IPS Implants®
Orthognathics
Oral and maxillo-facial surgery is our passion! Its further development, together with our customers, is our ambition. Every day we work on developing innovative products and services which meet the highest demands on quality, and which contribute to the wellbeing of the patient.
Dysgnathia in its various manifestations affects the quality of life of many patients - both physiologically and psychologically. In addition to orthodontic treatment, orthognathic surgery is a proven means of rectifying functional disorders and achieving balanced esthetics.

The use of modern technologies opens up new options in oral and maxillofacial surgery, particularly in the field of dysgnathia surgery. With the development of preoperative virtual planning as well as its realization through patient-specific planning aids and implants, further options have been created to reliably achieve predictable results. IPS® offers matched solutions for the computer-based planning of surgical procedures, the efficient design of customized treatment concepts and the realization of these concepts in the operating theater with functionalized implants and planning aids.
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IPS® is ideal for solutions customized to the patient by a simple and efficient process – from planning to the functional implant.

We supply IPS Gate®, a platform that guides surgeons and users reliably and efficiently through the process of inquiring about, planning, and completing patient-specific products. The intuitive concept offers the user maximum mobility, flexibility, and functionality. With the HTTPS standard IPS Gate® ensures encrypted data transmission, which is additionally certified by the TÜV Süd seal.

Patient-specific implants, planning aids, and anatomical models are made from various materials using state-of-the-art fabrication technologies. Thanks to computer-based planning and functionalized patient-specific implants, preoperative planning can be implemented in surgery with unprecedented precision.

The resulting advantages for patients are reduced complication rates, improved esthetic and functional results, reduced surgical time and faster rehabilitation.
## IPS Implants® Orthognatics

### Planning process
- Orthognathic case planning with the KLS Martin planning software IPS CaseDesigner®
- Simple and efficient interaction with the IPS designer via the IPS Gate®
- Planning, fabrication, shipping from a single source
- Range of options for planning:
  - Predetermination of screw positions
  - Screw diameter selectable, Ø 1.5 mm by default, alternatively Ø 2.0 mm
  - Realization of diverse implant geometries
- Planning time 8-9 working days

### Benefits
- Virtual planning created by user builds basis for potential designing of guides and implants
- Maximum mobility, flexibility and functionality
- Complete service with the requirement for coordinating multiple services eliminated
- High degree of safety in planning
- Save time with efficient case processing

### Drill, marking and saw guides, orthognathic splints
- Enables transfer of virtual planning to the OR
- Integrated steel sleeves
- Made of Polyamid or additive manufactured titanium alloy
- Orthognathic splints made of acrylate/methacrylate resins

### Benefits
- Maximum safety with accurate determination of plate position and screw holes
- No need for additional drill guides
- Variability in planning options and high biocompatibility
- Transparent and processible

### Implants
- Production using the latest additive manufacturing technology
- Manufactured as standard from high-strength Ti6Al4V titanium alloy
- Implant based on the individual CT scan of the patient, already checked for perfect fit ex-works

### Benefits
- Additive manufacturing technology provides complete freedom of design for implants
- High implant stability
- Best possible three-dimensional precision-fit
- Rounded, atraumatic edges avoid trimming and bending
Surgical technique

Step by Step to Optimal Fixation

Indications

Orthognathic procedures such as retrognathia, prognathia or skeletal open bite

Maxillary Osteotomies
- Guide
- Splints
- Implants

Mandibular Osteotomies
- Guide
- Splints
- Implants

Genioplasty
- Guide
- Implants
Surgical Techniques

**Bimaxillary Osteotomy**
PD Dr. Dr. Majeed Rana  
Pages 10-13

**Bilateral Sagittal Split Osteotomy**
Dr. Dr. Giovanni Badiali  
Pages 14-15
Virtual planning

Orthognathic case and splint planning can be accomplished by the clinical user with the IPS CaseDesigner®. Alternatively, patient and model scans can be transmitted for case planning by KLS Martin via IPS Gate®. This planning forms the basis for the realization of patient-specific implants as well as for drilling and marking templates.

Note:
More detailed information on the preparation of patient data can be found in our brochure “Scan protocol for the virtual planning of orthognathic procedures”.

Positioning the drill and marking guide

After preparation of the maxilla, the drill and marking guide is fixed to the maxilla with Ø 1.5 mm osteosynthesis screws. The small drill holes (without metal inserts) serve to fasten the template to the maxilla.
Marking the osteotomy line

The osteotomy lines are marked with e.g. a piezo device.

Please note that polyamide marking templates are not intended for immediate osteotomization.

Drilling

The screw holes for the implants are predrilled through the drill and marking guide.

Steel sleeves are fitted into the drill guide so that drilling can be performed without requiring additional drill sleeves. When using drill and marking guides which do not contain steel sleeves, appropriate drilling guides must be used.
Surgical technique: Bimaxillary Osteotomy

Maxillary osteotomy

After marking the osteotomy lines and predrilling the screw holes, the drill and marking guide is removed and the osteotomy is performed along the marked line. In addition, the posterior part of the maxilla must be osteotomized and the septum severed.

Fixation of the implants

The IPS® plates are secured to the maxilla with Ø 1.5 mm maxDrive screws. At first only the screw holes of the mobilized maxilla have to be fixated. Preferably, the medial plate of one side is attached, followed by the posterior plate on the same side. The same procedure is to be applied on the opposite side.

After all the maxillary screw holes have been filled, the maxilla is moved into the planned position.

An intermediate splint can also be used for this step.
To mobilize the mandible, a bilateral sagittal split osteotomy needs to be performed. After insertion of the final splint, the mobile mandible is moved into the planned position and fixated with osteosynthesis plates and screws.
Virtual planning

Utilising the patient’s DICOM data set, a 3D virtual planning of the bilateral sagittal split osteotomy can be accurately performed with the IPS CaseDesigner® software by clinicians on their own. Patient-specific drill and marking / sawing guides can then be created with reference to the surgical plan.

Alternatively, the patient and model scans can be uploaded via IPS Gate® where a dedicated engineer will design the case plan.

In case of bimaxillary surgery the subsequently described procedure fits to the “Mandible first” protocol.

Positioning the guides

After preparation of the mandible, the drill and sawing guides made from Titanium (picture above) are fitted onto the area of the mandibular body and linea obliqua using the inferior clasping element.

Alternatively, a superior bow can help to establish the horizontal placement of a guide by aligning the notch to the last molar tooth.

Guides are fixed to the mandible with Ø 1.5 / 2.0 mm osteosynthesis screws into the flat drill holes.

Tooth-borne drill and marking guides made of polyamide are usually placed via an element designed to fit into the occlusal plane. Each guide is also form-fitting with the linea obliqua, between the mandibular angle and body and supported by an inferior clasping element.

Guides are fixed to the mandible with Ø 1.5 / 2.0 mm self-drilling osteosynthesis screws.
Please note that polyamide marking guides are not intended for an immediate osteotomy. The completion of osteotomies must be carried out after the removal of the guides. Steel sleeves are fitted into the drill guide so that drilling can be performed without requiring additional drill sleeves. The use of an angulated drill such as the Angulus 2 is recommended to meet the planned screw trajectory.

**Mandibular osteotomy**

The osteotomy lines are marked with e.g. a piezo device. Immediate sawing directly between the guiding slots can be performed on titanium guides. Remove the guides to finalize the osteotomies. The screw holes for the implants are predrilled through the drill guide using the guiding holes (higher profile compared to fixation holes).

**Fixation of the implants**

The IPS® plates are fixed to the mandible with Ø 2.0 mm maxDrive screws in the predrilled holes. For insertion of the posterior screws we recommend using an angulated screwdriver such as the Angulus 2.

Before final fixation of the mandibular parts, the bone segments can be additionally stabilized and the correct positioning can be checked with a suitable splint.
Y-shaped segmental Le Fort I osteotomy
Treatment with additive-manufactured drill and marking guide, polyamide

Le Fort I osteotomy
Treatment with additive-manufactured drill and saw guide, titanium alloy

Bilateral Sagittal Split Osteotomy (BSSO)
Treatment with additive-manufactured drill and marking guide, teeth-borne, polyamide

Bilateral Sagittal Split Osteotomy (BSSO)
Treatment with additive-manufactured drill and saw guide, bone-borne, titanium alloy
Bilateral Sagittal Split Osteotomy (BSSO)  
Treatment with additive-manufactured IPS® implants

Le Fort I osteosynthesis fixation with multi-plate Le Fort I technique  
* Treatment with additive-manufactured IPS® implants

Genioplasty fixation  
* Treatment with additive-manufactured IPS® implants

Bilateral Sagittal Split Osteotomy (BSSO)  
* Treatment with additive-manufactured IPS® implants

Bilateral Sagittal Split Osteotomy (BSSO)  
* Treatment with orthognathic splints
In addition to the IPS® implant and the included drill, marking and saw guides, the following osteosynthesis accessories in sterile condition are required for the surgical treatment:

- A sufficient number of KLS Martin osteosynthesis screws in the planned diameters
- A screwdriver to fit the planned osteosynthesis screws
- A pilot drill to fit the planned osteosynthesis screws
- Ø 2.0 mm osteosynthesis screws (alternatively Ø 1.5 mm screws) for fixing the drill, marking and saw guides with matching pilot drill and screwdriver
The IPS® Product Range

**IPS CaseDesigner®**
The IPS CaseDesigner® makes virtual 3D surgical planning easier and faster than ever before. With this flexible software tool, orthognathic procedures can be efficiently and reliably planned and simulated, and then applied to treatment in the operation in a customized manner.

**IPS Gate®**
The web-based platform and app guides surgeons and users reliably and efficiently through the process of inquiring about, planning, and completing patient-specific products. With the HTTPS standard IPS Gate® guarantees encrypted data transmission, which is additionally certified by the TÜV Süd seal.

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