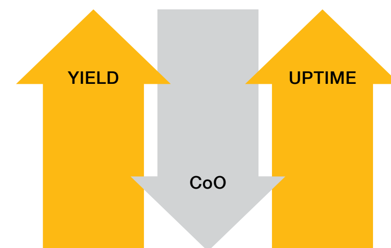
DIAMOND WIRE
MATERIAL TECHNOLOGIES

Diamond Wire

Sapphire and Opto-Electronic Applications

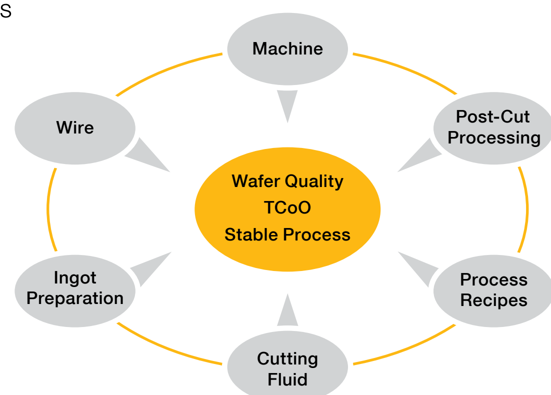
Reduced cost of ownership / Higher throughput

- **Faster cut times**
  - 6 - 8 x faster than slurry, depending upon application
  - Increased capacity without increasing capital expenditures
  - Faster ROI due to reduced initial capital investment
- **Roadmap to lower wafer cost and higher throughput**
  - Lower cost/wafer resulting from reduced TCO
  - Less expensive secondary process costs
  - Re-use of wire
  - Reduced utilities
- **Less plant complexity**
  - No slurry mixing or supply and recovery systems required
  - Reduced running costs such as electricity and cooling water



Quality results

- **Higher quality wafers and wafer topology**
  - Improved TV5
  - Reduced bow and warp
  - Enhanced Ra surface finish reduces secondary processes
  - Improved orientation
- **Holistic approach to cutting**
- **Excellent cutting accuracy**



Maintenance and environment friendly

- **Elimination of slurry management**
- **Fewer wire spool changes**
- **Cleaner and faster process**
- **Water-based** cutting fluids
- **Returnable / Reusable** spool program available

Sapphire Cropping

Wire Diameter – Cropping
310 wire / 350 wire

Key benefits

- Faster feed rates
- Increased yield
- Less plant complexity
- Higher machine productivity
- Reduced secondary processes

Parameters	Cropless Ingot Process
Diamond Wire:	310 µm
Feed Rate:	0.8 mm/min - 2 mm/min
Wire Tension:	35 N
Cutting Plane Roughness:	< 7 µm
Cutting Plane Offset:	< ± 0.07°

*Results subject to change based on process, material, and cutting orientation

Sapphire Wafering

Wire Diameter – Wafering
200 wire / 250 wire

Key benefits

- Faster feed rates
- Increased saw capacity
- Improved TV5
- Reduced bow and warp
- Enhanced RA surface finish
- Improved orientation
- Less plant complexity
- Reduced secondary processes

Flexibility and support

- Diamond wire works on Meyer Burger saws in addition to other saw platforms
- Start-up consumable kits are available
- On-site process and applicaitons engineering support provided

50mm / 2” cutting results*

Parameters	Material: Sapphire / C-Plane	
Diamond Wire:	200 µm	250 µm
Wire Speed:	12 m/sec	12 m/sec
Wire Tension:	32 N	35 N
Cut Time	180 minutes	150 minutes
TV5:	< 15 µm	< 15 µm
Bow:	< 15 µm	< 15 µm
Warp:	< 20 µm	< 20 µm

*Results subject to change based on process, material, and cutting orientation

Sapphire Wafering

100mm / 4" cutting results*

Parameters	Material: Sapphire / C-Plane
Diamond Wire:	250 µm
Wire Speed:	12 m/sec
Wire Tension:	35 N
Cut Time:	510 minutes
TV5:	< 20 µm
Bow:	< 22 µm
Warp:	< 30 µm

*Results subject to change based on process, material, and cutting orientation

150mm / 6" cutting results*

Parameters	Material: Sapphire / C-Plane
Diamond Wire:	250 µm
Wire Speed:	9 m/sec
Wire Tension:	35 N
Cut Time:	1440 minutes
TV5:	< 25 µm
Bow:	< 25 µm
Warp:	< 35 µm

*Results subject to change based on process, material, and cutting orientation

200mm / 8" cutting results*

Parameters	Material: Sapphire / C-Plane
Diamond Wire:	250 µm
Wire Speed:	9 m/sec
Wire Tension:	35 N
Cut Time:	2880 minutes
TV5:	< 30 µm
Bow:	< 40 µm
Warp:	< 50 µm

*Results subject to change based on process, material, and cutting orientation

Note: All images shown using MB Wafertec DS 265 with Diamond Wire

Wire / Consumables / Wire Data

Wire

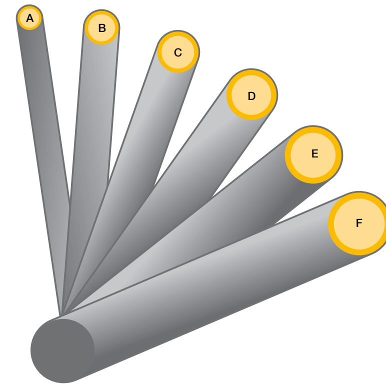
- Extensive process control
  - 100% of diameter tested and compliant
  - Certificate of quality issued on each lot of wire
- Wire supplied on spools ready for direct use when on the saw
  - "Load & Go" (no de-spooling)

Consumables

- Application-specific cutting fluids
  - WaferKool 2010
  - WaferKool 3010 with corrosion inhibitor
- Anti Foam
  - SAG 2001
- Saw cleaners:
  - SawKleen
- Others (in development)

Wire Data

	Nominal wire size (µm)	Kerf size (µm)	Application
A	140	150	Si Wafering
B	**200**	**210**	**Sapphire Wafering**
C	**250**	**270**	**Sapphire Wafering**
D	**310**	**340**	**Sapphire Cropping**
E	**350**	**385**	**Sapphire Cropping**
F	420	---	Si Bricking



Wire Specifications

	140 µm	200 µm	250 µm	310 µm	350 µm	420 µm
Diameter	143 - 149	199 - 206	247 - 255	310 - 322	360 - 370	405 - 420
Pitch (mm)*	0.6 - 1.2	0.6	0.6	0.6	0.6	0.6
Spool Wire Tension at Winding*	9 N	9 N	25 N	9 N	15 N	35 N
Mass/length (g/m)	0.122 - 0.132	0.221 - 0.232	0.338 - 0.351	0.214 - 0.225	0.669- 0.757	0.902 - 0.982
Wire Break Strength (N)	> 40	> 57	> 75	> 102	> 146	> 222
	* dependent on spool type and application					

We reserve the right to make changes reflecting technical progress (02-2012)