Case Study
Miniaturized camera for endoscopy
Miniaturized camera for endoscopy

Demands of minimally invasive surgery

Scope

Development and production of a miniaturized camera with maximum resolution and flexibility.

The dimensions of the components that enter the body are said to be as low as possible in order to shorten the healing process and to ensure the accessibility to the smallest vessels.
Technical specifications

With the definition of the image sensor a big part of the requirements in the miniaturized camera already were transmitted:

- Lowest possible outer diameter of the housing
- Optics with an object angle of 85°, individually aligned to the camera sensor
- Electronic data transfer and data processing for displaying on the monitor
<table>
<thead>
<tr>
<th>No.</th>
<th>System</th>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Property</td>
<td>Value</td>
</tr>
<tr>
<td>1</td>
<td>Objective</td>
<td>Object distance</td>
<td>20,0 mm</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Field of view</td>
<td>80 – 90°</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Shape of the last lens surface</td>
<td>Plan</td>
</tr>
<tr>
<td>4</td>
<td>Housing</td>
<td>Diameter</td>
<td>Preferably small</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Length</td>
<td>Preferably short</td>
</tr>
<tr>
<td>6</td>
<td>Electronics / SW</td>
<td>Image quality on the screen</td>
<td>Excel state of the art</td>
</tr>
</tbody>
</table>
Effective realization

Phase Two

Objective lens 1 out of optical glass and aperture out of sapphire

Rigid housing part

Objective lens 2 out of optical glass

Movable housing part

Cover glass of the image sensor

Image plane
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The individually adaptable optics along with the corresponding camera provide the essential part to a whole new ranges of applications.
Maximised resolution with minimal size

Endless possibilities

With the development and production of this miniaturised camera was shown, that very small construction size (ø1.55 x 2.5) are sufficient to view and evaluate the picture of hard-to-access areas on a display screen – whether inside the human body or in a non-human cavity.

Technical data

- Field of view: 80 - 90°
- Focal length objective: 1,10 mm
- Main beam-angle: 25°
- Construction size: ø1.55 x 2.5
- Resolution: 62.500 Pixel
Project analysis

With the successful handling of this project, which is characterized by its interdisciplinary, we achieved another milestone towards product development and production of complex miniaturised systems. The excellent customer feedback confirms the project results and the quality provided by feinwerkoptik zünd.
Time line

February 2015: Selection of the image sensor
March 2015: Definition of standards and specifications (optic and mechanic)
April 2015: Development of optic and mechanic
May - July 2015: Production of optic and mechanic
August 2015: Testing and evaluating
Content

<table>
<thead>
<tr>
<th>R &amp; D (Research and Development)</th>
<th>Produktion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defining requirements</td>
<td>Spherical optics</td>
</tr>
<tr>
<td>Defining specifications</td>
<td>Rod lenses</td>
</tr>
<tr>
<td>Development of optical system</td>
<td>Optical assembly</td>
</tr>
<tr>
<td>Development of optomechanical system</td>
<td>Optomechanical assembly</td>
</tr>
<tr>
<td>Development of production process</td>
<td>Electrooptomechanical assembly</td>
</tr>
</tbody>
</table>