

# Nanometrics 210XP Specifications

## MEASUREMENT SYSTEM

Typical Measurement Time	Visible light	2.5 sec.
	VT	0.3 sec.
	UV light	7 sec.

Optics	Measurement <u>Spot Sizes</u>	<u>VT Configuration</u>	<u>UV &amp; Visible Configuration</u>
	5X objective lens	50 µm spot size	30 µm
	10X objective lens	25 µm spot size	15 µm
	50X objective lens	5 µm spot size	3 µm
	15X UV objective lens	N/A	10 µm (UV only)
	VT spot	1mm x 4 mm ellipse	N/A

Wafer Sizes	75 - 100 mm	Must be specified on order.
	100 - 125 mm	
	125 - 150 mm	
	200 mm	Optional

## INSTALLATION REQUIREMENTS

Power Requirements      Primary power: 117 volts  $\pm$  5%, 50/60Hz

Power Dissipation: 250 watts

Approximate Weight	Measurement system	60 pounds
	CS-9 computer	17 pounds
	CRT and computer	35 pounds
	CRT keyboard	3 pounds
	Optional cleanroom data printer	4 pounds
	Optional color spectra printer	10 pounds
	Optional UV lamp source	10 pounds
	Approximate shipping weight	200 pounds

Note: This specification revision replaces all previous Model 210XP Specifications. Specifications are subject to change without notice.

## 210XP Typical Measurement Specifications\*

Standard Film Types Measured	Spot Size (μm)**	Typical Range (Å)*	Typical Repeatability**	Notes
Silicon Dioxide on Silicon	50, 30 15, 25 5, 3	500-50,000 500-40,000 500-15,000	2Å	
2. Silicon Nitride on Silicon	50, 30 15, 25 5, 3	500-50,000 500-40,000 500-12,000	2Å	
3. Non-absorbing Negative Resist on Silicon	50, 30, 25, 15 5, 3	500-40,000 500-15,000	2Å	
4. Polysilicon on Oxide Polysilicon Measurement	50, 30, 25, 15	Poly: 100-15,000 Oxide: 100-10,000	2Å	1,2,3
	5, 3	Poly: 100-5,000 Oxide: 100-10,000	2Å	1,2,3
5. Negative Resist on Oxide Resist Measurement	50, 30, 25, 15	Resist: 400-30,000 Oxide: 100-10,000	2Å	1,3
	5, 3	Resist: 400-15,000 Oxide: 100-10,000	2Å	1,3
6. Nitride on Oxide Nitride Measurement	50, 30, 25, 15	Nitride: 200-30,000 Oxide: 100-10,000	2Å	1,3,4
	5, 3	Nitride: 200-12,000 Oxide: 100-10,000	2Å	1,3,4
7. Thin Oxide on Silicon	50, 30, 25, 15, 3	150-500	2Å	
8. Thin Nitride on Silicon	50, 30, 25, 15, 3	150-500	2Å	
9. Non-absorbing Polyimide on Silicon	50, 30, 25, 15	500-30,000	2Å	
	5, 3	500-15,000		
10. Non-absorbing Positive Resist on Silicon	50, 30, 25, 15	500-40,000	2Å	
	5, 3	500-15,000		
11. Non-absorbing Positive Resist on Oxide Resist Measurement	50, 30, 25, 15	Resist: 400-40,000 Oxide: 100-10,000	2Å	1,3
	5, 3	Resist: 400-15,000 Oxide: 100-10,000	2Å	1,3
12. Reflectance Mode	50, 30, 25, 15, 3	400-800nm	0.5%	7
13. Thick Films	50, 30	4-25μm	1%	5
14. Red Resist on Silicon	50, 30, 25, 15	4,000-30,000	2Å	6
	5, 3	4,000-15,000	2Å	
21. Oxinitride	3, 15, 30, 60			11
22. Oxinitride on Oxide	3, 15, 30, 60			11

<u>VT Option</u>	<u>Spot*** Size (µm)</u>	<u>Typical* Range Å</u>	<u>Typical** Repeatability</u>	<u>Notes</u>
15. Very Thin Oxide on Silicon	1mm x 4mm	20-450	1Å	
16. Very Thin Nitride on Silicon	1mm x 4mm	20-450	1Å	

<u>UV Option</u>	<u>Spot*** Size (µm)</u>	<u>Typical* Range Å</u>	<u>Typical** Repeatability</u>	<u>Notes</u>
12. Reflectance Mode	10	200-800nm	0.5%	7
17. Very Thin Oxide on Silicon	10	25-175	1Å	
18. Very Thin Nitride on Silicon	10	25-500	1Å	
19. Oxide on Polysilicon on Oxide	10	150-10,000	2Å	8,9
20. Oxide on Aluminum	10	500-20,000	3Å	9

<u>Refractive Index</u>	<u>Spot*** Size (µm)</u>	<u>Typical* Range Å</u>	<u>Typical** Repeatability</u>	<u>Notes</u>
Oxide on Silicon	50, 30, 25, 15	3,000-20,000	0.003	10
Resists on Silicon	50, 30, 25, 15	3,000-20,000	0.003	10
Oxynitride on Silicon (for $N_{REF} < 1.8$ )	50, 30, 25, 15	3,000-20,000		10,11

### Special Film Types Measured

Program  
 252 Programmable optical constants for single layer films and substrates.  
 253 Double layer film measurement with user definable optical constants. This program for dual layer transparent films on Silicon allows the following optical constants to be defined:

Top layer Modified Cauchy coefficients a & b; absorption coefficients  $k_x, k_y, k_z$   
 Bottom layer Modified Cauchy coefficients a & b

254 Single layer film measurement with user definable optical constants. This program for single layer transparent films on Silicon allows the modified Cauchy coefficients a and b to be defined.  
 255 Special film program for substrates (5mm maximum thickness) other than Silicon.

### NOTES

- \* Typical results based on sampling of customer wafers.
- \*\* 1 Sigma based upon measurement of the same spot 15 times in succession.
- \*\*\* Available spot sizes dependent upon system configuration.
- Note 1 Oxide thickness must be entered with an accuracy of  $\pm 100\text{Å}$ . 2Å repeatability applies to top layer measurement. Simultaneous bottom layer measurement has 8Å repeatability.
- Note 2 Assumes undoped Poly and minimal haze. Performance may vary under other conditions.
- Note 3 For the 5X and 10X objectives,  $1,000\text{Å} < \text{total optical thickness of the stack} < 60,000\text{Å}$ . For the 50X objective,  $1,000\text{Å} < \text{total optical thickness of the stack} < 27,000\text{Å}$ . (The total optical thickness of a film with thickness T and refractive index  $N_f$  is  $T \times N_f$ ).
- Note 4 Assumes Nitride with  $N_{ref} = 2.00 \pm 0.04$ . Performance may vary under other conditions.
- Note 5 Specification is for Oxide only; however, this program has proven very useful for other films and substrates whose refractive index has low dispersion as a function of wavelength.
- Note 6 Specification is for EPA914 Resist. Performance with other Resists may vary.
- Note 7 Measurement time at 2.5 seconds.
- Note 8 Polysilicon thickness must exceed 500Å.
- Note 9 Assumes good surface and smoothness; rough surface will degrade the repeatability, and minimum measurable oxide thickness.
- Note 10 When measuring refractive index, film thickness is also simultaneously measured with repeatability of 8Å, 1 Sigma.
- Note 11 Being characterized.