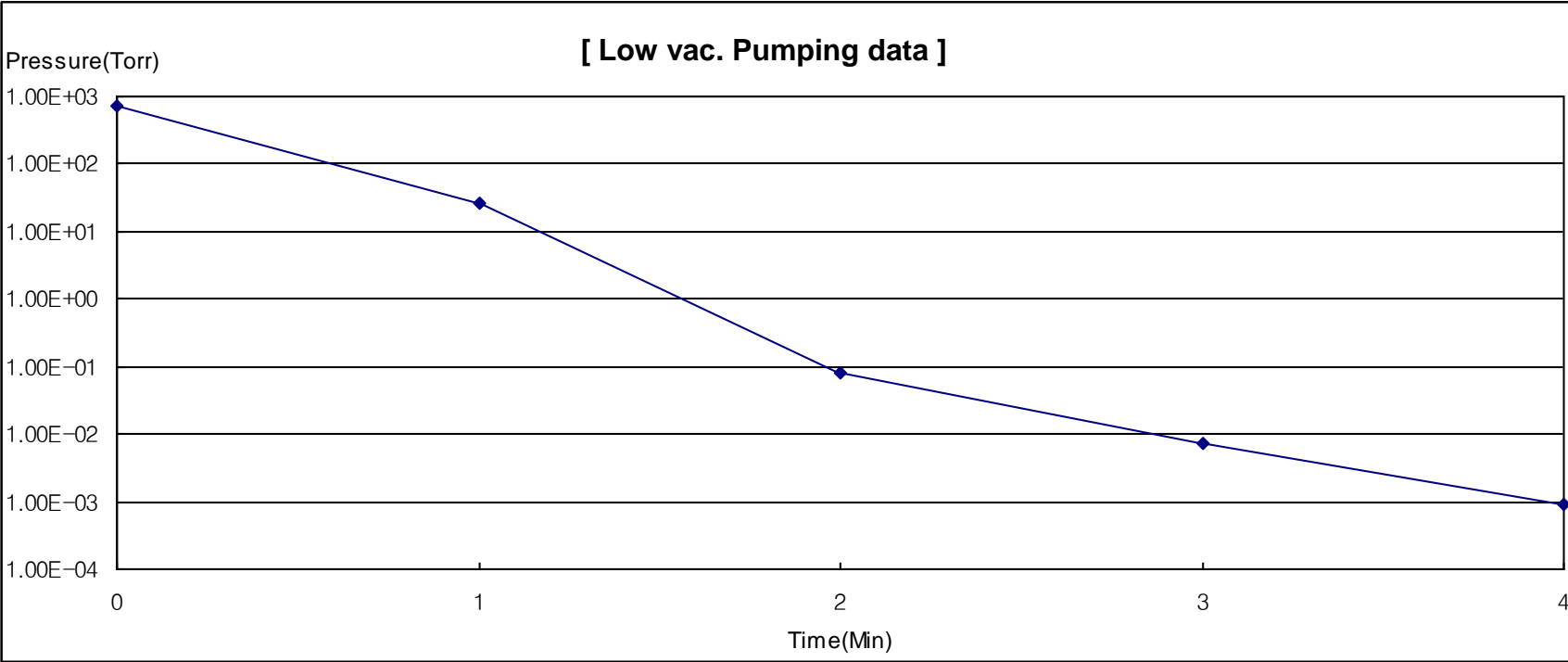
## Warranty

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

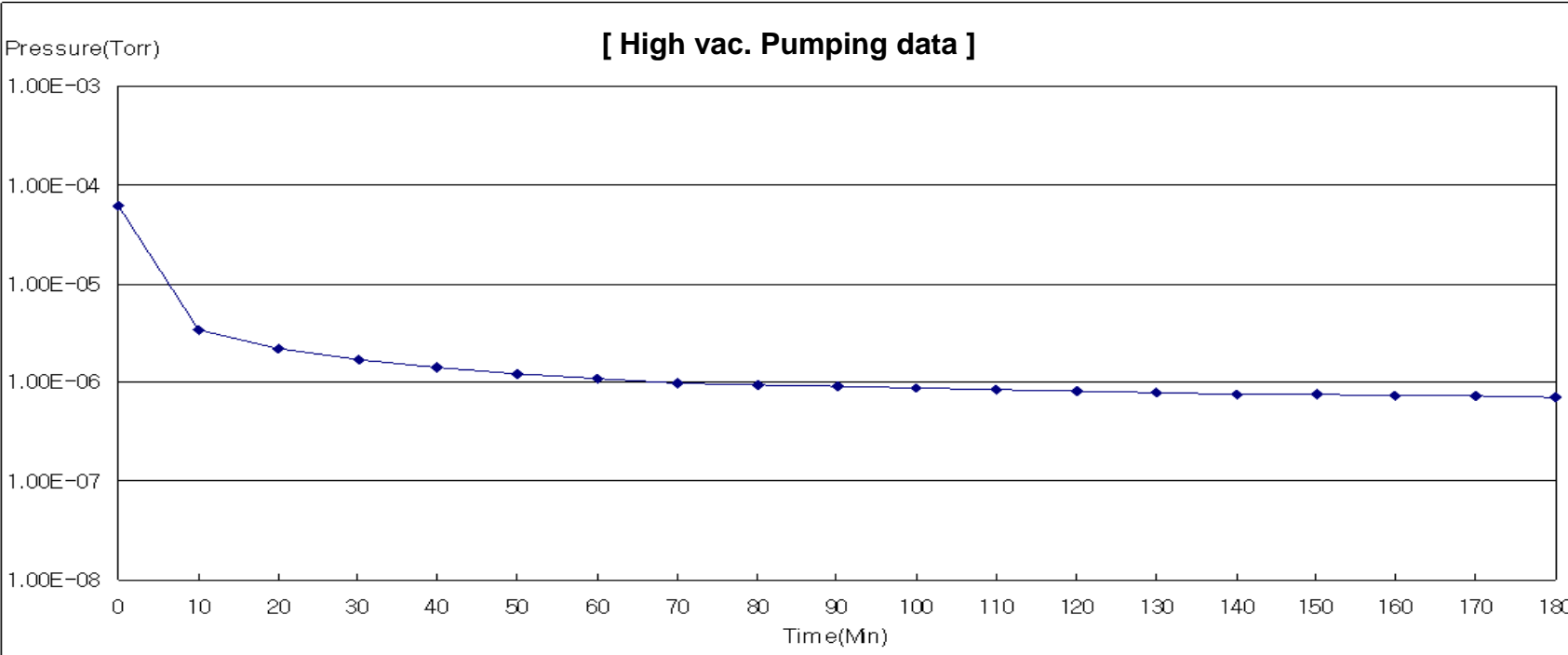
This warranty shall become null and void upon any modification and/or improper service performed to the equipment by the customer. This warranty shall not be extended to those defects caused by improper operation, maintenance and handling by the customer.

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

## Pumping Data



## Pumping Data



## Leak Check data

- Leak rate check data

Condition: Base pressure & Pressure Readout => Over range [C/G] //  $5.5 \times 10^{-7}$  Torr [I/G], Delay 5min after the reactor isolation 후 I/G로 측정

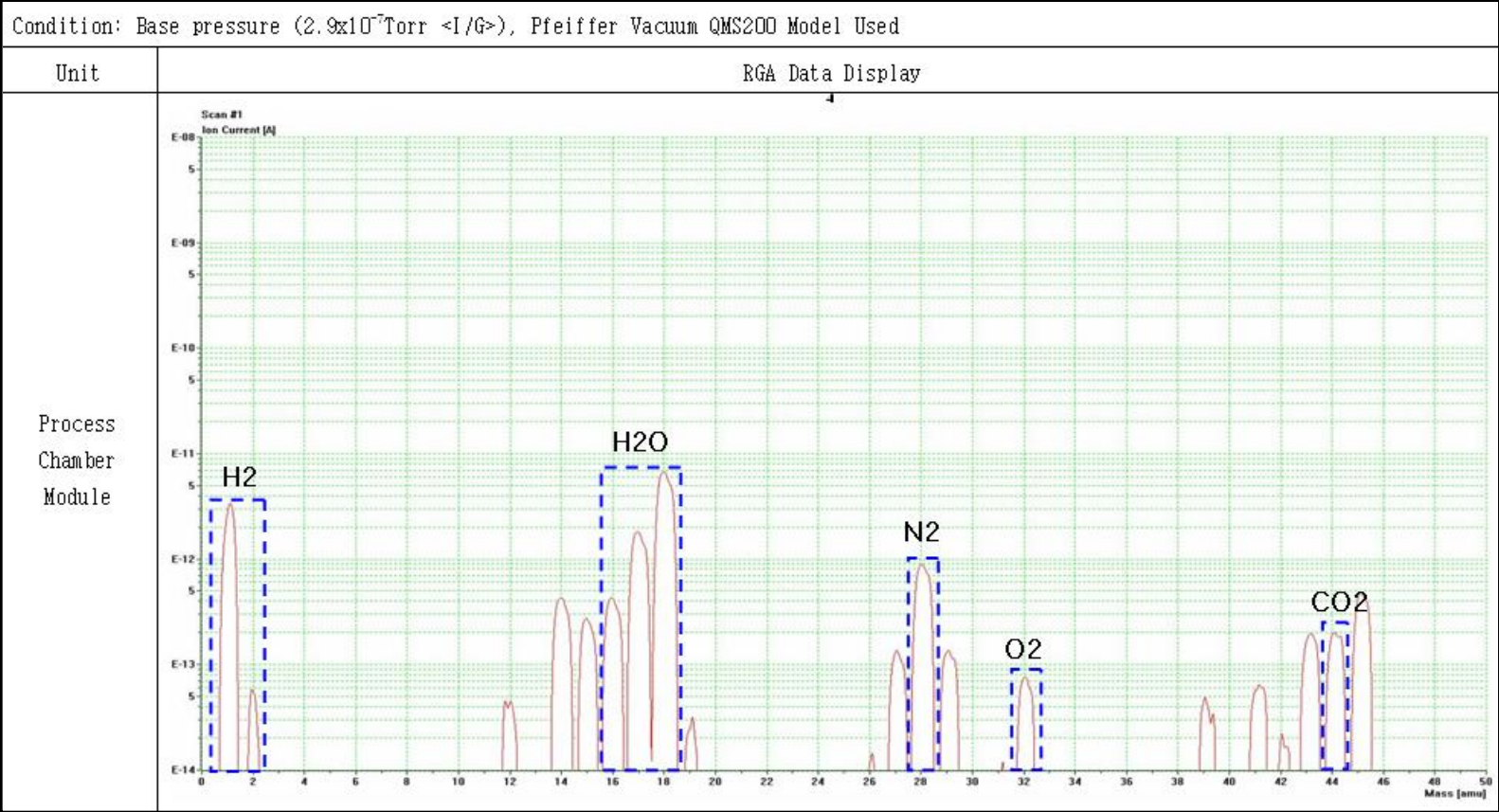
Unit	Leak Rate Spec.	Actual Leak Rate	Leak Check Time (min)	Pressure (mTorr)
Process Chamber	$\leq 3$ mTorr/min	$\cong 0.0168$ mTorr/min	0	8.6E-5
			1	1.1E-4
			2	1.3E-4
			3	1.5E-4
			4	1.6E-4
			5	1.7E-4

- Leak check data (used by He leak detector)

Condition: Base pressure => PM I/G :  $7.0 \times 10^{-7}$  Torr

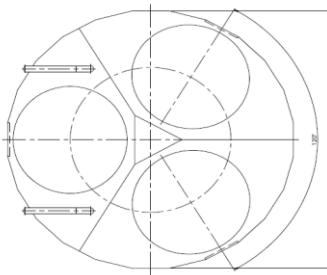
Unit	Base Leak Rate	Test Leak Rate	Result	Remark
Process chamber	$\leq 1.0 \times 10^{-10}$ Torr · L/sec	$5.0 \times 10^{-10}$ Torr · L/sec	O.K.	
Gas line	$\leq 1.0 \times 10^{-10}$ Torr · L/sec	$1.0 \times 10^{-10}$ Torr · L/sec	O.K.	

## Residual Gas Analyzer data



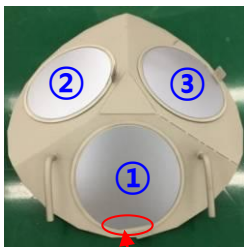


## ► Cu deposition (W-boat)

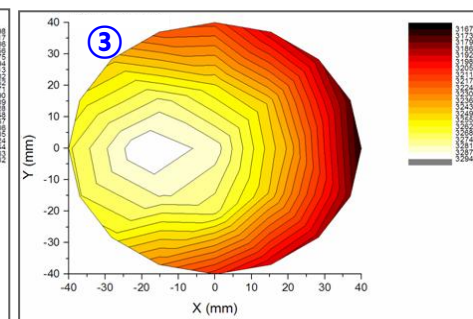
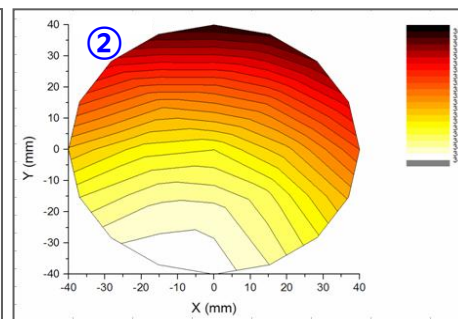
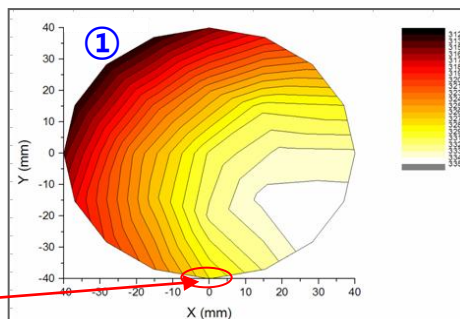


4" Si bare wafer process condition	
<b>Process Condition</b>	
Used Material	Cu (1~2mm pellet type)
Sample To Boat distance	460mm
Base Pressure	1.8E-6 Torr
Used Boat	10mm(W) W Boat
Charge amount to boat	24 EA
<b>Process Detail</b>	
0.62V / 61A	Source Melting START
0.84V / 98A	Depo rate 2.0 Å/sec
Final Thickness	3000 Å

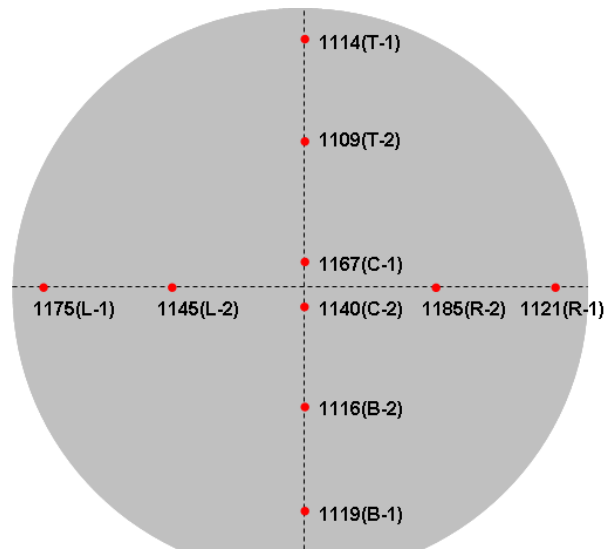
4" Si bare wafer process results			
ITEM	SAMPLE #1	SAMPLE #2	SAMPLE #3
MIN (Å)	3043	3015	3081
MAX (Å)	3264	3213	3204
AVERAGE (Å)	3165	3158	3147
DEVIATION (Å)	220	198	123
UNIFORMITY (±%)	3.49	3.17	1.96



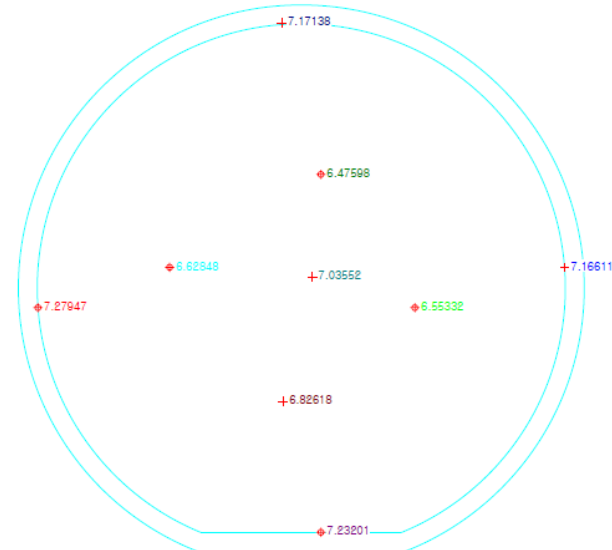
Flat Zone



## ► NiCr Deposition test data (6inch wafer)



- S-T distance : 300mm
- Thickness Uniformity :  $\pm 3.34\%$



- S-T distance : 300mm
- Sheet Resistance Uniformity :  $\pm 2.45\%$