## **Commercial Wafer Specifications**

Here are the specification for Si wafers from one of the worlds top companies, Wacker Siltronic, as they appear in the Internet in Nov. 2000.

- Notice: Concentrations here are in cm<sup>3</sup>. The conversion to parts per .. is simple: The atomic density of Si is 4.96 · 10<sup>22</sup> cm<sup>-3</sup> or about 5 · 10<sup>22</sup> cm<sup>-3</sup>.
   1 ppm thus corresponds to 5 · 10<sup>16</sup> cm<sup>-3</sup>.
  - The lowest concentration given in the table (look for it) is 5 10<sup>10</sup> cm<sup>-3</sup>; it corresponds to 1 ppt or 10<sup>-12</sup>.
- Surface concentrations [S] (given in  $cm^{-2}$ ) are converted to volume concentrations [V] by [S] = [V] /a with a = lattice constant (= 0,5431 nm) or, more precise for single crystals, distance between the crystallographic planes. With a  $\approx$  0,5 nm = 5  $\cdot$  10<sup>-8</sup> cm, we have [V] = 5  $\cdot$  10<sup>16</sup> cm<sup>-3</sup> = 1 ppm corresponds to S = 10<sup>8</sup> cm<sup>-2</sup>.
- Many specifications relate to the "flatness" of the wafers and the perfection of the surface; the abbreviations used are

*LLS* (sometimes also abbreviated LPDs): *Localized Light Scattering Defect*; this relates to a detection method of **sub-µm** size surface imperfections (resulting from bulk microdefects)

**SFQR**: Site flatness quality requirements (??): Definitely a measure of flatness in a region comparable to the size of a single chip

(The rest: Who knows?

Here is a link with precise defininitioons of geometricla parameters: http://www.freiberger.com/english/products/geom\_parameters.php

			0115								
Crystal / Bulk				300mm		200mm		150	mm	125mm	100mm
Growth Technique "}				CZ		CZ		(	Z	CZ	CZ
Orientation				1-0-0		1-0-0		1-0-0	/ 1-1-1	1-0-0/1-1-1	1-0-0 / 1-1-1
Orientation Tolerance		degree		± 0.2		± 0.2		±	0.5	± 0.5	± 0.5
Off Orientation		degree		0		0 - 4		0	- 4	0 - 4	0 - 4
Dopant			Bor	on / Phosphorus	Bor	on / Phosphorus		Boron / P	hosphorus	Boron / Phosphorus	Boron / Phosphorus
Resistivity Target Range	pol prime - Boron	Ohmcm	0.5 - 50			0.5 - 50		0.5 - 50		0.5 - 50	0.5 - 50
	pol prime - Phosphorous	Ohmcm	1.0 - 50			1.0 - 50		1.0 - 50		1.0 - 50	1.0 - 50
	epi substrate - Boron	Ohmcm	0.006 - 50			0.006 - 50		0.006 - 50		0.006 - 50	0.006 - 50
Radial Resistivity Variation	Boron typical 1-0-0 / 1-1-1	%	< 10			< 5		< 5 / < 6		< 6 / < 10	< 8 / < 9
	Phosph. typical 1-0-0 / 1-1-1	%	< 15			< 15		< 12 / < 25		< 12 / < 25	< 15 / < 25
Oxygen Target Range ± Tol.	pol prime - Boron 1-0-0		4.8 - 7.8 x 10 <sup>12</sup> ± 0.5		5 -	5 - 7.8 x 10 <sup>12</sup> ± 0.5		5.8 - 8.9 x 1013 (± 0.6 - 0.8)		5.8 - 8.9 x 1012 (± 0.5 - 1.0)	5.8 - 8.9 x 1012 (± 0.8 - 1.1
	1-1-1	at cm <sup>3</sup>	NA			NA		5.8 - 8.9 x 101 (± 0.7 - 1.0)		6.2 - 8.9 x 1017 (± 0.5 - 1.0)	5.9 - 8.9 x 1012 (± 0.8 - 1.5
	pol prime - Phosph. 1-0-0	ASTM F121-83	4.8 - 7.8 x 10 <sup>17</sup> ± 0.5		6 -	6 - 7.5 x 10" ± 0.5		5.8 - 8.9 x 10 <sup>11</sup> (± 0.6 - 0.8)		5.8 - 8.9 x 1017 (± 0.5 - 1.0)	5.8 - 8.9 x 1012 (± 0.8 - 1.2
	1-1-1		NA			NA		5.8 - 8.9 x 10 <sup>11</sup> (± 0.7 - 1.0)		6.2 - 8.9 x 1017 (± 0.5 - 1.0)	5.9 - 8.9 x 1012 (± 0.8 - 1.
Radial Oxygen Variation	typical	vical %		< 10		< 5		< 6		< 6	< 5 - 10
Bulk Metal Concentration	Fe at cm <sup>3</sup>		≤ 5.0 x 10 <sup>∞</sup>			≤ 5.0 x 10 <sup>∞</sup>		≤ 1.0 x 10"		≤ 1.0 x 10 <sup>11</sup>	≤ 1.0 x 10 <sup>11</sup>
Bulk Carbon Concentration	measured on wafer at cm <sup>3</sup>		≤ 2.0 x 10 <sup>%</sup>			≤ 2.0 x 10 <sup>16</sup>		≤ 2.0 x 10 <sup>™</sup>		< 2.5 x 10 <sup>16</sup>	< 2.5 x 10 <sup>16</sup>
											•
Polished Wafers / Substrates				300mm		200mm		15	Imm	125mm	100mm
Polished Wafers / Substrates	Cu / Cr / Fe / Ni	at cm <sup>2</sup>	1	300mm ≤ 1.0 x 10 <sup>™</sup>		<b>200mm</b>		15 < 5 (	0mm	125mm	100mm < 5.0 x 10%
Polished Wafers / Substrates Surface Metals	Cu / Cr / Fe / Ni	at cm <sup>2</sup>		300mm ≤ 1.0 x 10 <sup>10</sup> < 5.0 x 10 <sup>10</sup>		200mm ≤ 2.5 x 10 <sup>11</sup>		154 ≤ 5.0 ≤ 2.0	0mm 1 x 10 <sup>10</sup>	<b>125mm</b> ≤ 5.0 x 10 <sup>36</sup> < 2.0 x 10 <sup>11</sup>	<b>100mm</b> ≤ 5.0 x 10 <sup>10</sup> < 2.0 x 10 <sup>11</sup>
Polished Wafers / Substrates Surface Metals	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size	at cm <sup>2</sup> at cm <sup>2</sup>	> 0.2	300mm ≤ 1.0 × 10 <sup>10</sup> ≤ 5.0 × 10 <sup>10</sup> > 0.15 > 0.	12 > 0.2	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > 0	0.12	150 ≤ 5.0 ≤ 2.0	0mm × 10 <sup>10</sup> × 10 <sup>11</sup> 0.2 > 0.12	<b>125mm</b> ≤ 5.0 x 10 <sup>38</sup> ≤ 2.0 x 10 <sup>15</sup> > 0.3	100mm ≤ 5.0 x 10 <sup>th</sup> ≤ 2.0 x 10 <sup>th</sup> > 0.3
Polished Wafers / Substrates Surface Metals	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol orime	at cm² at cm² µm # per wafer	> 0.2	300mm ≤ 1.0 x 10 <sup>10</sup> ≤ 5.0 x 10 <sup>10</sup> > 0.16 > 0. < 40-300 < 200	12 > 0.2 -10 <sup>2</sup> < 15-35	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > 0 < 20-120 < 70	<b>0.12</b>	150 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 <	0mm × 10 <sup>10</sup> × 10 <sup>11</sup> 0.2 > 0.12 30 NA	<b>125mm</b> ≤ 5.0 x 10 <sup>36</sup> ≤ 2.0 x 10 <sup>11</sup> > 0.3 < 15	$100mm \le 5.0 \times 10^{10} \le 2.0 \times 10^{11} > 0.3 < 15$
Polished Wafers / Substrates Surface Metals LLSs (Frontside) *)	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol prime Uttrafizat (150 com)	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer	> 0.2 < 30	300mm           ≤ 1.0 x 10°           ≤ 5.0 x 10°           > 0.16         > 0.           < 40.300	12 > 0.2 -10 <sup>3</sup> < 15-35 NA	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > 0 < 20-120 < 70 NA N	0.12 0-600	150 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 <	0mm × 10 <sup>10</sup> × 10 <sup>11</sup> 0.2 > 0.12 30 NA 10 < 150	125mm           ≤ 5.0 x 10 <sup>10</sup> ≤ 2.0 x 10 <sup>11</sup> > 0.3           < 15	100mm ≤ 5.0 × 10 <sup>10</sup> ≤ 2.0 × 10 <sup>11</sup> > 0.3 < 15 NA
Polished Wafers / Substrates Surface Metals LLSs (Frontside) *)	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pot prime UtraFlat (150 mm) monitor	at cm <sup>3</sup> at cm <sup>3</sup> µm # per wafer # per wafer # per wafer	> 0.2 < 30 NA < 30	300mm           ≤ 1.0 x 10°           ≤ 5.0 x 10°           > 0.16         > 0.           < 40-300	12 > 0.2 -10 <sup>2</sup> < 15-35 A NA D0 < 15	200mm ≤ 2.5 x 10 <sup>11</sup> ≤ 1.0 x 10 <sup>11</sup> > 0.16 > 0 < 20-120 < 70 NA N < 20-65 < 13	0.12 0-600 NA 0-700	15/ ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 < NA	0.2 > 0.12 30 NA 10 < 150 VA NA	125mm ≤ 5.0 × 10 <sup>10</sup> ≤ 2.0 × 10 <sup>11</sup> > 0.3 < 15 NA NA	100mm ≤ 5.0 × 10 <sup>∞</sup> ≤ 2.0 × 10 <sup>∞</sup> > 0.3 < 15 NA NA
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ") Diameter Tolerance	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol prime UltraFial (150 mm) monitor	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer mm	> 0.2 < 30 NA < 30	300mm           ≤ 1.0 × 10 <sup>10</sup> ≤ 5.0 × 10 <sup>10</sup> ≤ 5.0 × 10 <sup>10</sup> < 0.16	12 > 0.2 -10 <sup>2</sup> < 15-35 A NA 200 < 15	200mm ≤ 2.5 × 10" ≤ 1.0 × 10" > 0.16 > 0 < 20-120 < 70 NA N < 20-65 < 130 ± 0.2	0.12 0-600 NA 0-700	151 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 < NA I ±	x 10 <sup>10</sup> x 10 <sup>11</sup> 0.2 > 0.12 30 NA 10 < 150 NA 0.2	125mm ≤ 5.0 x 10 <sup>10</sup> ≤ 2.0 x 10 <sup>11</sup> > 0.3 < 15 NA NA ± 0.2	100mm ≤ 5.0 x 10 <sup>∞</sup> ≤ 2.0 x 10 <sup>∞</sup> > 0.3 < 15 NA NA ± 0.2
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ') Diameter Tolerance Ware	Cu / Cr / Fe / Ni A / Zn / K / Na / Ca Size pol prime UltraFlat (150 mm) monitor polished - without layer	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer mm µm	> 0.2 < 30 NA < 30	300mm ≤ 1.0 × 10 <sup>10</sup> < 5.0 × 10 <sup>10</sup> > 0.16 > 0. < 40-300 < 200 NA N/ < 60 < 1 ± 0.2 < 50	12 > 0.2 -10° < 15-35 A NA 00 < 15	200mm ≤ 2.5 x 10 <sup>11</sup> ≤ 1.0 x 10 <sup>11</sup> > 0.16 > 0 < 20-120 < 70 NA N < 20-65 < 131 ± 0.2 < 20	D.12 D-600 NA 0-700	151 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < < 5 < NA 11 ±	x 10 <sup>10</sup> x 10 <sup>10</sup> 0.2         > 0.12           30         NA           10         < 150	125mm ≤ 5.0 × 10 <sup>m</sup> ≥ 2.0 × 10 <sup>m</sup> > 0.3 < 15 NA ± 0.2 < 30	100mm           ≤ 5.0 x 10 <sup>10</sup> ≤ 2.0 x 10 <sup>11</sup> > 0.3           < 15
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ") Diameter Tolerance Warp Wafer / Substrate Thickness	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol prime UltraFlat (150 mm) UltraFlat (150 mm) monitor polished - without layer Standards	at cm <sup>2</sup> µm # per wafer # per wafer mm µm µm	> 0.2 < 30 NA < 30	$\begin{array}{c c} 300mm \\ \leq 1.0 \times 10^{\circ} \\ \leq 5.0 \times 10^{\circ} \\ > 0.16 \\ < 40-300 \\ < 200 \\ NA \\ < 60 \\ < 1 \\ \pm 0.2 \\ < 50 \\ 775 \end{array}$	12 > 0.2 -10° < 15-35 A NA 30 < 15	200mm ≤ 2.5 × 10 <sup>10</sup> > 0.16 > C < 20-120 < 7C NA N < 20-65 < 130 ± 0.2 < 20 725	0.12 D-600 NA 0-700	154 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 < NA I ± ± 375 / 525	0mm × 10 <sup>™</sup> × 10 <sup>™</sup> 0.2 > 0.12 30 NA 10 < 150 VA NA 0.2 30 ( 625 / 675	125mm ≤ 5.0 x 10 <sup>th</sup> ≤ 2.0 x 10 <sup>th</sup> > 0.3 < 15 NA ± 0.2 < 30 375/525 / 625	100mm ≤ 5.0 × 10° ≤ 2.0 × 10° < 0.3 < 15 NA ± 0.2 < 30 300 (375 / 55
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ") Diameter Tolerance Warp Wafer / Substrate Thickness Thickness Thickness	Cu / Cr / Fe / Ni A/ Zn / K / Na / Ca size pol prime UtraFist (150 mm) monitor polished - without layer Standards	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer mm µm µm µm µm	> 0.2 < 30 NA < 30	300mm           ≤ 1.0 x 10°           ≤ 5.0 x 10°           > 0.16           > 0.0           < 40-300	12 > 0.2 -10 <sup>1</sup> < 15-35 Å NA 00 < 15	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>17</sup> < 20.120 < 70 NA N ≤ 20-65 < 130 ± 0.2 < 20 725 ± 15	0.12 D-600 NA 0-700	150 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 < NA 1 ± 375 / 525	x 10 <sup>10</sup> x 10 <sup>11</sup> 0.2         > 0.12           30         NA           10         < 150	125mm ≤ 5.0 × 10 <sup>m</sup> ≥ 2.0 × 10 <sup>m</sup> > 0.3 < 15 NA ⇒ 0.2 < 30 375 / 525 / 625 ± 15	100mm ≤ 5.0 × 10°° ≥ 2.0 × 10° > 0.3 < 15 NA ± 0.2 < 300 / 375 / 525 ± 15
Polished Wafers / Substrates Suface Metals LLSs (Frontside) ") Diameter Tolerance Warp Wafer / Substrate Thickness Wafer / Substrate Thickness GRIR = TM YGI (UmraFaf 4)	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca Site pol prime UltraFlat (150 mm) UltraFlat (150 mm) monitor polished - without layer Standards	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer mm µm µm µm µm µm	> 0.2 < 30 NA < 30	$\begin{array}{c} \textbf{300mm} \\ \leq 1.0 \times 10^{10} \\ \leq 5.0 \times 10^{10} \\ > 0.16 \\ > 0.0 \\ < 40.300 \\ < 200 \\ NA \\ Nu \\ < 60 \\ < 11 \\ \pm 0.2 \\ < 50 \\ \hline 775 \\ \pm 25 \\ < 4 \end{array}$	12 > 0.2 -10 <sup>1</sup> < 15-35 A NA 20 < 15	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > 0 < 20-120 < 70 NA N ± 0.2 < 20 ± 0.2 < 20 725 ± 15 < 3.5	0.12 0-600 NA 0-700	15( ≤ 5.0 ≤ 2.0 > 0.3 > < 15 < < 5 < 375 / 525 ± < 5.0	x 10 <sup>10</sup> x 10 <sup>10</sup> 0.2         > 0.12           30         NA           10         < 150	$\begin{array}{c} 125mm \\ \leq 5.0 \times 10^m \\ \leq 2.0 \times 10^m \\ < 15 \\ NA \\ \pm 0.2 \\ < 30 \\ 315/525/625 \\ \pm 15 \\ < 5.0 \end{array}$	$\begin{array}{c} 100mm \\ \leq 5.0 \times 10^{01} \\ \leq 2.0 \times 10^{11} \\ < 15 \\ NA \\ \pm 0.2 \\ < 30 \\ 300 (375/525) \\ \pm 15 \\ < 5.0 \end{array}$
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ") Diameter Tolerance Warp Wafer / Substrate Thickness Tolerance GBIR = TIR (Sid   UttraFab ") GFIR = TIR (Sid   UttraFab ")	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol prime UltraFial (150 mm) monitor polished - without layer Standards	at cm <sup>2</sup> µm # per wafer # per wafer mm µm µm µm µm µm µm µm	> 0.2 < 30 NA < 30	300mm ≤ 1.0 × 10 <sup>10</sup> ≤ 5.0 × 10 <sup>10</sup> > 0.16 > 0. < 40.300 < 200 NA N. < 600 < 1 ± 0.2 < 50 775 ± 25 < 4 NA	12 > 0.2 -10' < 15-35 M NA 20 < 15	200mm ≤ 2.5 × 10 <sup>10</sup> > 0.16 > 0 < 20-120 < 7C NA N < 20-65 < 13 ± 0.2 < 20 725 ± 15 < 3.5	0.12 0-600 NA 0-700	150 ≤ 5.0 ≤ 2.0 > 0.3 > < 15 << 15 < 0.3  375 / 525 375 / 525 ± 4 5.0 4 2.0	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c} 125mm \\ \leq 5.0 \times 10^{10} \\ \leq 2.0 \times 10^{11} \\ > 0.3 \\ < 15 \\ NA \\ \pm 0.2 \\ < 30 \\ 3375 / 525 / 625 \\ \pm 15 \\ < 5.0 \\ < 2.0 \end{array}$	100mm ≤ 5.0 × 10" ≥ 2.0 × 10" > 0.3 < 15 NA ± 0.2 < 30 300/ 375/ 525 ± 15 < 5.0 < 2.0
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ") Diameter Tolerance Warp Wafer / Substrate Thickness Thickness Tolerance GRIR = TTY (Std. / UttraFald ") Local Flattess" - TIR (Std. / UttraFald ")	Cu / Cr / Fe / Ni A/ Zn / K / Na / Ca Size pol prime UtraFiat (150 mm) monitor polished - without layer Standards	at cm <sup>2</sup> at cm <sup>2</sup> µm ¢ per water ¢ per water mm µm µm µm µm µm µm µm	> 0.2 < 30 NA < 30	300mm ≤ 1.0 x 10 <sup>10</sup> ≤ 5.0 x 10 <sup>10</sup> < 40·300 < 200 NA N/ < 60 < 1 ± 0.2 < 50 775 ± 25 < 4 NA < 0.25	12 > 0.2 -10 <sup>1</sup> < 15-35 ∧ NA 00 < 15	$\begin{array}{c} \textbf{200mm} \\ \textbf{\leq} 2.5 \times 10^{10} \\ \textbf{\leq} 1.0 \times 10^{11} \\ \textbf{>} 0.16 \\ \textbf{>} 20.16 \\ \textbf{>} 20.20 \\ \textbf{<} 20.120 \\ \textbf{<} 70 \\ \textbf{>} 10 \\ \textbf{<} 20.65 \\ \textbf{<} 13 \\ \textbf{<} 0.2 \\ \textbf{<} 20 \\ \textbf{<} 20 \\ \textbf{<} 20 \\ \textbf{<} 20 \\ \textbf{<} 15 \\ \textbf{<} 3.5 \\ \textbf{<} 2.0 \\  ~$	0.12 0-600 NA 0-700	154 ≤ 5.0 ≤ 2.0 > 0.3 ≥ < 15 < < < 5 < < 375 / 52 < 5.0 < 2.0 < 2.0 < 2.0	x 10 <sup>∞</sup> x 10 <sup>∞</sup> x 10 <sup>∞</sup> 30           NA           10           x 10 <sup>∞</sup> 30           NA           0.2           30           / 625 / 675           15           < 2.5	125mm ≤ 5.0 × 10 <sup>10</sup> ≥ 2.0 × 10 <sup>11</sup> > 0.3 < 15 NA ± 0.2 < 30 375 / 525 / 625 ± 15 < 5.0 < 2.0 NA	100mm ≤ 5.0 × 10° ≥ 2.0 × 10° > 0.3 < 15 NA ± 0.2 < 30 300 / 375 / 525 ± 15 < 5.0 < 2.0 NA
Polished Wafers / Substrates Surface Metals LLSs (Frontside) ') Diameter Tolerance Warp Ware / Substrate Thickness Thickness Tolerance GBIR = TIR (Sd   <i>UtraFiab</i> ') GEIR = TIR (Sd   <i>UtraFiab</i> ') Local Flatness ') (Sd   <i>UtraFiab</i> ')	Cu / Cr / Fe / Ni Al / Zn / K / Na / Ca size pol prime UltraFiat (150 mm) monitor polished - without layer Standards SFOR / STIRmax, s.b.f. SFOD / SFPD, s.b.f.	at cm <sup>2</sup> at cm <sup>2</sup> µm ¢ per wafer ¢ per wafer mm µm µm µm µm µm µm µm	> 0.2 < 30 NA < 30	300mm ≤ 1.0 x 10° ≤ 5.0 x 10° > 0.16 > 0, < 40.300 < 200 NA Nv < 60 < 1 ± 0.2 < 550 775 ± 25 < 4 NA Nv < 0.25 < 0.18	12 > 0.2 -10 <sup>1</sup> < 15-35 N NA 200 < 15	≤ 200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > C < 20.16 > C NA N N < 20.65 < 13 ± 0.2 < 20 725 ± 15 < 3.5 < 2.0 < 0.25 < 0.18	0.12 )-600 NA 0-700	150           ≤ 5.0.           ≤ 2.0.           < 15	x 10°       x 10°       0.2     > 0.12       30     NA       10     < 150	125mm           ≤ 5.0 × 10 <sup>n</sup> ≤ 2.0 × 10 <sup>n</sup> > 0.3           < 15	100mm ≤ 5.0 × 10° ≤ 2.0 × 10° > 0.3 < 15 NA 4.0.2 < 30 300 / 335 / 525 ± 15 < 5.0 < 2.0 NA
Polished Wafers / Substrates Surface Metals LLSs (Frontside) *) Diameter Tolerance Warp Warp / Substrate Thickness Thickness Tolerance GEIR = TTY (Std   <i>UtraFila</i> ) * Local Flatters *) (Std   <i>UtraFila</i> )	Cu / Cr / Fo / Ni           Al / Zn / K / Na / Ca           size           pol prime           Ultra/Bal (150 mm)           monitor           polished - without layer           Standards           SFOR / STIRmax, s.b.f.           SFOR / STIRmax, s.b.f.           SPD / SFOP, s.b.f.           SPR / STIRmax, b.r.	at cm <sup>2</sup> at cm <sup>2</sup> µm # per wafer # per wafer mm µm µm µm µm µm µm µm µm µm	> 0.2 < 30 NA < 30	300mm           ≤ 1.0 x 10°           ≤ 5.0 x 10°           ≤ 5.0 x 10°           <0.16	12 > 0.2 10 <sup>0</sup> < 15:35 00 < 15	200mm ≤ 2.5 × 10 <sup>10</sup> ≤ 1.0 × 10 <sup>11</sup> > 0.16 > 0 < 20.120 < 7C NA N × 0.2 < 20 × 2.0 × 2.0 < 2.0 × 2.0 × 2.0 × 2.0 × 2.0 × 0.25 < 0.18 < 0.7	0.12 D-600 NA 0-700	154           ≤ 5.0           ≤ 2.0           ≤ 15           < 5	x 10" × 10" × 10" 0.2 > 0.12 30 NA 10 < 150 VA NA 0.2 30 (625/675 15 < 2.5 < 1.2 < 0.3 < 0.2 < 0.3 < 0.2 < 0.12 < 0.2 < 0.12 < 0.2 < 0	125mm ≤ 5.0 × 10 <sup>10</sup> ≥ 2.0 × 10 <sup>11</sup> > 0.3 < 15 NA ± 0.2 < 30 375 / 525 / 625 ± 15 < 5.0 < 2.0 NA NA NA	100mm ≤ 5.0 × 10° ≤ 2.0 × 10° > 0.3 < 15 NA ± 0.2 < 300/375/555 ± 15 < 5.0 < 2.0 NA NA NA < 1.0