Division Light & Production: global player with competence and solutions in photonic-based applications for smart manufacturing industries

<table>
<thead>
<tr>
<th>Laser Processing</th>
<th>Metrology</th>
<th>Automation</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Efficient, precise and safe 3D laser machines for perforation, pitching, cutting and welding of plastics, metals and diverse sensitive materials</td>
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<tr>
<td>- Best in class laser robot trimming system for body-in-white integration</td>
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<td>- Integrated solutions with handling and process control to support customer production needs</td>
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<tr>
<td>- Complete range of high-precision metrology instruments, machines and technologies</td>
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<td>- Optical, pneumatic, and tactile measurement and inspection processes</td>
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<tr>
<td>- Fully integrated Metrology cells for automated 100% inspection</td>
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<tr>
<td>- Deep engineering competence in automated assembly equipment</td>
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<td>- Experienced with various metal joining systems and material handling systems and the integration of both</td>
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</table>
Our competence: intelligent and efficient integration of multiple technologies with deep application and process know-how enabling smart manufacturing

<table>
<thead>
<tr>
<th>Purchased components</th>
<th>Integration</th>
<th>Product offer</th>
</tr>
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<tbody>
<tr>
<td>Laser source / diode</td>
<td>Sensor integration</td>
<td>traditional: Stand-alone machines</td>
</tr>
<tr>
<td>Laser head</td>
<td>Software algorithms</td>
<td>increasingly: Integrated solutions</td>
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<tr>
<td>Robotics</td>
<td>Innovative beam guidance (cooled mirrors)</td>
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Our core contribution
We are addressing a strong market

Smart manufacturing market

- Smart manufacturing comprises solutions to increase the intelligence and flexibility of manufacturing processes:
  - **Components**: machine vision, controls, 3D printing, collaborative robotics…
  - Software, data management: SCADA, ERP, MES, PLM…
- It indicates the demand for photonic technologies in manufacturing
- Expected to grow to ~400bn USD in 2025 at 10% CAGR

Target industries

- **Automotive** clearly largest segment with >20% of total
- Share of automotive industry expected to remain stable
- We have just started to address the next largest segment **Aerospace**
- Oil & gas: Process industry, not discrete manufacturing
- Electronics already addressed by L&O
- **Industrial Equipment** offers room to grow

Source: Grand view research, Agileon analysis

Smart manufacturing market 2019 ≈ 220bn USD
Even the currently challenged automotive industry still offers growth opportunities through its ongoing transformation.

**Declining invest**
- Conventional powertrain
- Chassis structure

**Constant levels despite weak market**
- Body and Exterior
- Interior

**Increased invest**
- Electrified drive / battery technology
- Autonomous / automated driving

**Areas affected:**
- Conventional powertrain
- Chassis structure

**Rationale:**
- **Declining invest**
  - Mature technology, not a key differentiator
  - Strong synergies through platforms and modularization
  - Platform sharing across brands and even across corporations

- **Constant levels despite weak market**
  - Brand image requires regular new model releases
  - Reduced technology innovation compensated with design
  - New design as differentiator

- **Increased invest**
  - Key brand differentiator
  - Technology competition
  - However, already efforts to build and share platforms or collaborate with competitors for speed and scale

**Historic portfolio of metrology**
- **Sustain**

**Focus area for laser and A/I**
- **Grow and develop**

**Potential for new applications**
- e.g. in metrology
- **Build up**

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As a consequence we are transforming our division …

We develop & grow with our **Automotive** customers …

We changed to an **integrated organization** with more combined offerings and **higher integrated solution capabilities**

… and transfer **solutions** to **new industries** and markets

- Aviation
- Electronics
- Healthcare
- Industrial machinery
- Packaging
- White goods
Example extended automotive offer: 
**metrology** is growing outside combustion engine

### Target applications

<table>
<thead>
<tr>
<th>Combustion engine</th>
<th>Applications besides engines</th>
<th>Applications in e-mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard business driving the actual budget</td>
<td>New workpieces like breaks, bearings, turbine blades, need the same measuring accuracies</td>
<td>Transfer of know-how and measuring systems to support the needs of electrical engines</td>
</tr>
</tbody>
</table>

#### Legacy work pieces like:
- Conrods
- Crankshafts / camshafts
- Turbochargers

#### New work pieces like:
- Brakes
- Bearings
- Turbine blades
  - Need the same measuring accuracies

For example:
- Hollow shift
  - Transfer of know-how and systems
  - to support the needs of new technologies
Example extended automotive offer: **laser processing** benefits from growing individualization trend in car interior and exterior

### Target (3D) laser scanner applications

<table>
<thead>
<tr>
<th>Pitching</th>
<th>Scoring</th>
<th>Laser Structuring</th>
<th>Laser Paint Removal</th>
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<tbody>
<tr>
<td>Making holes, slits, etc. in interior components to enable vacuum lamination.</td>
<td>Weakening of steering wheel covers to create an invisible tear line for airbags.</td>
<td>Surface structuring of interior components for functional &amp; design light integration.</td>
<td>Laser ablation for light integration into front/rear plastic bumpers.</td>
</tr>
</tbody>
</table>

- Customized materials in interior cockpit design
- Supporting new trend for shiny surfaces / materials
- New ambient light applications in dashboards, door panels
- New face of e-cars with light integrated design components instead of radiator grills

**Growth area**
Example higher integrated solution capabilities: laser cutting, joining and metrology equipment in different degrees of automation for new global e-car program

<table>
<thead>
<tr>
<th>Project description</th>
<th>L&amp;P scope</th>
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<tbody>
<tr>
<td><strong>Customer</strong></td>
<td>Dual or triple laser head 3D cutting of contours and holes</td>
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<tr>
<td><strong>Produced part: Lift gate</strong></td>
<td>Conventional trimming operations</td>
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<tr>
<td></td>
<td>Laser brazing for joining tailgate with outer skins</td>
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<td></td>
<td>Conventional joining operations (adhesive &amp; hemming)</td>
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<tr>
<td></td>
<td>Full automation of production line (loading, unloading, transfer)</td>
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<td></td>
<td>Optical inline inspection and measurement (exemplary picture)</td>
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</table>

**Produced part: Lift gate**
- Raw part is made by aluminum die-casting
- Implementation plan for three regions globally with different degree of automation
- 1st project already won, using dual laser head 3D cutting
- Full line integration of further processes in next two regions requested by customer

**L&P scope**

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Source: www.perceptron.com/solutions
Example new industries: **automation/ integration and metrology**
business development activities for aerospace market

### Automation/ Integration

- Jenoptik awarded **global supplier** number for MHI Canada Aerospace and Airbus
- Prodomax named **preferred integrator** for the Aerospace Supercluster in Ontario
- Active quotes for solutions to streamline auto-drilling and sealant dispensing processes

### Metrology

- Well-known aerospace customer
- Opticline C314
- Measurement of rotor actuator rods

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**Customer**

**Content**
Driving photonics in Automotive production processes and other Smart Manufacturing industries, L&P advances Jenoptik's corporate strategy.

Jenoptik Strategy: Intelligent use of photonic technologies …

… creates value for the customer

Our competence:
- Intelligent and efficient integration of multiple technologies with…
- … focus on photonics, e.g. optical control and laser technology

Our differentiator:
- Deep application & process know-how to understand the customer's requirements

Global player for smart manufacturing solutions, enabled through photonic technologies.
Thank you