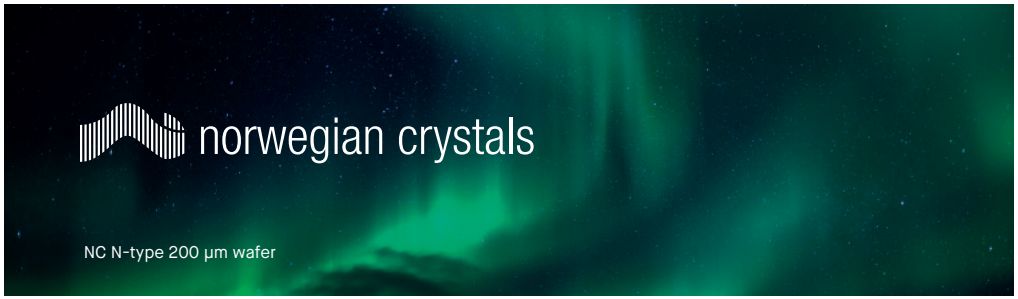


1	Crystal, chemical and material properties				
	Property	Specification	Control frequenzy	Measuring Methodes	References
	Crystal Growing methode	CZ	-	-	-
	Crystal Structure	Mono-crystalline	-	-	-
	Crystal Orientation	<1-0-0> +/- 3°	-	-	-
	Conductivity Type	N-type	Each block	-	-
	Dopant	Phosphorus	-	-	-
	Oxygen Concentration[1]	≤ 9,0 x 10^{17} atoms/cm^3 [≤ 18 ppma]	Each ingot - center value, seed and tail	FTIR	(new) ASTM F121 - 83
	Carbon Concentration[2]	≤ 5,0 x 10^{16} atoms/cm^3 [≤ 1,0 ppma]	Each ingot - center value, seed and tail	FTIR	ASTM F1391-93a

2	Electrical and Chemical properties				
	Property	Specification	Control frequenzy	Measuring Methodes	References
	Specific Resistivity[3]	~~1,0 - 6,0 Ohmcm~~ 1,0~7,0 Ohmcm	Each ingot - center value, seed and tail	4-point probe	ASTM F84
	Bulk Lifetime[4]	≥ 1000 µs	Each ingot - center value, seed and tail	Sinton	Transient
	Defects[5]	No slip lines	Each ingot - seed and tail	Visual	-

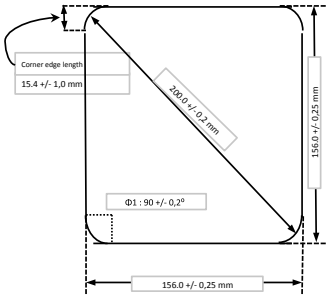
3	Geometry				
	Property	Specification	Control frequenzy	Measuring Methodes	References
	Wafer Shape	Pseudo square	-	-	-
	Wafer Size - flat to flat	~~156~~ 156,15 mm +/- 0,25 mm	Continous	Vision system	-
	Wafer Diameter	~~200~~ 205 mm +/- 0,2 mm	Continous	Vision system	-
	Corner edge length	15,4 mm +/- 1,0 mm	Continous	Vision system	-
	Right Angel [⌀1]	90° +/- 0,2°	Continous	Vision system	-
	Thickness	~~200~~ 150 µm +20/-10 µm	Continous	Vision system	-
	TTV	< 25 µm	Continous	Vision system	-

4	Surface Properties				
	Property	Specification	Control frequenzy	Measuring Methodes	References
	Wafer Slicing	Glycol Based Wafering	-	-	-
	Wafer Cleaning	Water + Detergent	-	-	-
	Wafer Surface	As cut - No stains exp. A) Water stains B) Stains from Si dust	Continous	-	-

5	Apperance				
	Property	Specification	Control frequenzy	Measuring Methodes	References
	Edge Defect	Length ≤ 0,3 mm, Width ≤ 0,3 mm	100% - Stacks of 100 pieces	Visual	-
	Surface Chipping	Length ≤ 0,3 mm, Width ≤ 0,3 mm	Continous	Vision system	-
	Saw Marks	Depth ≤ 15 µm	Continous	Vision system	-
	Crack and Pin Holes	No cracks w/ size > 1 mm. No Pin Holes	Continous	IR - Camera	-

6	Packaging	
	Property	Specification
	Packaging Method	EPS boxes packed in cardboard cartons and wooden pallet
	Information on each EPS box	Product name, thick-ness, ingot lot, quantity, packaging date and inspector
	Information on each pallet	Pallet number
	Statistical quality criteria	AQL 1,0 - Inspection level II. AQL items are thickness, sawmarks, dimension and visual surface defects/Ap-pearance

7 Illustration



8 Explanations

1 Oxygen is measured on 1,5 mm test wafer using FTIR (after Thermal donor removal)
- Measurement is done in center - Average of 5 measurements.
Note: Oxygen conc. is guaranteed to the customer specification at crystal growing inspection using test samples specifically prepared for oxygen analysis. Oxygen is not characterized on prime solar wafers.

2 Carbon is measured on 1,5 mm test wafer using FTIR (after Thermal donor removal)
- Measurement is done in center - Average of 5 measurements.
Note: Carbon conc. is guaranteed to the customer specification at crystal growing inspection using test samples specifically prepared for carbon analysis. Carbon is not characterized on prime solar wafers.

3 Specific resistivity is measured on 1,5 mm test wafer by using 4-point probe after thermal donor removal (single wafer annealing, 750°C, 120 sec cyclus, Ar-atmosphere)
Note: Resistivity is guaranteed to the customer specification at crystal growing inspection using test samples specifically prepared for resistivity analysis. Resistivity is not characterized on prime solar wafers.

4 Bulk lifetime is measured on as cropped (i.e as squared) surface with Sinton BCT-0087 or BCT-210 equipment. Transient method is used for all values.
Specific Minority Carrier Density [cm^{-3}] is measured @ 1,4 x 10^{15} (characteristic for n-type).

5 Slip - lines is manually checked on as grown ingot before slabbing