Innovative Laser Cutting Process, enabling novel proceedings in product design and production flow for industrial glass
INNOLAS GROUP: Milestones ...

Foundation of InnoLas

First Laser Marking System
First Laser System for R&D purposes

First Sales into cSi Solar
First Sales into Thinfilm Solar

First 300mm Wafer marking System

Foundation of IL Holding

Processes for cSi and Innovative CIGS sold
Service Hubs in Malaysia, Philippines and Korea opened

Foundation of InnoLas Inc., USA
Sales SILAS to Oerlikon Solar, Switzerland

Foundation of IL Systems GmbH,
IL Semiconductor GmbH,
IL Laser GmbH,
IL SEA Pte Ltd.

First Sales of CIGS Scribing System

InnoLas Systems GmbH
HQ, Sales & Service

InnoLas Inc.
USA
Sales & Service

InnoLas / JR Korea
Service

InnoLas SEA Pet. Ltd.
Singapore
Sales & Service SEA

InnoLas Systems China
Shanghai
Sales & Service China
(in course of foundation)

INNOLAS SYSTEMS: International

Subsidiary / Service Hub
Representation Office
**PV**
- Crystalline Silicon: cSi
- ThinFilm: CIGS / CdTe /aSi

**PCB**
- Al₂O₃ PCB Cutting / Scribing
- AIN PCB Cutting / Scribing

**GLASS**
- Display & Gen. Glass Appl.
- Chem. Strengthened Glass

**LED**
- Sapphire Wafer Dicing
- DBR / Metal Removal

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**GLASS: Applications in Glass Processing**

**Separation of Strengthened Glass**
- Cover glasses of mobile phone’s
- Cover glasses of tablet PC’s
- Camera protection glasses

**Cutting of Glass Substrates**
- Display technologies
- Coated substrates (e.g. ITO, AR)
- Sandwich applications
- Cutting at an angle
- Cutting “thin” substrates

**Drilling of Through Holes in Glass Substrates**
- Mobile Devices (camera aperture, home button, loudspeaker, etc.)
- Electronic components
- Tablet PC’s and computers
InnoLas Glass Cutting

- A specially tuned laser is used to perforate brittle material using a non-linear process, leading to direct material dissociation.
- So-called “Filaments” extend through the glass.

InnoLas Filament Cutting Edge Roughness Profile

- “as cut” (not post processed) edge roughness < 2μm
- “as cut” bending strength up to 300MPa
- Less post processing required
InnoLas Glass Cutting Performance

- **Material**
  - Glass (Float, Fusion, Borosilicate, Aluminosilicate)
  - Sapphire & SiC, Si

- **Cutting shapes**
  - Outline contours
  - Cut-outs: Circles or slots
  - Closed-form and radius form factors

InnoLas Glass Cutting - Customer Benefits

- Low CoO (requires no fluids for processing or post processing, no consumables)
- No micro cracks
- Almost no debris → clean room compatible processing
- Cutting of Multi Layer Stacks
- Angled cuts possible
- Cutting of Pre-Coated substrates
- Yield >99%
- Cutting of glass from ≤ 50μm up to 4mm thickness
- Fast cutting speeds

InnoLas Glass Cutting of Outline Contours

- High speed cutting of outline contours, at cutting speeds of up to 1m/s)
- Additional separation cuts necessary when cutting complex geometries
- Manual or automatic separation process
InnoLas Glass Cutting of Inner Contours (Holes, Slots etc.)

- Cutting of Inner Contours e.g. holes with no or very little chipping

InnoLas Glass Cutting changes production flow

- Chemically strengthened glass → ion exchange prior to glass shipment/ less breakage
- High cutting speeds → maximized throughput
- High bend strengths after cutting → increased resistivity for downstream handling steps/ increased yield
- Excellent cutting edge quality → less or even no post processing required
- Almost no debris → enabling HPD and other clean room applications
- Free form cutting possible → less process steps required for final product (e.g. smart phone)
- Stack cutting possible → assembled devices can be cut
- Cutting of printed glasses → less process steps for cover glasses

InnoLas Glass Cutting changes production design

- Free form cutting possible → any kind of design feature for speaker, home button, microphone...
- Cutting of sapphire → maximized throughput (currently Laser Full Body Cut)
- Cutting at an angle → customized features (speaker slots, …)
**InnoLas Machine Solution**

- ILS 500X Platform (R&D/ up to GEN 3 size)
- ILS Flexi-Cut (Production/ up to GEN 4.5 size)
- IMPALA Platform (production on GEN 6 size and greater)
- Machine Uptimes >95%
- All InnoLas machines are 24/7 proven and fully automated

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**InnoLas Systems GmbH**

*Thank-You for Your Attention*