THE ENDOSCOPIC SURGICAL TECHNIQUE
“TWO NOSTRILS – FOUR HANDS”

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The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

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Instrument Set for the Endoscopic Surgical Technique
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Introduction

Surgical access to the skull base and to the sellar and parasellar regions has undergone substantial development over the years, resulting in minimally invasive surgery. In line with this, the surgical feasibility of procedures using the intranasal endoscopic technique has paved the way for providing a valid alternative option to the classic transcranial and transseptal approaches.

The endonasal endoscopic technique, classically applied in the field of ENT for the treatment of inflammatory sinonasal pathologies involves guiding the operating instrument with the dominant hand while the non-dominant hand holds the endoscope. The first author to promote the endoscopic technique using more than two hands was May in 1990. The modification of the endoscopic technique that he suggested, allows the use of more surgical instruments in a single nasal cavity and requires the collaboration of two surgeons in such a way that the first surgeon is able to use both hands while the second surgeon holds the endoscope. Briner and Simmen have recently emphasized the positive aspects of this technique with particular regard to reducing duration of surgery, improving vision of the surgical field (owing particularly to the possibility of introducing a suction tube as a second instrument) and the no less important optimizing of resources.

In recent years, the experience of other authors in the neurosurgical field, for example Kassam and Snyderman, has demonstrated how this technique can be extended to the treatment of advanced pathology of the anterior, middle and, in selected cases, posterior skull base.

With the aim of further reducing the surgical trauma to the sinonasal mucosa during skull base procedures, and to speed up and facilitate resection, we decided in 1997 to start using the “Two Nostrils – Four Hands Technique.” More precisely, we have used this technique for the surgical management of sellar and parasellar pathology, sinonasal tumors and neoplastic lesions with intracranial invasion, in the latter case, using it in addition to the traditional external approach (“Cranioendoscopic” technique).

4-Hands Bilateral Endonasal Endoscopic Surgical Technique

The “Two Nostrils – Four Hands” technique requires the constant collaboration of two surgeons throughout the entire procedure: in the initial stage of the approach to the area affected by pathology, and also in the stages of tumor removal and cranial base dura-plasty.

It is possible for the two surgeons to work together in various ways, applying the endoscopic-assisted technique according to different modalities. Initially, the endoscope can be held by the first surgeon together with one instrument, for example a curette, while the second surgeon controls microhemorrhages by means of a suction tube.

In this case, the technique is performed with three hands, which can be considered the standard transnasal technique where the surgeon guides the endoscope to maintain topographical orientation by identification of specific anatomical landmarks and assessment of spatial depth. In addition, while removing the lesion, a second surgeon keeps the operative field clear by means of suction (Fig. 1).
Alternatively, the second surgeon may guide a second instrument in addition to the suction tube or the endoscope, thus allowing the surgeon to operate with two instruments using both hands to remove the lesion. This four-hands technique can be considered the further development of the traditional three-hands technique without the use of holders and has evolved from the increasing interaction of the surgical team as the two surgeons became accustomed to working with four hands (Figs. 2–4).

In every case, the endoscope is held by three fingers (thumb, index, middle), like a pencil, and is introduced in the nasal vestibule under direct vision. The instruments are usually introduced from below the endoscope, along the side of the dominant hand and parallel to the endoscope, which is used as a guide. The mobility of the endoscope is one of the main benefits of this technique. Guiding the endoscope without the use of holders, in fact provides the permanent option of “to-and-fro” movements, which are crucial to maintain the spatial orientation, with sense of spatial depth, and the visual control of the more peripheral landmarks. Particularly in complex anatomical situations, the possibility of changing the visual angle and the angle of the instruments offers undoubted advantages to the surgeon in inspecting the lesions to be removed.

Since the two surgeons alternate as first and second surgeon frequently throughout the procedure, it is evident that the technique requires dual training: both with regard to handling the endoscope and specific instruments, and with regard to coordination with the second surgeon.

The approaches through which it has been possible, in our experience, to utilize the advantages offered by the 4-hands technique are summarized in Diagram 1.
1.0 Paraseptal Approach

1.1 Direct Paraseptal Approach to the Olfactory Region

The paraseptal approach is directed through one nasal fossa to treat medial meningoencephalic herniations while sparing the ethmoid (Figs. 5A, B). In this case, the procedure is performed using three hands. The endoscope is guided with different angles. Suction and one operating instrument are used as well. The surgical steps for removal of a meningoencephalocele of the olfactory cleft are (see Chapter 6.3):

- Bipolar electrocoagulation of the mass as far as the cribriform plate
- Resection of the cribriform plate and removal of the lesion
- Exposure of the recipient site for the graft with debridement of the intracranial dural edges
- Preparation of free grafts of septal mucoperichondrium and cartilage
- Repair in 2–3 layers
- Stabilization of the graft and packing

1.2 Direct Paraseptal Trans-sphenoidal Approach

1.2.1 Direct Bilateral Paraseptal Trans-sphenoidal Approach to the Sellar Region

This is the preferential approach to the sellar region and provides rapid access to the sphenoid sinus using the natural pathways leading to the sphenoid cavity.

The type of approach is regarded as standard in the case of space-occupying lesions with sellar and suprasellar invasion without infiltration of the cavernous sinus and, in fact, allows access to the sellar and suprasellar structures and permits good hemostasis and absolute respect for the anatomical structures of the nasal and paranasal cavities and for their function.

During the procedure, a 0° endoscope (diam. 4 mm) is used. Initially, the endonasal paraseptal access to the sphenoid sinus is gained by choosing the nasal cavity that offers more space for surgery. Depending on the individual anatomical situation, we prefer to use two different methods for approaching the sphenoid sinus.

The first type involves patients with a narrow sphenoid rostrum and a broad sphenethmoid recess which makes it easier to localize the natural ostium of the sphenoid sinus. In these cases, we proceed parallel to the nasal septum and to the nasal floor with the medial edge of the inferior turbinate as lateral landmark, and the superior edge of the choana as superoposterior landmark. When the latter is reached, we proceed upwards, following the medial edges of the tails of the ethmoid turbinates (middle, superior and supreme) (Figs. 6–7).

The sphenoid ostium will become visible medial to the tail of the superior or supreme turbinate. The ostium is enlarged centrifugally with a circularbute cutting punch or Citelli forceps (Figs. 8–10).
The second type involves patients with a well-pneumatized sphenoidal rostrum and narrow sphenoethmoidal recess, where it is not possible to localize the sphenoidal ostium. The morphological appearance of this different anatomical situation can be assessed with an axial CT scan, centered on the sphenoidal rostrum at the level of the sphenoidal ostia (Figs. 11A, B). In this way, it will be possible to evaluate the degree of lateral displacement of the ostia and thus to determine the anticipated degree of difficulty to gain direct access to the ostia, and to choose the appropriate type of approach.

Anatomical landmarks:
- choanal margin
- tail of the superior turbinate
- sphenoid ostium

Risks:
- iatrogenic injury to the skull base at the level of the olfactory cleft with CSF leak
- iatrogenic injury to the olfactory neuroepithelium with hyposmia
- iatrogenic injury to the optic nerve and internal carotid artery

Tricks:
- the sphenoid ostium is enlarged centrifugally using a circular-bite cutting punch
- instruments with a greater capacity for removing bone are then used, such as Citelli forceps or an intranasal drill with cutting burr, removing the sphenoid rostrum
- the septal branch of the sphenopalatine artery may be encountered; this is electrocoagulated with bipolar forceps beneath the tail of the superior turbinate

Fig. 8
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. A circular-bite cutting punch is used to enlarge the natural sphenoid sinus ostium.

st = superior turbinate
so = sphenoid ostium
R = sphenoid rostrum
ch = choana

Fig. 9
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Removal of the anterior wall of the sphenoid sinus is completed using a Citelli forceps.
st = superior turbinate; mt = middle turbinate; ss = sphenoid sinus; ch = choana; s = nasal septum

Fig. 10
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Sphenoid sinus after removal of the anterior wall. This procedure allows the sphenoid sinus cavity to be inspected.
st = superior turbinate; mt = middle turbinate; ss = sphenoid sinus; ch = choana; s = nasal septum

Fig. 11A
Axial CT scan at the level of the sphenoid ostia demonstrating the poorly pneumatized sphenoid rostrum.

nld = nasolacrimal duct; mt = middle turbinate; S = nasal septum; eb = ethmoidal bulla; R = sphenoid rostrum; so = sphenoid ostium; ss = sphenoid sinus; pe = posterior ethmoid

Fig. 11B
Axial CT scan at the same level as Fig. 11A showing a pneumatized rostrum and lateral displacement of the sphenoid ostia.
S = nasal septum; R = sphenoid rostrum; so = sphenoid ostium; ss = sphenoid sinus
In this second case, it will be necessary to drill the sphenoid rostrum at a secure anatomical site to gain access to the sphenoid sinus (Figs. 12, 13).

**The secure site for access to the sphenoid sinus** is represented by the junction of two lines, the first vertical and parallel to the interchoanal septum and the second horizontal (parallel to the tail of the superior turbinate).

**Anatomical landmarks:**
- floor of the nasal fossa
- superior border of the choana
- tail of the superior turbinate

**Risks:**
- iatrogenic injury to the skull base with CSF leak
- iatrogenic injury to the optic nerve and internal carotid artery

**Tricks:**
- access to the sphenoid sinus is gained by perforating medial to the secure anatomical site
- direct drilling of the sphenoid rostrum without elevating mucosal flaps

In both cases, enlarging the sphenoid sinus opening facilitates locating the intracavitary position of the internal carotid artery and of the optic nerve. While widening the opening inferiorly, attention must be paid to the septal branch of the sphenopalatine artery, which is electrocoagulated with bipolar forceps (Fig. 14).

At this point, after opening the sphenoid sinus on one side, the same approach is employed on the opposite side to obtain a wider access and to continue the surgical procedure using both nasal fossae, possibly also removing a limited part of the vomer. The technique allows for complete removal of the entire anterior wall of the sphenoid sinus,
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

1.2.2 Direct Bilateral Paraseptal Trans-sphenoidal Approach to the Nasopharynx and Clivus

The technique, similar to the previous one in the approach to the sphenoid sinus, provides for removal of the sphenoid sinus floor rather than opening the sellar floor. This maneuver, combined with resection of the posterior third of the vomer, gives access to the nasopharynx (Fig. 18). This type of approach enables treatment of selected cases of pathology located in the nasopharynx, clivus and retroclival spaces (including C1–C2 and the posterior cranial fossa), which can be achieved by drilling the clivus (Fig. 19).

1.2.2 Direct Bilateral Para-septal Trans-sphenoidal Approach to the Nasopharynx and Clivus

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joining the two ostia, removing the intersphenoidal septum and thus exposing the sellar floor (Figs. 15, 16).

To facilitate the insertion of operating instruments, it may sometimes be necessary to create access to the second nasal cavity by endoscopically removing a septal spur. From this step onwards, it is very useful to collaborate with the second surgeon who can irrigate and aspirate at the same time to keep the surgical field bloodless (Fig. 17).

The intersphenoidal septum is removed using cutting instruments such as the intranasal drill. In a step-by-step fashion, both the septum and the sphenoid rostrum are removed with this device. Once the entire sphenoid sinus cavity is exposed, the sellar floor will be opened.

1.2.2 Direct Bilateral Paraseptal Trans-sphenoidal Approach to the Nasopharynx and Clivus

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2.0 Trans-ethmoidal Approach

2.1 Trans-ethmoidal Approach

This approach is adopted for the treatment of lesions involving the ethmoid with possible extension to the anterior cranial fossa, but without involving the olfactory cleft. A classical example is represented by congenital or acquired defects of the ethmoidal roof associated with menin.

The surgical procedure starts from the nasal cavity into which the lesion extends. This is generally performed with a unilateral approach using three hands. At the beginning, the approach allows the middle nasal meatus to be entered with removal of the second third of the middle turbinate (frontal part). To do this, depending on the specific anatomy, it will be necessary to perform an uncinectomy and to completely remove the ethmoidal bulla. The second third of the middle turbinate is completely removed avoiding injury to the first and the third parts to preserve the stability of the turbinate itself. The frontal recess is then broken down by removal of the most cranial part of the uncinate process and of the agger nasi (Fig. 20).

In this way, an overall view of the entire ethmoidal roof will be obtained, extending from the frontal sinus ostium to the anterior sphenoid sinus wall. A modification of this procedure is required in the case of particular anatomical circumstances in which, in order to inspect the frontal infundibulum, it is necessary to drill the frontal sinus floor using a Draf type Ila or IIb frontal sinusotomy.

The safety maneuver to access the frontal infundibulum is represented by the localization of the free aspect of the uncinate process cranial portion (Fig. 21).

Risks:
- iatrogenic injury to the lamina papyracea and to the nasolacrimal duct
- iatrogenic injury to the lateral part of the lamina cribrosa with the risk of a CSF leak
- iatrogenic injury to the medial rectus muscle

Tricks:
- Uncinectomy has to be performed with a back-bite cutting punch, working inferiortly to the infero-medial margin of the ethmoidal bulla

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Fig. 20
A Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus.
- up = uncinate process
- mt = middle turbinate
- ms = maxillary sinus
- it = inferior turbinate
- S = nasal septum

B Macroscopic coronal section of an anatomical specimen, posterior to the preceding one.
- st = superior turbinate
- ms = maxillary sinus
- mt = middle turbinate
- it = inferior turbinate
- S = nasal septum

Both of the green sections in A and B show the area that is removed with the trans-ethmoidal approach.

Fig. 21
A Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa.
- s = nasal septum
- m = middle turbinate
- eb = ethmoidal bulla
- of = olfactory cleft

B Endoscopic view, endoscope 45°, diam. 4 mm, left nasal fossa.

C Endoscopic view, endoscope 45°, diam. 4 mm, left nasal fossa. The series of pictures shows the opening of the frontal recess. Performing uncinectomy, the residual cranial part of the uncinate process (green) acts as a landmark for identifying the bony shell, which obstructs access to the frontal ostium.

This is removed with angled cutting forceps (no.1).
- fs = frontal sinus
2.2 Trans-ethmoidal-sphenoidal Approach

This approach is performed to remove lesions involving the sellar region with extension to the medial parasellar region, the lateral recess of the sphenoid sinus and the posterolateral ethmoid. Using this route, the posterior ethmoid, the apex of the orbit, the lateral wall of the sphenoid sinus (pterygoid recess) or the medial component of the cavernous sinus may readily be inspected (Fig. 22).

The surgical procedure begins from the nasal fossa of the side into which the tumor extends laterally. The approach allows the middle nasal meatus to be entered initially with removal of the second third of the middle turbinate (frontal part).

To do this, depending on the specific anatomy, it will be necessary to partially or completely remove the ethmoidal bulla (Figs. 23, 24), while the uncinate process will generally be preserved (Fig. 25, see p. 14).
The second third of the middle turbinate is completely removed, avoiding injury to the anterior and posterior thirds as to preserve the stability of the turbinate itself.

The **secure point** to access the structures of the posterior ethmoid is localized in correspondence with the inferomedial angle of the second third, the point where all three parts of the middle turbinate meet. (Figs. 26, 27).

The next step is to identify the free inferior edge of the superior turbinate. The turbinate is then gently lateraled, thus allowing the sphenoid ostium to be localized.
After the cutting of the inferior portion of the superior turbinate and, if necessary, of the supreme turbinate, the sphenoid sinus ostium is enlarged with a circular-bite cutting punch (Figs. 28–29, Fig. 30 see page 16).

Fig. 29
A Macroscopic sagittal section of an anatomical specimen. The portion of the tail of the superior turbinate, that will be removed to allow visualization of the natural ostium of the sphenoid sinus in the trans-ethmoidal approach is highlighted in orange. The red area indicates the second third of the middle turbinate, that will be removed to visualize the superior turbinate.

ss = sphenoid sinus
st = superior turbinate
acb = anterior cranial base
bl = basal lamella
I mt = anterior third of the middle turbinate
II mt = second third of the middle turbinate
III mt = posterior third of the middle turbinate
it = inferior turbinate

B Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. The endoscope, in paraseptal position, allows to confirm that the superior turbinate has been resected as required.

S = nasal septum
so = sphenoid ostium
m = middle turbinate
st = superior turbinate

Fig. 28
A Macroscopic sagittal section of an anatomical specimen. The picture illustrates the maneuver of resecting the superior turbinate tail during a sphenoidectomy in a trans-ethmoidal approach, after removal of the second third of the middle turbinate.

ss = sphenoid sinus; t = superior turbinate; II mt = second third of the middle turbinate;
mt = middle turbinate; it = inferior turbinate

B Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. View of the natural ostium of the sphenoid sinus after removal of the superior turbinate tail in a trans-ethmoidal approach.

so = natural ostium of the sphenoid sinus; st = superior turbinate
The anterior wall of the sphenoid sinus is then completely removed (Figs. 31–33).

**Risks:**
- Iatrogenic injury to the olfactory cleft with anosmia and risk of CSF leak
- Iatrogenic injury to the optic nerve and cavernous internal carotid artery
- Iatrogenic injury to the medial rectus muscle

**Tricks:**
- The inferior part of the superior turbinate must be cut and not roughly removed

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**Fig. 30**
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Once the tail of the superior turbinate has been removed, it is possible to widen the natural ostium of the sphenoid sinus with a cutting round-jawed forceps introduced by the paraseptal route.

- **so** = sphenoid sinus ostium
- **st** = superior turbinate
- **asw** = anterior wall of the sphenoid sinus

**Fig. 31**
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. The anterior wall of the sphenoid sinus can also be removed using a Citelli forceps.

- **st** = superior turbinate
- **ss** = sphenoid sinus
- **asw** = anterior wall of the sphenoid sinus

**Fig. 32**
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Removal of the anterior wall of the sphenoid sinus allows for endoscopic intracavitary inspection.

- **asw** = anterior wall of the sphenoid sinus
- **iocr** = interoptic-carotid recess
- **ss** = sphenoid sinus

**Fig. 33**
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Complete left ethmoido-sphenoidectomy.

- **I mt** = anterior third of the middle turbinate
- **Il mt** = second third of the middle turbinate
- **Ill mt** = posterior third of the middle turbinate
- **st** = superior turbinate
- **SS** = sphenoid sinus
- **asw** = anterior wall of the sphenoid sinus
- **eb** = ethmoidal bulla
This surgical approach provides optimal view of the entire sellar floor and, in particular, of the lateral sphenoidal wall. In addition, the inclination of the operating instruments, different from the paraseptal approach, facilitates the inspection of the sphenoidal roof.

At this point, the procedure allows the four-hands work utilising a trans-ethmoidal approach on one side and a direct paraseptal approach on the contralateral side. The contralateral introduction of the operating instruments allows wider movements of the endoscope with better vision of the surgical field, three-dimensional orientation of the field and wider exposure of the spheneno-ethmoidal region.

Use of the 45° endoscope allows visual control of instruments even when introduced on the opposite side. In this way, the endoscope may also be used via paraseptal approach.

### 2.3 Trans-ethmoidal-pterigoidal-sphenoidal Approach

This third surgical approach is indicated for surgical inspection of the lateral part of the anterior and middle skull base, such as the lateral part of the cavernous sinus, the base of the middle cranial fossa, particularly in case of well-pneumatized pterygoidal-sphenoidal recesses, and the infratemporal fossa (Fig. 36).

The surgical approach starts with an ethmoidectomy with partial resection of the middle and superior turbinates. This removal, in combination with resection of the posterior ethmoidal cells, allows the exposure of the anterior wall of the sphenoid sinus, of the orbital apex and of the base of the pterygoid. The anterior wall of the sphenoid sinus is then removed and the sphenopalatine artery is electrocauterized (at its septal and turbinate branches) using bipolar forceps.

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**Fig. 34**
Macroscopic coronal section of an anatomical specimen at the level of the superior nasal meatus. The structures that are removed during a right trans-ethmoidal and left paraseptal approach to the sellar region are highlighted in orange. The structures that are removed subsequently using a trans-ethmoidal-pterigoidal approach are shown in red.

- ms = maxillary sinus
- e = ethmoid
- lp = lamina papyracea
- st = superior turbinate
- mt = middle turbinate
- it = inferior turbinate
- s = nasal septum

**Fig. 35**
Macroscopic coronal section of an anatomical specimen at the level of the sphenoid sinus. The structures that are removed during a right trans-ethmoidal and left paraseptal approach to the sellar region are shown in orange. The structures that are removed subsequently using a trans-ethmoidal-pterigoidal approach are shown in red.

- pp = pterygoid process of the sphenoid
- ss = sphenoid sinus
- on = optic nerve
- R = sphenoid rostrum
- it = inferior turbinate
- spa = sphenopalatine artery

**Fig. 36**
Macroscopic axial section of an anatomical specimen. The image illustrates the use of four instruments inserted through both nasal cavities in a trans-ethmoidal-pterigoidal-sphenoidal approach to the sellar and parasellar region and to the middle cranial fossa. Both the right ethmoidectomy and maxillectomy can be seen, which allows the instruments to be moved easily in a lateral direction.

- lp = lamina papyracea
- mcf = middle cranial fossa
- s = nasal septum
- mt = middle turbinate
- ms = maxillary sinus
- ss = sphenoid sinus
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Fig. 37
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once ethmoidectomy is complete, the area of the fontanelle of the middle and posterior thirds of the inferior turbinate has to be removed using a cutting instrument via trans-ethmoidal-pterigoido-sphenoidal approach.

ms = maxillary sinus
mwms = medial wall of the maxillary sinus
st = superior turbinate
spa = sphenopalatine artery
ch = choana
s = nasal septum

Fig. 38
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The medial wall of the maxillary sinus may be removed using a lateral-bite cutting forceps.

ms = maxillary sinus
mwms = posterior wall of the maxillary sinus
st = superior turbinate
s = nasal septum

Fig. 39
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once the posterior wall of the maxillary sinus has been exposed, it is possible to gain access to the pterygomaxillary fossa.

pwms = posterior wall of the maxillary sinus
ima = internal maxillary artery
spa = sphenopalatine artery
va = vidian artery
spa = branches of the sphenopalatine artery
lwss = lateral wall of the sphenoid sinus
fr = foramen rotundum
pcica = paraclival internal carotid artery

The posterior wall of the maxillary sinus is then exposed with an incomplete medial maxillectomy, removing the area of the fontanelle of the middle and posterior thirds of the inferior turbinate (Figs. 37, 38). Subsequently, the pterygomaxillary fossa is opened, widening its foramen with a Citelli forceps (Fig. 39). With the same forceps, the posterior wall of the maxillary sinus is removed. Once the content of the pterygoid and infratemporal fossae is visible, the vidian foramen and the foramen rotundum may be localized. After the electrocoagulation of the vidian artery, the base of the pterygoid and the sphenoid floor are drilled. This maneuver opens up the view of both the cavernous sinus and the base of the middle cranial fossa. In cases where the treatment of the pathology would require even further lateral inspection, a total maxillectomy may be combined with this approach.

The procedure comprises a wide contralateral paraseptal approach, drilling the sphenoid rostrum to access to the sphenoid sinus and removing its anterior wall and the intersphenoidal septum. This is followed by the removal of the posterior third of the vomer from the floor of the nose to the skull base. The drilling of the sphenoid floor is completed. Moreover, the contralateral access permits a wider angle of insertion of surgical instruments, allowing work to proceed more laterally. In this way, it will be easy to use four surgical hands in various combinations because of the wider space.

Risks:
- Iatrogenic injury to the olfactory cleft with anosmia and risk of CSF-leak
- Iatrogenic injury to the optic nerve and cavernous internal carotid artery
- Iatrogenic injury to the medial orbital wall (medial rectus muscle)

Tricks:
- Sparing of the anterior third of the middle turbinate and of the superior part of the lamella of the ethmoidal turbinates
2.4 Approach to the Sellar Cavity

The opening of the sellar floor is a common stage for the trans-sphenoidal approaches to the sella.

The removal of the sellar floor involves prior localization of specific anatomical landmarks to avoid iatrogenic injury to major structures, such as the internal carotid artery, the optic nerve and the dura mater. These intrasphenoidal anatomical landmarks vary in appearance depending on the degree of pneumatization of the sphenoid sinus: presellar, sellar, conchal. The bony prominences covering the two paracloival carotid arteries, the depression of the clivus wall through which the sellar floor becomes visible, the bony prominence that covers the cavernous carotid artery, the bony prominence that covers the optic nerve and the interoptic-carotid recess are the secure anatomical landmarks, generally in the presellar type of sphenoid sinus. These structures surround the sellar floor through 360°, encircling a central area that can be surgically removed without the risk of iatrogenic injury (Fig. 40).

When the central bony part of the sellar floor has been removed, the perioseal dural layer is incised, and the tumor is removed (Figs. 41–43).

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**Fig. 40**
Endoscopic view, 0° endoscope, diam. 4 mm, left nasal fossa. Sellar type sphenoid sinus after the removal of the left anterior sphenoidal wall and of the intersphenoidal septum. The landmarks that allow the sellar floor to be localized are clearly visible.

- **on** = optic nerve
- **iocr** = interoptic carotid recess
- **sf** = sellar floor
- **pcica** = paracloival internal carotid artery
- **iss** = intersphenoidal septum
- **c** = clivus

**Anatomical landmarks:**
- Varying according to the type of sphenoid (sellar, presellar, conchal):
  - Bony prominence covering both paracloival internal carotid arteries
  - Depression of the wall of the clivus
  - Bony prominence of the cavernous tract of the internal carotid arteries
  - Chiasmatic protrusion
  - Interoptic carotid recess

**Risks:**
- Iatrogenic injury to the optic nerve, internal carotid and basilar artery

**Tricks:**
- The anatomical landmarks surround the sellar floor through 360°, encircling a central area that can be resected without the risk of iatrogenic injury.
The intrasellar surgical technique assumes use of continuous washing of the endoscope (hydroscopy). This will allow hydro-detachment of the tumor and continuous irrigation of the sellar cavity and also improve hemostasis (Fig. 44). Elevation of the suprasellar cistern, which frequently protrudes towards the base, getting in the way and impeding tumor removal, is also essential (Fig. 45). This problem is overcome by using more surgical hands. Moreover, the use of 45° telescopes allows 360° inspection of the recesses of the sellar cavity.

Extension to the parasellar region requires the removal of the bone that covers the cavernous internal carotid arteries. The lateral wall of the sphenoid sinus is then removed to expose the orbital apex. In well-pneumatized sphenoid bones, resection can involve the medial part of the greater wing of the sphenoid itself. The option of gaining access to the lateral part of the cavernous sinus is offered by its devascularization due to tumour invasion.

Risks:
- iatrogenic injury to the 6th cranial nerve in the approach to the cavernous sinus

Tricks:
- the 6th cranial nerve crosses the sphenoid sinus in a mediolateral direction

The techniques that can be advantageously applied during lesion resection or endosellar exploration are:
- **Doppler probe** avoids disorientation of the surgeon showing the anatomical landmark of pulsatory movements of the carotid artery.
- **Neuronavigation**: demonstrates anatomical landmarks that can be localized in the patient on the basis of neuroradiological imaging.
- **Navigation in intrasellar immersion**: intracavitary exploration performed under continuous irrigation and suction allows visualization of supra- and parasellar structures with good hemostasis: the flow pressure of the irrigation liquid limits the descent of the suprasellar cisterns and limits bleeding from the anterior intercavernous sinus and the medial wall of the cavernous sinus, which is sometimes eroded by the lesion.
- **Diode laser**: useful in the resection of tumors of hard to elastic consistency, offers the advantage of coagulating and vaporizing tissues only on contact without producing heat at a distance; may require simultaneous readjustment of the objective lens or endoscopes of various directions of view for access relative to the point of endoscopic access.
3.0 Multilayer Centripetal Technique

This technique, which is based on the criterion of oncologic radicality (to obtain surgical margins free of disease), has been made possible by the introduction of two important procedures: the piecemeal removal and the cavitation of the lesion. Both of these procedures allow a reduction in the volume of the lesions with control of their margins. Once the origin has been identified, cavitation of the mass allows centripetal collapse of the "surgical box" that has to be resected. At this point, the centripetal technique is capable of obtaining sufficiently wide resection margins of healthy tissue surrounding the lesion.

3.1 Naso-ethmoidal Approach

This technique allows removal of sinonasal neoplasms with extension limited to the anterior skull base. This type of centripetal removal has five steps:

- debulking of the lesion (piecemeal removal and cavitation)
- dissection of a subperiosteal layer comprising the ethmoid and the nasal fossa: the initial horseshoe-shaped incision includes the septum, the nasal vault anteriorly to the first olfactory fibers, the lamina papyracea and the lateral nasal wall (medial wall of the maxillary sinus). This allows the centripetal anteroposterior elevation of a single flap of periosteum containing the pathological tissue
- removal of the bony margins: lamina papyracea, ethmoidal roof, cribriform plate, nasal septum and medial maxillary wall
- removal of the periorbit, the dura of the anterior cranial fossa and, if possible, of the olfactory bulb
- skull base duraplasty

In this way, working in successive steps, the structures surrounding the lesion are removed until healthy tissue is found. Multiple frozen histological sections and reconstruction of the skull base are very important. The contralateral approach, when required, consists of a median sphenoidotomy with removal of the two posterior thirds of the nasal septum (Fig. 18, see page 11). With this wider space, the surgical procedure is continued using two nasal cavities and four hands.

3.2 Naso-maxillo-ethmoidal Approach

When needed, the naso-ethmoidal approach can include a medial maxillectomy to widen the surgical field to the lateral nasal wall; the combination with a medial maxillectomy thus allows en bloc removal of malignant tumors involving this structure by the centripetal technique (Fig. 46).

Depending on tumor infiltration and thus on the need to remove the lateral nasal wall, dissection may include:

- removal of the medial wall of the maxillary sinus with preservation of the anterior portion of the inferior turbinate and of the nasolacrimal duct,
- removal of the medial wall of the maxillary sinus with complete removal of the inferior turbinate, dissection of the nasolacrimal duct and en bloc removal of the maxillary sinus mucoperiosteum,
- removal of the medial wall of the maxillary sinus with complete removal of the inferior turbinate, dissection of the nasolacrimal duct, removal of the lateral wall of the piriform nasal aperture and en bloc removal of the maxillary sinus mucoperiosteum,
- removal of the ethmoid labyrinth and base.

It is also possible to employ the "Two Nostrils – Four Hands" technique with this surgical procedure by removing an adequate portion of the nasal septum.

Risks:

- iatrogenic injury to the spheno-palatine artery and to the descending palatine artery
- iatrogenic perforation of the hard palate
- iatrogenic injury to the nasolacrimal duct

The exclusion criteria for this procedure are:

- invasion of the frontal sinus
- invasion of the orbital content
- massive invasion of the dura (not only focal contact)
- invasion of the bony walls of the maxillary sinus with the exception of the medial wall
- extension to the nasopharynx (with the exception only of the pharyngo-basilar fascia)
- invasion of the lacrimal pathways
- invasion of the hard palate
- invasion of the nasal pyramid
4.0 Craniocendoscopic Technique

This technique is applied in the treatment of malignant sinonasal tumors with intracranial infiltration and also in cases of benign intracranial extra-axial median and paramedian tumors of the anterior and middle skull base. The craniocendoscopic technique combines the classic transtemporal approach with the multilayer centripetal endonasal technique and allows the entire outer circumference of the lesion to be exposed and removed en bloc, without the need for classic transfacial osteotomie (Figs. 47–51).

Fig. 47
Macroscopic coronal section of an anatomical specimen at the level of the frontal sinus. The structures that can be removed in a craniocendoscopic approach are shown in green. The lines of bone resection performed by the neurosurgeon in an external frontal craniotomy approach are colored in yellow. The lines of transection performed in an endonasal endoscopic approach, which may be extended (or not) to the medial maxillary sinus wall are shown in red.

it = inferior turbinate
mt = middle turbinate
up = uncinate process
s = nasal septum
lp = lamina papyracea
fs = frontal sinus

Fig. 48
Same color scheme as in Fig. 47 on a macroscopic coronal section of an anatomical specimen at the level of the anterior ethmoid.
it = inferior turbinate
mt = middle turbinate
s = nasal septum
mwms = medial wall of the maxillary sinus
st = superior turbinate
et = ethmoid
lp = lamina papyracea

Fig. 49
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a craniocendoscopic approach are shown in green. The lines of endoscopic resection are highlighted in red.
S = nasal septum
ae = anterior ethmoid
pe = posterior ethmoid
ss = sphenoid sinus
ica = internal carotid artery
ms = maxillary sinus
mcf = middle cranial fossa

Fig. 50
Macroscopic axial section of an anatomical specimen. The structures that can be removed in a craniocendoscopic approach are shown in green. The lines of resection performed in an external approach are shown in yellow.
lp = lamina papyracea
fb = frontal bone
ae = anterior ethmoid
pe = posterior ethmoid
o = orbit
ss = sphenoid sinus

Fig. 51
Macroscopic sagittal section of an anatomical specimen. The structures that can be removed in a craniocendoscopic approach are shown in green. The lines of bone resection performed by the neurosurgeon in an external approach are shown in yellow. The lines of endoscopic resection are shown in red. The broken yellow line highlights the resection when cerebral infiltration of the tumor mass is present.
fs = frontal sinus; cb = cranial base
st = superior turbinate; mt = middle turbinate; it = inferior turbinate; ss = sphenoid sinus; c = clivus;
esp = ethmoidal-sphenoidal planum

The exclusion criteria for this procedure are:

- involvement of the lacrimal pathways
- involvement of the bony maxillary sinus walls, with the exception of the medial wall
- involvement of the hard palate
- involvement of the nasal pyramide
The approach requires a surgical team of four surgeons (two neurosurgeons and two otolaryngologists) and a nurse; the operating room equipment should include two video monitors (one for the operating microscope and one for the endoscope), to make sure that all surgeons have a 360° view of the lesion to be removed (Fig. 52).

4.1 Endoscopic Step

The step of endoscopic surgery involves the use of rigid endoscopes of 0° and 45° direction of view and in conjunction with corresponding specific straight, angled and double-curved operating instruments.

The sphenopalatine arteries are exposed and coagulated bilaterally to reduce bleeding.

The nasal septum is transsected at its base, and anteriorly by a vertical incision that reaches the nasal vault at the level of the superior nasal spine. The nasal septum is mobilized posteriorly by means of lateral transsection of the anterior wall of the sphenoid sinuses, which is extended inferiorly to the level of the sphenoid floor posterior to the rostrum.

The lateral transsections also require the lamina papyracea to be localized, and then dissected from the periorbita starting from its anterior margin as far as the orbital apex. Finally, the lamina papyracea is removed en bloc with the ethmoidal labyrinth.

In the course of the transcranial approach, the neurosurgeon cauterizes the ethmoidal arteries and assists the otolaryngologist in medializing the lamina papyracea using malleable spatulas.

4.2 Transcranial Step

The transcranial approach needs a coronal subperiosteal flap to be elevated, taking care not to injure the superior branch of the facial nerve. A frontal or lateral craniotomy of different shape and size is then performed depending on the individual requirements of surgery (Figs. 53, 54).

At the frontal level, the craniotomy is performed a few millimeters superior to the upper orbital arches to permit a wide opening to be created as tangentially as possible to the anterior skull base so as to prevent excessive retraction of the cerebral parenchyma, and to prevent the pericranial flap from being overly bent while reconstructing the anterior skull base.

Once the superior sagittal sinus at the level of its insertion at the base is ligated, the dura is opened in the fronto-orbital region. With the aid of the operating microscope, the cerebral falx is transsected at its base and the frontal lobes are gently retracted, gradually draining the cerebrospinal fluid. The basal cisterns are accessed in this way, and the medial part of the anterior cranial fossa is exposed bilaterally by the opening of the chiasmatic cistern. Following the course of the olfactory nerves, the ethmoidal-sphenoidal planum, the optic nerves, the chiasm, the A1 and A2 tracts of the anterior cerebral artery, the posterior communicating artery, the pituitary stalk and the carotid arteries are exposed. At this point, it is possible to start centripetal dissection of the neoplasm until surgical margins of healthy tissue are achieved. The superior margin of the bony box is created using a cutting burr until the endonasal margin accomplished previously by the nasal endoscopic approach is joined, achieving its isolation.

Fig. 52  
Intraoperative view demonstrating the positioning of the surgical team in the OR.  
ns1 = first neurosurgeon  
ns2 = second neurosurgeon  
ext1 = first ENT surgeon  
ext2 = second ENT surgeon  
n = nurse

Fig. 53  
Schematic drawing of the coronal incision, and the size and position of the frontal bone flap elevated during the cranioendoscopic approach.

Fig. 54  
A Schematic showing the skin incision and the size and position of the perioral bone flap that is elevated during the combined approach to the middle cranial fossa.  
B Preoperative positioning of the triggers for the neuronavigation system. The red dotted line highlights the line of incision.  
C Intraoperative view demonstrating the use of four surgical hands during the endoscopic step of the procedure.
4.3 En-bloc Removal of the “Ethmoidal Box”

This is the surgical step in which the two teams have to communicate and collaborate as closely as possible. The technical feature of working with two video monitors – one connected to the microscope and one to the endoscope – provides a full view of the ethmoidal labyrinth during its removal without leaving visible tumour margins.

5.0 Duraplasty Techniques

5.1 Sellar Duraplasty

In most of the surgical procedures, there is no need for reconstruction of the sellar floor after tumor removal is completed. However, this becomes necessary in the presence of a cerebrospinal fluid leak detected at the end of tumor removal. The technique requires multilayer reconstruction of the sellar floor using different types of material. The authors prefer autologous materials such as temporal fascia, septal or turbinate mucoperiosteum; quadrangular cartilage and turbinate bone. At times, heterologous material may also be used. The choice of material depends on the type of employed surgical approach and on the individual anatomical variance.

For example, if the patient presents with a concha bullosa, the lateral part of this structure will be harvested during conchal repair, a procedure that is also of benefit to the patient. The obtained tissue is then dissected in two layers of bone and mucoperiosteum. The procedure does not remove anatomical structures and preserves nasal function. If during surgery (transethmoidal-pterigoideal-sphenoidal approach) the middle turbinate has to be removed, this structure can be used to provide free grafts.

The technique comprises placement of an intrasellar layer of connective fascia, a second layer of bone or cartilage (underlay) and a third extracranial layer of mucoperiosteum on the sellar floor (overlay). The layers may be reduced to two (underlay and overlay) and the fascia may also be used alone. The various combinations, as mentioned above, are placed in a different manner in each individual patient (Figs. 55–57).

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**Fig. 55**
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Sellar cavity following removal of the tumor mass.

- sc = sellar cavity
- pcica = paracilval internal carotid artery
- c = clivus

**Fig. 56**
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Duraplasty is performed using fibrin glue to stabilize the graft.

- sdp = dural patch
- pcica = paracilval internal carotid artery
- c = clivus

**Fig. 57**
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. With an instrument introduced into the left nasal fossa sellar duraplasty is performed, placing an underlay graft of synthetic dural substitute.

- sdp = dural patch
- c = clivus
- pcica = paracilval internal carotid artery
5.2 Skull Base Duraplasty after Nasoethmoidal Approach

The ethmoidal duraplasty, after the removal of tumors invading the anterior skull base, is performed using a multi-layer technique with artificial loidura or connective fascia as intracranial underlay grafts and muco-perichondrial or muco-periosteal grafts as overlay grafts (Fig. 58).

5.3 Skull Base Duraplasty after Cranioendoscopic Approach

After en-bloc removal of the “box” made up of skull base and ethmoid, the defect is reconstructed by replacing the flap of pericranial galea, previously elevated during the transcranial coronal approach, inside the cranium. From the endonasal side, a layer of connective tissue (temporal fascia) is placed to reinforce the site of repair. To provide additional support the grafts are packed with Spongostan gelatin foam (Fig. 59).
6.0 Clinical Cases

6.1 Apoplectic Adenoma with Bilateral Compression of the Optic Chiasm and Cavernous Sinus

Clinical Findings
The patient presented with severe, exacerbating headache and ensuing manifestation of right-sided ptosis and diplopia. Visual field testing showed temporal hemianopsia in the left eye and upper temporal quadrant in the right eye. The cranial MR scan showed an expanding sellar lesion with apoplectic component of about 4 cm in diameter, with compression of the medial walls of both cavernous sinuses, particularly on the right side, and displacement of the optic chiasm (Figs. 60–62).

Surgical Procedure
We performed a combined endonasal endoscopic and bilateral paraseptal approach with drilling of the sphenoid rostrum, removal of the intersphenoidal septum, and drilling of the sella turcica deformed by the tumor mass. The erosion of the bony clivus wall was evident. Removal of the heteroplasia following coagulation and stellate incision of the dura. Intrasellar evacuation of the lateral recesses under continuous irrigation (hydroscopy) using 45° endoscopes. The medial walls of the cavernous sinuses appeared bilaterally displaced but not infiltrated (Figs. 63–66).
Post-operative Course
The MRI scan of the hypophysis taken on the first post-operative day showed the outcome of surgery. The cavernous sinuses and anterior recesses of the third ventricle demonstrated normal appearance in terms of shape and symmetry. The suprasellar cistern was free of disease (Figs. 67–69).
Clinically, the patient presented regression of the deficits of the right third and sixth cranial nerves on the first post-operative day. The patient was discharged five days after surgery.
The visual field was tested one month after surgery and appeared normal. Neither early nor late deficits of the hypothalamic-pituitary axis occurred. Endoscopic follow-up was performed on a regular basis (Fig. 70). Histopathological features were compatible with apoplectic pituitary adenoma.

![Image](image_url)

**Fig. 67**
Axial T1-weighted MR scan after administration of contrast agent.

**Fig. 68**
Coronal T1-weighted MRI scan after administration of contrast agent: integrity of the pituitary stalk is demonstrated, the residual adenohypophysis and the disease-free suprachiasmatic cistern are visible.

*ss* = sphenoid sinus
*sf* = sellar floor
*ssf* = floor of the sphenoid sinus

**Fig. 69**
Sagittal T1-weighted MR scan after administration of contrast agent: the optic chiasm is free from compression, the configuration of the anterior recesses of the third ventricle and the course of the pituitary stalk are in normal condition.

**Fig. 70**
One month after surgery, endoscopic control. Reabsorption of the hemostatic packing and complete mucosal re-epithelialization of the sinus cavity can be demonstrated, with no signs of poorly ventilated mucosa.

*sf* = sellar floor
*ssf* = floor of the sphenoid sinus
6.2 Macroadenoma with Suprasellar Extension

Clinical Findings
The patient presented with progressive loss of vision and subsequent onset of increasing diplopia. Visual field testing showed bitemporal hemianopsia. The cranial MRI scan demonstrated an expansive sellar lesion of about 2 x 1.5 x 1.2 cm in size with suprasellar extension occupying the corresponding cistern. The optic chiasm appeared compressed and displaced cranially (Fig. 71).

Surgical Procedure
The endonasal endoscopic access was created using a bilateral paraseptal approach with drilling of the sphenoid rostrum, after a left turbinoplasty. After drilling the intersphenoidal septa and the sellar floor, spontaneous pressure-related descent of the adenoma was visible. The sellar cavity was inspected with angled curettes, and the residual tumor was removed using grasping forceps. Intraseellar exploration was performed under irrigation (hydroscopy) and the residual adenopituitary gland was localized (Figs. 72–73).
Post-operative Course
The post-operative course was normal without any neurological, ophthalmologic or endocrine complications. The patient was discharged six days after surgery.

MRI of the hypophysis, three months after surgery, shows the total removal of the expansive lesion and the absence of compression at the level of the optic chiasm or supraoptic and infundibular recesses of the third ventricle.

The visual field was tested three months after surgery and showed substantial improvement with a slight residual bitemporal visual field deficit. One year after surgery, there was no more evidence of deficits in the hypothalamic-pituitary axis (Figs. 74–77).

Histopathological features consistent with a null cell type non-secreting pituitary adenoma.

Fig. 74 Endoscopic control one month after surgery. In the right nasal fossa, the paraseptal surgical access route is visible, confirming the integrity of the middle turbinate without scars. There was no evidence of poor ventilation affecting the nasal fossae.

Fig. 75 Endoscopic follow-up one month after the surgery. Complete mucosal re-epithelialization of the sphenoid sinus with no signs of poor ventilation.

sf = sellar floor
c = clivus
pcica = paraclival internal carotid artery

Fig. 76 Coronal T1-weighted MR after administration of contrast agent: postoperative follow-up three months after surgery. The correct position of the pituitary stalk and residual adenohypophysis can be demonstrated.

ps = pituitary stalk
ss = sphenoid sinus

Fig. 77 Sagittal T1-weighted MR after administration of contrast agent: postoperative follow-up three months after surgery. The suprasellar cistern appears free of disease and the optic chiasm is in place.

it = inferior turbinate
sf = sellar floor
ss = sphenoid sinus
6.3 Removal of a Right Ethmoidal Meningoencephalocele with Preservation of the Middle Turbinat

Clinical Findings and Surgery
The patient was referred to us following an episode of meningitis and with a continuous CSF leak, diagnosed with a dosage of beta-2-transferrin. The surgery required removal of the herniated part of the brain and duraplasty corresponding to the bony defect, with preservation of the middle turbinate. Duraplasty was performed with the three-layer technique, using autologous and heterologous materials (Figs. 78–85).
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Post-operative Course

Six months after surgery, endoscopic control and MR showed stable attachment of the muco-perichondrial flap and the absence of a CSF leak, with no signs of intracranial hypertension (Figs. 86–87).

Fig. 83
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. Placement of the free intracranial extradural graft of septal cartilage.
- **bl** = basal lamella
- **sc** = septal cartilage
- **er** = ethmoidal roof

Fig. 84
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. Placement of the free overlay graft of septal mucoperichondrium.
- **bl** = basal lamella
- **sc** = septal cartilage
- **er** = ethmoidal roof
- **smp** = septal mucoperichondrium

Fig. 85
Endoscopic view with 45° endoscope, diam. 4 mm, right nasal fossa. The flap is kept in a stable position by means of absorbable sponges.
- **er** = ethmoidal roof
- **sp** = absorbable sponges

Fig. 86
MR six months after the surgery confirmed the stable attachment of the flap and continuous integrity of duraplasty.
- **fso** = frontal sinus ostium
- **mt** = middle turbinate
- **er** = ethmoidal roof

Fig. 87
Endoscopic follow-up at six months, showing healthy graft mucosa and complete closure of the defect.
- **Mt** = middle turbinate
- **er** = ethmoidal roof
- **fso** = frontal sinus ostium
6.4 Removal of a Right Ethmoidal Tumor with Multilayer Centripetal Technique and Endoscopic Medial Maxillectomy

Clinical Findings and Surgery

The patient was referred to us with symptoms of nasal obstruction and epistaxis. The endoscopic examination revealed a right ethmoidal neoplasm occupying nearly all of the nasal fossa. A CT without contrast and a gadolinium-enhanced MRI were performed followed by biopsy with histopathological diagnosis of an intestinal-type adenocarcinoma G3 (T4N0M0). The neoplasm was removed by centripetal endoscopic technique followed by reconstruction of the anterior skull base (Figs. 88–100).

Fig. 88
The gadolinium-enhanced coronal MR scan shows a right ethmoidal neoplasm completely occupying the nasal fossa. Neither the periorbit nor the walls of the maxillary sinus show any signs of infiltration. The neoplasm appears slightly enhanced and is in contact with the dura, however there is no evidence of intracranial invasion. The maxillary sinus is filled with inflammatory fluid.

Fig. 89
The gadolinium-enhanced axial MR scan shows a right ethmoidal neoplasm. Neither the periorbit nor the sphenoid sinus walls show any signs of infiltration. The sphenoid sinus cavity appears to be occupied by secretions.

Fig. 90
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Preoperative endoscopy demonstrates a neoplasm completely occupying the right nasal fossa.

Fig. 91
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. The volume of the lesion is reduced by removing the intranasal part by use of a diode laser.

Fig. 92
External view obtained with a 0° endoscope, diam. 4 mm. Surgical removal of the intranasal part of the tumor mass through a transnasal approach.

Fig. 93
Endoscopic view, 45° endoscope, diam. 4 mm, right nasal fossa. Horseshoe incision to elevate a sinonasal subperiosteal layer.

Fig. 94
External view obtained with a 0° endoscope, diam. 4 mm. Intra-operative specimen consisting of sinonasal periosteum, removed by centripetal technique, and of part of the residual tumor wrapped en bloc with the ethmoid.

Fig. 88

Fig. 89

Fig. 90

Fig. 91

Fig. 92

Fig. 93

Fig. 94
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Fig. 95
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Removal of the bony margins of the “resection box” started by inferior transection of the nasal septum, in this case performed with a diode laser.
ch = choana
nf = nasal floor
s = nasal septum

Fig. 96
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Drilling of the anterior skull base in correspondence with the olfactory cleft.
of = olfactory cleft

Fig. 97
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Resection of the dura and right olfactory bulb by endonasal endoscopic approach.
★ = dura mater of the olfactory cleft, including the olfactory bulb

Fig. 98
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Once the dura has been removed from the olfactory cleft, it is possible to localize the frontal cerebral lobe through the defect.
FL = frontal cerebral lobe
s = nasal septum

Fig. 99
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Underlay placement of the heterologous graft of dural substitute.
Dp = patch of dural substitute

Fig. 100
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. Overlay placement of the autologous graft of septal muco-perichondrium.
Smp = septal muco-perichondrium

Post-operative Course
The patient is free of disease 18 months after surgery (Fig. 101).

Fig. 101
Twelve months after surgery, the gadolinium-enhanced coronal MR scan shows no signs of recurrence at the ethmoidal level. There is slight uptake of contrast at the level of the ethmoidal roof indicating trophic scar after skull base duraplasty. The MRI scan also gives evidence of post-operative scar at the level of the maxillary sinus after medial maxillectomy.
6.5 Removal of a Meningoencephalocele of the Olfactory Cleft with Preservation of the Middle Turbinate

Clinical Presentation and Surgery
The three-year-old patient was referred to us with rhinorrhea and unilateral right nasal obstruction from one year. Nasal endoscopy showed a large mass, grayish in color, occupying the right nasal fossa and consistent with meningoencephalic herniation. The T2-weighted MR scan confirmed the diagnosis. Removal of the lesion was performed with a direct paraseptal approach, and the skull base duraplasty was performed with three layers of dural substitute, septal cartilage and septal mucoperichondrium (Figs. 102–104).

Post-operative Course
Four years after surgery, the patient presented with a stable condition of the anterior skull base duraplasty (Figs. 105–107).

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Fig. 102
T2-weighted coronal MR scan showing bulky meningoencephalic herniation completely occupying the right nasal fossa. ★ = meningoencephalocele

Fig. 103
Sagittal MR scan, which shows the herniated meningoencephalocele and the cribriform plate at the level of the olfactory cleft. ★ = meningoencephalocele

Fig. 104
Endoscopic view, 0° endoscope, diam. 4 mm, right nasal fossa. The meningoencephalocele, colored in gray, and originating from the olfactory cleft, entirely occupies the nasal fossa. The green color is due to lumbar intrathecal injection of 5% fluorescein (0.5 ml). Mt = middle turbinate; s = nasal septum; of = olfactory cleft; ★ = meningoencephalocele

Fig. 105
MR scan in coronal section confirming the correct placement of the graft and the integrity of the duraplasty.

Fig. 106
Radiological follow-up four years after surgery. The sagittal MR scan demonstrates complete resection of the meningoencephalocele and confirms integrity of the skull base at the level of the duraplasty.

Fig. 107
Endoscopic view, endoscope 45°, diam. 4 mm, right nasal fossa. Endoscopic follow-up four years after surgery. The muco-periosteal graft appears trophic and is in the correct place in the olfactory cleft. No signs of cerebrospinal fluid leak.
6.6 Removal of a Sinonasal Intestinal-type Adenocarcinoma by a Combined Cranioendoscopic Approach

Clinical Findings and Surgery
The patient was referred to us complaining of unilateral nasal obstruction. He had CT and MRI with contrast followed by biopsy giving histopathological evidence of an intestinal-type adenocarcinoma. To remove the mass surgery was performed using a combined cranioendoscopic approach with reconstruction of the anterior skull base (Figs. 108–113).

Fig. 108
Gadolinium-enhanced MR scan showing a bulky ethmoidal neoplasm with intracranial extension and pronounced enhancement. ★ = tumor mass

Fig. 109
Gadolinium-enhanced sagittal MR scan. The arrow indicates the intracranial extension of the neoplasm above the ethmoidal roof with invasion of the frontal cerebral lobe.

Fig. 109
Endoscopic intranasal view, 0° endoscope, diam. 4 mm, left nasal fossa. Endoscopy shows, that the neoplasm is at the level of the left middle meatus.

Fig. 110
Gadolinium-enhanced sagittal MR scan. The arrow indicates the intracranial extension of the neoplasm above the ethmoidal roof with invasion of the frontal cerebral lobe.

Fig. 111
Intranasal endoscopic view, 0° endoscope, diam. 4 mm. Duraplasty of the anterior skull base with suture of the pericranial flap to the ethmoidal-sphenoidal planum. esp = ethmoidal-sphenoidal planum

Fig. 112
External view demonstrating the simultaneous four-hands collaboration of the neurosurgeon and of the otolaryngologist. The otolaryngologist (ent) holds the endoscope in the left hand and the operating instrument in the right hand, while the neurosurgeon (ns) holds the bipolar electrocoagulator in the right hand and the suction in the left hand.

Fig. 113
Intranasal endoscopic view, 0° endoscope, diam. 4 mm. The picture shows the reconstruction of the ethmoido-sphenoidal roof using a pedicled graft of pericranium.

- esp = ethmoidal-sphenoidal planum
- po = periorbit
- ms = maxillary sinus
- ss = sphenoid sinus
- tf = temporal fascia
- ★ = vegetating part of the neoplasm
- s = nasal septum
- up = uncinate process
- mt = middle turbinate
- lw = lateral nasal wall
At four years follow up, the pericranial flap positioned to reconstruct the anterior skull base appears trophic. There is no evidence of CSF leak or recurrence of the disease. At the level of the previously removed anterior sphenoid sinus wall, there is a central sphenoid neo-ostium due to excessive scarring. 

post-operative course

The patient had post-operative radiotherapy (56 Gy) and is free of disease four years after surgery (Figs. 114–116).
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

References


Other articles published by the same authors:


Instrument Set for Endoscopic Surgical Technique
“Two Nostrils – Four Hands”

Extracts from the following catalogs:
ENDOSCOPES and INSTRUMENTS for ENT and TELEPRESENCE,
IMAGING SYSTEMS, DOCUMENTATION and ILLUMINATION
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

HOPKINS® Telescopes – autoclavable
diameter 2.7 mm / 4 mm, length 18 cm

It is recommended to check the suitability of the product for the intended procedure prior to use.
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

HOPKINS® Telescopes – autoclavable
diameter 3 mm, length 14 cm

7220 AA–FA

7220 AA  HOPKINS® Straight Forward Telescope 0°,
enlarged view, diameter 3 mm, length 14 cm, autoclavable,
fiber optic light transmission incorporated, color code: green

7220 BA  HOPKINS® Forward-Oblique Telescope 30°,
enlarged view, diameter 3 mm, length 14 cm, autoclavable,
fiber optic light transmission incorporated, color code: red

7220 CA  HOPKINS® Lateral Telescope 70°,
enlarged view, diameter 3 mm, length 14 cm, autoclavable,
fiber optic light transmission incorporated, color code: yellow

7220 FA  HOPKINS® Forward-Oblique Telescope 45°,
enlarged view, diameter 3 mm, length 14 cm, autoclavable,
fiber optic light transmission incorporated, color code: black

Wire Tray for Cleaning, Sterilization and Storage

39501 A1  Wire Tray for Cleaning, Sterilization and Storage
of one rigid endoscope, including holder for light post adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 290 x 60 x 52 mm, for rigid endoscopes with up to diameter 5 mm and working length 20 cm

39501 A2  Wire Tray for Cleaning, Sterilization and Storage,
of two rigid endoscopes and one light cable, including holder for adaptors, silicone telescope holders and lid, external dimensions (w x d x h): 352 x 125 x 54 mm, for rigid endoscopes with up to diameter 10 mm and working length 20 cm
KARL STORZ CLEARVISION® II System
for intra-operative irrigation of the telescope lens

One-pedal footswitch

Silicone tubing set

UNIT SIDE

PATIENT SIDE

40334101 KARL STORZ CLEARVISION® II Set,
Lens irrigation system for telescopes,
power supply: 100–240 VAC, 50–60 Hz
including:
CLEARVISION® II
Mains Cord
One-pedal Footswitch
Silicone Tubing Set

*) Optional Accessories:
MTP 031229-10 Single-use tubing set.
For use with CLEARVISION® II, Sterile, 10 per pack

Irrigation sheath
KARL STORZ CLEARVISION® II
Irrigation Sheath for use with CLEARVISION® II System

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Elevators, Curettes and Knives

- **479100** COTTLE Elevator, double-ended, semisharp and blunt, graduated, length 20 cm
- **660500** Sickle Knife, slightly curved, pointed, length 18 cm
- **660506** Round Knife, vertical cutting, 3.5 x 2.5 mm, length 18 cm
- **660509** Round Knife, angled 45°, diameter 2 mm, length 18 cm

- **628702** Antrum Curette, oblong, small size, length 19 cm
- **628712** KUHN-BOLGER Frontal Sinus Curette, 55° curved, oval, forward cutting, length 19 cm

**STAMMBERGER RHINOFORCE® II Forceps**

- **651010** STAMMBERGER RHINOFORCE® II Forceps, cupped jaws, vertical opening, 65° upturned, cupped jaws diameter 3 mm, with cleaning connector, working length 12 cm
- **651020** Same, horizontal opening
**STAMMBERGER Punch**

651055  **STAMMBERGER Punch**, circular cutting, for sphenoid, ethmoid and choanal atresia, diameter 3.5 mm, with cleaning connector, working length 18 cm, including Cleaning Tool 651050 R

651050  **Same**, diameter 4.5 mm

651060  **STAMMBERGER Punch**, circular cutting, 65° upturned, for frontal sinus recess, diameter 3.5 mm, with cleaning connector, working length 17 cm, including Cleaning Tool 651050 R

651065  **Same**, diameter 4.5 mm

651061  **STAMMBERGER Punch**, egg-shaped tip, circular cut, 90° cutting direction, tip diameter 3.5 mm, sheath 65° upturned, for frontal sinus recess, with cleaning connector, working length 17 cm

651066  **Same**, diameter 4.5 mm

**Cleaning Tool**

651050 R  **Cleaning Tool**, for circular cutting punches type 651050 / 651055 / 60 / 65, double-ended, length 14 cm
HOSEMANN Frontal Sinus/Recess Punch
HOSEMANN Sphenoid Punch
with integrated irrigation channel

651503
HOSEMANN Frontal Sinus/Recess Punch,
70° upturned, slender model, punch head diameter
3.5 mm, not through-cutting, upper part of punch fixed,
lower part of punch movable, sheath diameter 2.5 mm,
integrated irrigation channel with LUER-Lock,
working length 13 cm

651504
HOSEMANN Sphenoid Punch,
straight, slender model, punch head diameter 3.5 mm,
ot through-cutting, front part of punch fixed,
rear part of punch movable, sheath diameter 2.5 mm,
integrated irrigation channel with concealed LUER-Lock
irrigation adaptor, working length 13 cm

BLAKESLEY RHINOFORCE® II Nasal Forceps

456000 B
BLAKESLEY RHINOFORCE® II
Nasal Forceps, straight, size 0,
with cleaning connector,
working length 13 cm

456500 B
BLAKESKEY-WILDE
RHINOFORCE® II Nasal Forceps,
45° upturned, size 0,
with cleaning connector,
working length 13 cm
BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps
end of sheath 25° upturned

BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps, end of sheath 25° upturned, jaws 45° angled upwards, width 3.5 mm, with cleaning connector, working length 13 cm

GRÜNWALD-HENKE RHINOFORCE® II Nasal Forceps

GRÜNWALD-HENKE RHINOFORCE® II Nasal Forceps, straight, through-cutting, tissue-sparing, BLAKESLEY shape, size 0, width 3 mm, with cleaning connector, working length 13 cm

Same, 45° upturned
BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps
end of sheath 25° upturned

456009 B  BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps, end of sheath 25° upturned, with straight jaw, width 2.5 mm, with cleaning connector, working length 13 cm

456010 B  BLAKESLEY-CASTELNUOVO RHINOFORCE® II Nasal Forceps, end of sheath 25° upturned, with straight jaws, width 3 mm, with cleaning connector, working length 13 cm

456509 B  Same, jaws 45° upturned, width 2.5 mm

456510 B  Same, jaws 45° upturned, width 3 mm

451010 B  CASTELNUOVO RHINOFORCE® II Nasal Forceps, end of sheath 25° upturned, through-cutting, with straight jaws, BLAKESLEY shape, width 3 mm, with cleaning connector, working length 13 cm

451510 B  Same, jaws 45° upturned
### SILCUT® Nasal Forceps

**Special features:**
- Tactile instrument feedback
- Uniform patented force transmission
- Powerful resection under precise control
- Accurate incision due to small tolerances
- Special cutting geometry to prevent tissue from slipping
- Large aperture angle
- Flat jaws
- Through-cutting and backward-cutting versions also available

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RHINOFORCE® II Nasal Scissors

- **RHINOFORCE® II, Nasal Scissors**, straight, small model, length of cut 10 mm, with cleaning connector, working length 13 cm
- **RHINOFORCE® II, Nasal Scissors**, curved to right
- **RHINOFORCE® II, Nasal Scissors**, curved to left

RHINOFORCE® II Miniature Nasal Forceps

- **RHINOFORCE® II Miniature Nasal Forceps**, with extra fine flat jaws, through-cutting, tissue-sparing, straight sheath, straight jaws, width of cut 1.5 mm, with cleaning connector, working length 13 cm
- **RHINOFORCE® II Miniature Nasal Forceps**, jaws upturned 45°
- **RHINOFORCE® II Miniature Nasal Forceps**, sheath curved 30°, straight jaws
- **RHINOFORCE® II Miniature Nasal Forceps**, sheath curved 30°, jaws 45° upturned
CASTELNUOVO **RHINOFORCE® II** Miniature Nasal Forceps

452841 CASTELNUOVO **RHINOFORCE® II** Miniature Nasal Forceps, with extra fine flat jaws, through-cutting, tissue-sparing, 65° upturned, backward opening, width of cut 1.5 mm, with cleaning connector, working length 13 cm

452841 L **Same**, left side opening

452841 R **Same**, right side opening

HEUWIESER **Antrum Grasping Forceps**

653000 HEUWIESER **Antrum Grasping Forceps**, jaws curved downwards, fixed jaw curved 90°, movable jaw backward opening 120°, with cleaning connector, working length 10 cm

653005 HEUWIESER **Antrum Grasping Forceps**, with extra long curve for anterior alveolar recess, fixed jaw curved downwards 115°, movable jaw backward opening up to 140°, with cleaning connector, working length 10 cm
CASTELNUOVO Sphenoid Punch

CASTELNUOVO Sphenoid Punch, rigid, 65° upbiting forward cutting, size 3.5 x 3.7 mm, fixed jaw extra thin, working length 11 cm

CASTELNUOVO Sphenoid Punch, rigid, 30° upturned, not through-cutting, upbiting forward cutting, fixed jaw extra flat, size 2 x 2 mm, working length 11 cm

PARSONS RHINOFORCE® II Punch

PARSONS RHINOFORCE® II Punch, for partial resection of the uncinate process, upside backward cutting, movable jaw with round tip, diameter 2.5 mm, with cleaning connector, working length 10 cm

OSTRUM Rotating Antrum Punch

Rotating Punch, for resection of the uncinate process, with set screw, backward cutting, sheath slightly curved downwards, small size, bite 2.3 x 4 mm, with cleaning connector, working length 9 cm
STAMMBERGER Antrum Punch

459051 STAMMBERGER Antrum Punch, right side downward and forward cutting, working length 10 cm

459052 Same, left side downward and forward cutting

CASTELNUOVO TAKE-APART® Bipolar Forceps

462020 CASTELNUOVO TAKE-APART® Bipolar Forceps with fine jaws, width 2 mm, distally angled 45°, outer diameter 3.4 mm, working length 14 cm, with irrigation connection for cleaning, including:

Handle
Outer Sheath
Inner Sheath
Bipolar Insert
CASTELNUOVO Frontal Sinus Probe and Positioning Instrument

629820    Probe, double-ended, maxillary sinus ostium seeker, ball-shaped ends diameter 1.2 and 2 mm, length 19 cm

629822    CASTELNUOVO Positioning Instrument, double-ended, curved/double curved, with 4 spikes, length 22 cm

629823    CASTELNUOVO Positioning Instrument, double-ended, straight/curved 60°, with 4 spikes, length 22 cm

629824    CASTELNUOVO Frontal Sinus Probe, curved, double-ended, length 22 cm
CASTELNUOVO Elevators, double-ended
CASTELNUOVO Suction Elevators

28164 EA  CASTELNUOVO Elevator, double-ended, semisharp and blunt, length 26 cm

28164 EB  Same, angled end shovel-shaped, semisharp, blunt end slightly curved

28164 EC  Same, blunt end angled, semisharp end slightly curved, graduated

474015  CASTELNUOVO Suction Elevator, flat tip, 5 x 1.8 mm, lateral suction opening, bayonet-shaped, with grip plate, length 21 cm

474016  CASTELNUOVO Suction Elevator, flat tip, 3 x 1.8 mm, lateral suction opening, bayonet-shaped, with grip plate, length 21 cm

474017  CASTELNUOVO Suction Elevator, 5 x 1.8 mm, double curved, length 21 cm

474018  CASTELNUOVO Suction Elevator, 3 x 1.8 mm, double curved, length 21 cm
STRÜMPEL Nasal Forceps

**STRÜMPEL Forceps**, with oval, fenestrated, cupped jaws, 45° upturned, width 2.5 mm, working length 12.5 cm

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**Forceps**

**Forceps**, straight, not through-cutting, with oval, fenestrated cupped jaws, width 2.5 mm, working length 18 cm

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**Forceps**, 45° upturned, not through-cutting, extra sharp, with oval, fenestrated spoon, width 1.5 mm, working length 18 cm, color code: one blue handle
**RHINOFORCE® II Nasal Forceps**

- **28164 UA** RHINOFORCE® II Nasal Forceps, with extra fine flat jaws, through-cutting, tissue sparing, width of cut 1.5 mm, straight sheath, straight jaws, with cleaning connector, working length 18 cm
- **28164 UB** Same, jaws angled upwards 45°
- **28164 UE** Same, jaws angled downwards 45°

**Scissors**

- **663300** Scissors, straight, working length 18 cm
- **663301** Scissors, straight, delicate, working length 18 cm
- **663302** Scissors, straight, extra delicate, working length 18 cm
- **663304** Same, curved to right
- **663305** Same, curved to left
- **663307** Same, 45° curved upwards
- **663327** Scissors, 45° upwards curve, delicate, shaft 360° rotatable, with cleaning connector, working length 18 cm
Curettes, Dissectors and Elevators

28164 KA Curette, round spoon, tip slightly angled, size 1 mm, with round handle, length 23 cm
28164 KB CAPPABIANCA-de DIVITIIS Curette, round spoon, tip slightly angled, size 2 mm, with round handle, length 23 cm
28164 KF Curette, round spoon, tip highly angled, size 2 mm, with round handle, length 23 cm
28164 KG Same, size 3 mm

28164 RN CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 3 mm, tip angled 45°, with round handle, length 25 cm
28164 RE Same, malleable
28164 RO CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 5 mm, tip angled 45°, with round handle, length 25 cm
28164 RJ Same, malleable
28164 RI CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 3 mm, tip angled 90°, with round handle, length 25 cm
28164 RG Same, inner diameter 5 mm
28164 RB CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 3 mm, laterally curved sheath end, with round handle, length 25 cm
28164 RD CAPPABIANCA-de DIVITIIS Ring Curette, with round wire, inner diameter 5 mm, laterally curved sheath end 90°, with round handle, length 25 cm
28164 RW Same, inner diameter 7 mm
28164 RR CAPPABIANCA-de DIVITIIS Curette, blunt, stirrup-shape, with round handle, length 25 cm

28164 DA Dissector, sharp, tip angled 45°, round spatula, with round handle, size 2 mm, length 23 cm
28164 DB Same, size 3 mm
28164 DF Dissector, sharp, tip angled 15°, flat long spatula, with round handle, size 1.5 mm, length 23 cm
28164 DS Elevator, sharp, tip angled 15°, slightly curved spatula, with round handle, size 2 mm, length 23 cm
28164 DM Elevator, sharp, straight tip, slightly curved spatula, with round handle, size 3 mm, length 23 cm
de DIVITIIS-CAPPABIANCA Scalpel
Round Knife

28164 M  de DIVITIIS-CAPPABIANCA Scalpel, with retractable blade, length 23 cm, including:
Handle
Outer Sheath
Micro Knife, pointed

28164 KK  de DIVITIIS-CAPPABIANCA Scalpel, with retractable blade, length 23 cm, including:
Handle
Outer Sheath
Micro Knife, sickle-shaped

28164 MP  Round Knife, vertical, oval, with round handle, 3.5 x 2.5 mm, length 25 cm

de DIVITIIS-CAPPABIANCA Suction Curettes, with stylet, basket-shaped and hook-shaped

28164 RSB  CAPPABIANCA-de DIVITIIS Suction Curette, blunt, inner diameter 5 mm, tip angled 45°, Luer, length 25 cm

28164 RSC  Same, inner diameter 7 mm

28164 RT  CAPPABIANCA-de DIVITIIS Suction Curette, with basket, round, size 5 mm, rotatable tube, Luer, length 25 cm

28164 RU  Same, size 6.5 mm

28164 HKL  Hook Curette, curved to left, hook width 2.5 mm, hook size 0.5 mm, length 25 cm

28164 HKR  Hook Curette, curved to right, hook width 2.5 mm, hook size 0.5 mm, length 25 cm
CASTELNUOVO **Hook and Suction Tube**

**28164 H**

CASTELNUOVO **Hook**, 90°, blunt, with round handle, length 25 cm

**28164 X**

CASTELNUOVO **Suction Tube**, diameter 2 mm, malleable, lateral suction holes, working length 25 cm

**Fluorescein Blue Filter System**

**20100032**

**Fluorescein Blue Filter System** for fluorescence diagnosis, with 2 rotatable integrated blue filters of different spectral characteristic and additional passage for white light illumination, for use with KARL STORZ cold light fountains and fiber optic light cables. The use of fluorescein barrier filter **20100033** is recommended

**20100033**

**Fluorescein Barrier Filter**, for use with fluorescein blue filter systems **20100032** and HOPKINS® telescopes series 7230, for visual observation or for connection to KARL STORZ Endovision® video cameras
Antrum Cannulas

586125  v. EICKEN Antrum Cannula, Luer-Lock, long curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm

586130  Same, outer diameter 3 mm

586225  v. EICKEN Antrum Cannula, Luer-Lock, short curved, outer diameter 2.5 mm, length 12.5 cm

586230  Same, outer diameter 3 mm

586145  v. EICKEN-CASTELNUOVO Antrum Cannula, Luer-Lock, S-shaped slightly curved, malleable, serrated grip plate, outer diameter 2.5 mm, length 12.5 cm

586146  Same, S-shaped strongly curved
Suction Tube

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>722830</td>
<td><strong>Suction Tube</strong>, angular, with grip plate and cut-off hole, Luer-Lock, outer diameter 3 mm, working length 14 cm</td>
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<tr>
<td>649180 N</td>
<td>FERGUSON-CASTELNUOVO <strong>Suction Tube</strong>, without cut-off hole, with stylet, Luer, diameter 2 mm, working length 15 cm</td>
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<tr>
<td>649182 BU</td>
<td>FERGUSON-CASTELNUOVO <strong>Suction Tube</strong>, with cut-off hole and mandrel, with calibration markings, lateral opening downwards, diameter 2.5 mm, working length 15 cm</td>
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<tr>
<td>649183</td>
<td>FERGUSON <strong>Suction Tube</strong>, with cut-off hole and stylet, Luer, 10 Fr., working length 15 cm</td>
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<tr>
<td>662882</td>
<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angular, tip curved upwards, ball end, with grip plate and cut-off hole, Luer, diameter 2.4 mm, working length 13 cm</td>
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<tr>
<td>662883</td>
<td><em>Same</em>, tip curved downwards</td>
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<tr>
<td>662885</td>
<td>FRANK-PASQUINI <strong>Suction Tube</strong>, angular, tip curved upwards, ball end, with grip plate and cut-off hole, Luer, diameter 3 mm, working length 13 cm</td>
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</tr>
<tr>
<td>662886</td>
<td><em>Same</em>, tip curved downwards</td>
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Instrument Set for Endonasal Dacryocystorhinostomy

**according to** Prof. CASTELNUOVO

- **CASTELNUOVO Dissector**, 90°, right, double curved, length 19.5 cm
- **CASTELNUOVO Dissector**, 45°, right, double curved, length 19.5 cm
- **CASTELNUOVO Knife**, round, 45°, horizontal, diameter 2 mm, double curved, length 19.5 cm
- **CASTELNUOVO Palpation Probe**, 90°, double curved, length 19.5 cm
Knives, Elevator, Hook and WILDER Dilator

BOWMAN Lachrymal Probe, Light Transmission Probe

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
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<tr>
<td>748000</td>
<td>Surgical Handle, Fig. 7, length 16.5 cm, for Blades 208010–15, 208210–15</td>
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<tr>
<td>208215</td>
<td>Blade, Fig. 15, sterile, package of 100</td>
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<tr>
<td>660512</td>
<td>Elevator, sharp, curved to right, length 18 cm</td>
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<tr>
<td>660515</td>
<td>Elevator, sharp, curved to left, length 18 cm</td>
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<tr>
<td>660521</td>
<td>Hook, 90°, blunt, length 18 cm</td>
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<tr>
<td>745900</td>
<td>WILDER Dilator, for salivary duct, length 11 cm</td>
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<tr>
<td>634840</td>
<td>BOWMAN Lachrymal Probe, length 13 cm including:</td>
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<td>Probe, size 0000–000</td>
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<td></td>
<td>Probe, size 00–0</td>
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<tr>
<td></td>
<td>Probe, size 1–2</td>
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<tr>
<td>496 V</td>
<td>Light Transmission Probe, for diaphanoscopic localization of the nasolacrimal ducts and fistulae, diameter of distal tip 0.5 mm, sterile, for single use, for use with Fiber Optic Light Cable 495 NL, package of 3</td>
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</tbody>
</table>
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

UNIDRIVE® S III ENT SCB/UNIDRIVE® S III ECO

The multifunctional unit for ENT

**Special Features:**

- **Touch Screen:** Straightforward function selection via touch screen
- Set values of the last session are stored
- Optimized user control due to touch screen
- Choice of user languages
- Operating elements are single and clear to read due to color display

One unit – multifunctional:
- Shaver system for surgery of the paranasal sinuses and anterior skull base
- INTRA Drill Handpieces (40,000 rpm and 80,000 rpm)
- Sinus Shaver
- Micro Saw
- Dermatome
- High-Speed Handpieces (60,000 rpm and 100,000 rpm)

Two motor outputs: Two motor outputs enable simultaneous connection of two motors:
- For example, a shaver and micro motor

- Soft start function
- Textual error messages

Integrated irrigation and coolant pump:
- Absolutely homogeneous, micro-processor controlled irrigation rate throughout the entire irrigation range
- Quick and easy connection of the tubing set

Easy program selection via automated motor recognition

Continuously adjustable revolution range

Maximum number of revolutions and motor torque: Microprocessor-controlled motor rotation speed. Therefore the preselected parameters are maintained throughout the drilling procedure

Maximum number of revolutions can be preset

SCB model with connections to the KARL STORZ Communication Bus (KARL STORZ-SCB)

Irrigator rod included
Motor Systems
Specifications

System specifications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Order No.</th>
<th>rpm</th>
</tr>
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<tbody>
<tr>
<td><strong>Shaver mode</strong></td>
<td></td>
<td></td>
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<tr>
<td>Operation mode:</td>
<td></td>
<td></td>
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<tr>
<td>Max. rev. (rpm):</td>
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<td></td>
</tr>
<tr>
<td>Oscillating in conjunction</td>
<td>40712050</td>
<td>10,000*</td>
</tr>
<tr>
<td>with Handpiece:</td>
<td>40712055</td>
<td>10,000*</td>
</tr>
<tr>
<td>DRILLCUT-X® II Shaver Handpiece</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRILLCUT-X® II N Shaver Handpiece</td>
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<td></td>
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<tr>
<td><strong>Sinus burr mode</strong></td>
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<tr>
<td>Operation mode:</td>
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<td>Max. rev. (rpm):</td>
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<tr>
<td>Rotating in conjunction</td>
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<td>12,000</td>
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<tr>
<td>with Handpiece:</td>
<td>40712055</td>
<td>12,000</td>
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<tr>
<td>DRILLCUT-X® II Shaver Handpiece</td>
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<tr>
<td>DRILLCUT-X® II N Shaver Handpiece</td>
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<tr>
<td><strong>High-speed drilling mode</strong></td>
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<td>Operation mode:</td>
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<tr>
<td>Max. rev. (rpm):</td>
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<tr>
<td>Counterclockwise or clockwise</td>
<td>20712033</td>
<td>60,000/100,000</td>
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<tr>
<td>in conjunction with:</td>
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<td></td>
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<tr>
<td>High-Speed Micro Motor</td>
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<tr>
<td><strong>Drilling mode</strong></td>
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<td>Operation mode:</td>
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<tr>
<td>Max. rev. (rpm):</td>
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<tr>
<td>Counterclockwise or clockwise</td>
<td>[20711033]</td>
<td>40,000/80,000</td>
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<tr>
<td>in conjunction with:</td>
<td>[20711173]</td>
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<tr>
<td>micro motor and connecting</td>
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<tr>
<td>cable</td>
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<tr>
<td><strong>Micro saw mode</strong></td>
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<tr>
<td>Max. rev. (rpm):</td>
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<td></td>
</tr>
<tr>
<td>In conjunction with:</td>
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<td>15,000/20,000</td>
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<td>micro motor and connecting</td>
<td>[20711173]</td>
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</tr>
<tr>
<td>cable</td>
<td></td>
<td></td>
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<tr>
<td><strong>Dermatome mode</strong></td>
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<tr>
<td>Max. rev. (rpm):</td>
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<tr>
<td>In conjunction with:</td>
<td>[20711033]</td>
<td>8,000</td>
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<tr>
<td>micro motor and connecting</td>
<td>[20711173]</td>
<td></td>
</tr>
<tr>
<td>cable</td>
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</tbody>
</table>

**Power supply:**
100–240 VAC, 50/60 Hz

**Dimensions:**
300 x 165 x 265 mm

**Two outputs for parallel connection of two motors**

**Integrated irrigation pump:**
Flow:
Adjustable in 9 steps

*Approx. 4,000 rpm is recommended as this is the most efficient suction/performance ratio.

---

<table>
<thead>
<tr>
<th>UNIDRIVE® S III ENT SCB</th>
<th>UNIDRIVE® S III ECO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Touch Screen:</strong></td>
<td>6.4&quot; / 300 cd/m²</td>
</tr>
<tr>
<td><strong>Weight:</strong></td>
<td>5.2 kg</td>
</tr>
<tr>
<td><strong>Certified to:</strong></td>
<td>IEC 601-1 CE acc. to MDD</td>
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<tr>
<td><strong>Available languages:</strong></td>
<td>English, French, German, Spanish, Italian, Portuguese, Greek, Turkish, Polish, Russian</td>
</tr>
<tr>
<td></td>
<td>numerical codes</td>
</tr>
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</table>
Motor Systems

Special features of high-performance EC micro motor II and of the high-speed micro motor:

- Self-cooling, brushless high-performance EC micro motor
- Smallest possible dimensions
- Autoclavable
- Reprocessable in a cleaning machine
- Detachable connecting cable

- INTRA coupling enables a wide variety of applications
- Maximum torque 4 Ncm
- Number of revolutions can be continuously adjusted up to 40,000 rpm
- Provided a suitable handle is used, the number of revolutions can be continuously adjusted up to 80,000 rpm

---

**High-Performance EC Micro Motor II**, for use with UNIDRIVE® II/UNIDRIVE® ENT/OMFS/NEURO/ECO and Connecting Cable 20711033, or for use with UNIDRIVE® S III ENT/ECO/NEURO and Connecting Cable 20711173

---

**Connecting Cable**, to connect High-Performance EC Micro Motor 20711033 to UNIDRIVE® S III ENT/ECO/NEURO

---

**High-Speed Micro-Motor**, max. speed 60,000 rpm, including connecting cable, for use with UNIDRIVE® S III ENT/NEURO
UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO

Recommended System Configuration

UNIDRIVE® S III ENT SCB

UNIDRIVE® S III ECO

40701620-1

40701420

40701601-1  UNIDRIVE® S III ENT SCB, motor control unit with color display, touch screen, two motor outputs, integrated irrigation pump and SCB module, power supply 100–240 VAC, 50/60 Hz including:

Mains Cord
Irrigator Rod
Two-Pedal Footswitch, two-stage, with proportional function
Clip Set, for use with silicone tubing set
SCB Connecting Cable, length 100 cm
Single Use Tubing Set*, sterile, package of 3

407014 01  UNIDRIVE® S III ECO, motor control unit with two motor outputs and integrated irrigation pump, power supply 100–240 VAC, 50/60 Hz including:

Mains Cord
Two-Pedal Footswitch, two-stage, with proportional function
Clip Set, for use with silicone tubing set
Single Use Tubing Set*, sterile, package of 3

Specifications:

<table>
<thead>
<tr>
<th>Touch Screen</th>
<th>UNIDRIVE® S III ENT SCB: 6,4*/300 cd/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow</td>
<td>9 steps</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–240 VAC, 50/60 Hz</td>
</tr>
</tbody>
</table>

Dimensions w x h x d: 300 x 165 x 265 mm

Weight: 5.2 kg

Certified to: EC 601-1, CE acc. to MDD
UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO
System Components

Two-Pedal Footswitch
Single Use Tubing Set

System Components

UNIT SIDE
PATIENT SIDE

Two-Pedal Footswitch
Single Use Tubing Set

High-Speed Micro-Motor
High-Performance EC Micro Motor II
DRILLCUT-X® II Shaver Handpiece, for use with UNIDRIVE® S III ECO/ENT/NEURO
DRILLCUT-X® II N Shaver Handpiece, optional adaptability to Shaver Tracker, for use with UNIDRIVE® S III ECO/ENT/NEURO

High-Speed Handpiece
INTRA Drill Handpiece

Shaver Blade
Shaver Blade, curved
Sinus Burr

UNIDRIVE® S III ENT SCB
UNIDRIVE® S III ECO
System Components
### Optional Accessories
for UNIDRIVE® S III ENT SCB and UNIDRIVE® S III ECO

<table>
<thead>
<tr>
<th>Item Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>280053</td>
<td><strong>Universal Spray</strong>, 6x 500 ml bottles – HAZARDOUS GOODS – UN 1950 including:</td>
</tr>
<tr>
<td></td>
<td><strong>Spray Nozzle</strong></td>
</tr>
<tr>
<td>280053 C</td>
<td><strong>Spray Nozzle</strong>, for the reprocessing of INTRA burr handpieces, for use with Universal Spray 280053 B</td>
</tr>
<tr>
<td>031131-10*</td>
<td><strong>Tubing Set</strong>, for irrigation, for single use, sterile, package of 10</td>
</tr>
</tbody>
</table>
DRILLCUT-X® Shaver Handpieces

Special Features:

- Max. 10,000 rpm for shaver blades, max. 12,000 rpm for sinus shaver
- Straight suction channel
- Integrated irrigation channel
- Powerful motor, also suitable for harder materials
- Absolutely silent running, no vibration
- Completely immersible and machine-washable
- LOCK allows fixation of shaver blades and sinus shavers
- Extremely lightweight design
- Optional, ergonomic handle, detachable
- Can be adapted to navigation tracker

**DRILLCUT-X® II Shaver Handpiece**, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

**DRILLCUT-X® II N Shaver Handpiece**, optional adaptability to Shaver Tracker 408001 22, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS
DRILLCUT-X® II Shaver Handpiece

Special Features:
- Powerful motor
- Absolutely silent running
- Enhanced ergonomics
- Lightweight design
- Oscillation mode for shaver blades, max. 10,000 rpm
- Rotation mode for sinus shavers, max. 12,000 rpm
- Straight suction channel and integrated irrigation

The versatile DRILLCUT-X® II Shaver Handpiece can be adapted to individual needs of the user.
- Easy hygienic processing, suitable for use in washer and autoclavable at 134° C
- Quick coupling mechanism facilitates more rapid exchange of work inserts
- Proven DRILLCUT-X® blade portfolios can be used

40712050 DRILLCUT-X® II Shaver Handpiece, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40712090 Handle, adjustable, for use with DRILLCUT-X® II 40712050 and DRILLCUT-X® II N 40712055

Optional Accessory:

41250 RA Cleaning Adaptor, LUER-Lock, for cleaning DRILLCUT-X® shaver handpieces
DRILLCUT-X® II Shaver N Handpiece

Special Features:
- Powerful motor
- Absolutely silent running
- Enhanced ergonomics
- Lightweight design
- Oscillation mode for shaver blades, max. 10,000 rpm
- Rotation mode for sinus shavers, max. 12,000 rpm
- Straight suction channel and integrated irrigation
- The versatile DRILLCUT®-X II Shaver N Shaver Handpiece can be adapted to the individual needs of the user
- Easy hygienic processing, suitable for use in washer and autoclavable at 134° C
- Quick coupling mechanism facilitates more rapid exchange of working inserts
- Proven DRILLCUT-X® blade portfolios can be used
- Optional adaptability to Shaver Tracker 408001 22
- Allows shaver navigation when used with NPU 408000 01

40712055

40712055 DRILLCUT-X® II N Shaver Handpiece, optional adaptability to Shaver Tracker 408001 22, for use with UNIDRIVE® S III ECO/ENT/NEURO/OMFS

40712090

40712090 Handle, adjustable, for use with DRILLCUT-X® II 40712050 and DRILLCUT-X® II N 40712055

Optional Accessory:

41250 RA

41250 RA Cleaning Adaptor, LUPER-Lock, for cleaning DRILLCUT-X® shaver handpieces
Handle for DRILLCUT-X® II Shaver Handpiece
for use with DRILLCUT-X® II 40 7120 50 and DRILLCUT-X® II N 40 7120 55

Special Features:
- Ergonomic design
- Ultralight construction
- Easy handle control allows individual adjustment
- The adjustable handle can be mounted to DRILLCUT®-X II or -X II N Shaver Handpiece
- Easy fixation via rotary lock
- Sterilizable

40 7120 90 Handle, adjustable, for use with DRILLCUT-X® II 40 7120 50 and DRILLCUT-X® II N 40 7120 55
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

Shaver Blades, straight, sterilizable

<table>
<thead>
<tr>
<th>Detail</th>
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<th>Shaver Blade</th>
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</thead>
<tbody>
<tr>
<td>41201 KN</td>
<td>40712050 DRILLCUT-X® II Handpiece</td>
<td>serrated cutting edge, diameter 4 mm, color code: blue-red</td>
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<tr>
<td>41201 KK</td>
<td>40712055 DRILLCUT-X® II N Handpiece</td>
<td>double serrated cutting edge, diameter 4 mm, color code: blue-yellow</td>
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<tr>
<td>41201 GN</td>
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<td>concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green</td>
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<tr>
<td>41201 LN</td>
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<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black</td>
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<td>41201 SN</td>
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<td>straight cutting edge, diameter 4 mm, color code: blue-blue</td>
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<tr>
<td>41201 KSA</td>
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<td>41201 KKSB</td>
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<td>double serrated cutting edge, diameter 2 mm, color code: blue-yellow</td>
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<td>41201 LSA</td>
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<td>concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
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</table>

Optional Accessory:

41200 RA Cleaning Adaptor, LUER-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
### Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

<table>
<thead>
<tr>
<th>Detail</th>
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<tbody>
<tr>
<td>41204 KKB</td>
<td>40712050 DRILLCUT-X® II Handpiece 40712055 DRILLCUT-X® II N Handpiece</td>
<td>curved 35°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
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<tr>
<td>41204 KKF</td>
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<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
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<td>41204 KKB</td>
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<tr>
<td>41204 KKFA</td>
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<td>41204 KKBA</td>
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<td>curved 40°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
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</table>

Optional Accessory:

41200 RA **Cleaning Adaptor**, Luer-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

Shaver Blades, curved 65°, sterilizable

<table>
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<tr>
<td>41203 KNF</td>
<td>40 7120 50 DRILLCUT-X® II Handpiece 40 7120 55 DRILLCUT-X® II N Handpiece</td>
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<tr>
<td>41203 KNB</td>
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<td>curved 65°, cutting edge serrated backwards, diameter 4 mm, color code: blue-red</td>
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<tr>
<td>41203 KKF</td>
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<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
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<tr>
<td>41203 KKB</td>
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<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 KKFA</td>
<td></td>
<td>curved 65°, cutting edge serrated forwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 KKBA</td>
<td></td>
<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41203 GNF</td>
<td></td>
<td>curved 65°, concave cutting edge, oval cutting window, forward opening, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41203 GNB</td>
<td></td>
<td>curved 65°, concave cutting edge, oval cutting window, backward opening, diameter 4 mm, color code: blue-green</td>
</tr>
</tbody>
</table>

Optional Accessory:

Cleaning Adaptor, LUR-Lock, for cleaning the inner and outer blades of reusable Shaver Blades 412xx
Shaver Blades, straight
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

<table>
<thead>
<tr>
<th>Detail</th>
<th>for use with</th>
<th>Shaver Blade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DRILLCUT-X® II Handpiece</td>
<td>length 12 cm</td>
</tr>
<tr>
<td></td>
<td>DRILLCUT-X® II N Handpiece</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>41301 KN</td>
<td>40712050</td>
<td>serrated cutting edge, diameter 4 mm, color code: blue-red</td>
</tr>
<tr>
<td>41301 KK</td>
<td>40712055</td>
<td>double serrated cutting edge, diameter 4 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41301 GN</td>
<td></td>
<td>concave cutting edge, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41301 LN</td>
<td></td>
<td>concave cutting edge, oblique cutting window, diameter 4 mm, color code: blue-black</td>
</tr>
<tr>
<td>41301 SN</td>
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</tr>
<tr>
<td>41301 KSA</td>
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<td>serrated cutting edge, diameter 3 mm, color code: blue-red</td>
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<tr>
<td>41301 KKSA</td>
<td></td>
<td>double serrated cutting edge, diameter 3 mm, color code: blue-red</td>
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<tr>
<td>41301 KKSB</td>
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<tr>
<td>41301 LSA</td>
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<td>concave cutting edge, oblique cutting window, diameter 3 mm, color code: blue-black</td>
</tr>
</tbody>
</table>
Shaver Blades, curved
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

Shaver Blades, curved 35°/40°, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Detail</th>
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<th>Shaver Blade</th>
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<tbody>
<tr>
<td></td>
<td>40712050 DRILLCUT-X® II Handpiece</td>
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<td>40712055 DRILLCUT-X® II N Handpiece</td>
<td>41302 KN</td>
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<tr>
<td></td>
<td>41304 KKF</td>
<td>curved 40°, cutting edge serrated forwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
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<tr>
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<td>41304 KKB</td>
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<td>41304 KKFA</td>
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<td>41304 KKBA</td>
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</table>
**Shaver Blades, curved**

for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

<table>
<thead>
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<tbody>
<tr>
<td>41303 KNF</td>
<td>40 7120 50 DRILLCUT-X® II Handpiece</td>
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<td>41303 KKF</td>
<td>40 7120 55 DRILLCUT-X® II N Handpiece</td>
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<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 4 mm, color code: blue-yellow</td>
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<td>curved 65°, cutting edge serrated backwards, double serrated, diameter 3 mm, color code: blue-yellow</td>
</tr>
<tr>
<td>41303 GNF</td>
<td></td>
<td>curved 65°, cutting edge concave forwards, oval cutting window, diameter 4 mm, color code: blue-green</td>
</tr>
<tr>
<td>41303 GNB</td>
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### Sinus Burrs, curved
for Nasal Sinuses and Skull Base Surgery

For use with DRILLCUT-X® II and DRILLCUT-X® II N

<table>
<thead>
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<th>Detail</th>
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<tr>
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<td>curved 40°, cylindric, drill diameter 3 mm, shaft diameter 4 mm, color code: red-blue</td>
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<tr>
<td>41303 WN</td>
<td>curved 55°, cylindric, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-blue</td>
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<tr>
<td>41305 RN</td>
<td>curved 15°, bud drill, drill diameter 4 mm, shaft diameter 4 mm, color code: red-black</td>
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<tr>
<td>41305 DN</td>
<td>curved 15°, diamond head, drill diameter 3 mm, shaft diameter 4 mm, color code: red-yellow</td>
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</tr>
<tr>
<td>41305 D</td>
<td>curved 15°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow</td>
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<tr>
<td>41305 DW</td>
<td>curved 40°, diamond head, drill diameter 5 mm, shaft diameter 4 mm, color code: red-yellow</td>
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<tr>
<td>41303 DT</td>
<td>curved 70°, diamond head, drill diameter 3.6 mm, shaft diameter 4 mm, color code: red-yellow</td>
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</tbody>
</table>
Accessories for Shaver

39550 A **Wire Tray**, provides safe storage of accessories for KARL STORZ paranasal sinus shaver systems during cleaning and sterilization

*for storage of:*
- Up to 7 shaver attachments
- Connecting cable

Please note: The instruments displayed are not included in the sterilizing and storage tray.
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

INTRA Drill Handpiece
for Surgery in Ethmoid and Skull Base Area

Special Features:
- Tool-free closing and opening of the drill
- Right/left rotation
- Max. rotating speed up to 40,000 rpm / 80,000 U/min
- Detachable irrigation channels
- Lightweight construction
- Operates with little vibrations
- Low maintenance
- Reprocessable in a cleaning machine
- Safe grip

INTRA Drill Handpiece, angled, length 15 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

Same, Transmission 1:2 (80,000 rpm)

INTRA Drill Handpiece, straight, length 13 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

<table>
<thead>
<tr>
<th>Detail</th>
<th>Size</th>
<th>Dia. mm</th>
<th>Standard</th>
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<th>Diamond coarse</th>
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<td>649618</td>
<td>649718</td>
<td>–</td>
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</tr>
<tr>
<td>023</td>
<td>2.3</td>
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<td>649723</td>
<td>649723 G</td>
<td></td>
</tr>
<tr>
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<td>649727 G</td>
<td></td>
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<tr>
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<td>649731</td>
<td>649731 G</td>
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<tr>
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<td>649645</td>
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<td>649745 G</td>
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<td>649750 G</td>
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<td>649760 G</td>
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<td>070</td>
<td>7</td>
<td>649670</td>
<td>649770</td>
<td>649770 G</td>
<td></td>
</tr>
</tbody>
</table>

649600  | **Standard Straight Shaft Burr**, stainless, size 014–070, length 9.5 cm, set of 11
649700  | **Diamond Straight Shaft Burr**, stainless, size 014–070, length 9.5 cm, set of 11
649700 G| **Rapid Diamond Straight Shaft Burr**, stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, size 023–070, length 9.5 cm, set of 9, color code: gold
280033  | **Rack**, for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm
INTRA Drill Handpiece
for Surgery in Ethmoid and Skull Base Area

Special Features:
- Tool-free closing and opening of the drill
- Right/left rotation
- Max. rotating speed up to 40,000 rpm / 80,000 U/min
- Detachable irrigation channels
- Lightweight construction
- Operates with little vibrations
- Low maintenance
- Reprocessable in a cleaning machine
- Safe grip

INTRA Drill Handpiece, angled, length 18 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

INTRA Drill Handpiece, straight, length 17 cm, transmission 1:1 (40,000 rpm), for use with KARL STORZ high-performance EC micro motor II and burrs

<table>
<thead>
<tr>
<th>Detail</th>
<th>Size</th>
<th>Dia. mm</th>
<th>Standard sterilizable</th>
<th>Diamond sterilizable</th>
<th>Diamond coarse sterilizable</th>
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<tr>
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<td>1.4</td>
<td>649614 L</td>
<td>649714 L</td>
<td>–</td>
</tr>
<tr>
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<td>018</td>
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<td>649618 L</td>
<td>649718 L</td>
<td>–</td>
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<td>023</td>
<td>2.3</td>
<td>649623 L</td>
<td>649723 L</td>
<td>649723 GL</td>
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<tr>
<td></td>
<td>027</td>
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<td>649727 L</td>
<td>649727 GL</td>
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<td>649750 L</td>
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<td>649760 GL</td>
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<td>070</td>
<td>7</td>
<td>649670 L</td>
<td>649770 L</td>
<td>649770 GL</td>
</tr>
</tbody>
</table>

| 649600 L | Standard Straight Shaft Burr, stainless, size 014–070, length 12.5 cm, set of 11 |
| 649700 L | Diamond Straight Shaft Burr, stainless, size 014–070, length 12.5 cm, set of 11 |
| 649700 GL| Rapid Diamond Straight Shaft Burr, stainless, with coarse diamond coating for precise drilling and abrasion without hand pressure and generating minimal heat, sizes 023–070, length 12.5 cm, set of 9, color code: gold |
| 280034   | Rack, for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm |
Accessories for Burrs

280033 Rack, for 36 straight shaft burrs with a length of 9.5 cm, foldable, sterilizable, size 22 x 14 x 2 cm

280034 Rack, for 36 straight shaft burrs with a length of 12.5 cm, foldable, sterilizable, size 22 x 17 x 2 cm

NEW 280043 Rack, flat model, to hold 21 straight shaft burrs with a length of 7 cm (6 pcs) and 9.5 cm (15 pcs), folding model, sterilizable, size 17.5 x 11.5 x 1.2 cm

Please note: The burrs displayed are not included in the racks.
Accessories for Burrs

39552 A **Wire Tray**, provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **not** included

**for storage of:**
- Up to 6 drill handpieces
- Connecting cable
- EC micro motor
- Small parts

39552 B **Wire Tray**, provides safe storage of accessories for KARL STORZ drilling/grinding systems during cleaning and sterilization, includes tray for small parts, for use with Rack 280030, rack **included**

**for storage of:**
- Up to 6 drill handpieces
- Connecting cable
- EC micro motor
- Up to 36 drill bits and burrs
- Small parts

**Please note:** The instruments displayed are not included in the sterilizing and storage tray.
UNIDRIVE® S III ENT SCB
High-Speed Handpieces, angled, 100,000 rpm

For use with High-Speed Drills, shaft diameter 3.17 mm and with High-Speed Micro Motor 20712033

100,000 rpm

diameter 7.5 mm

20712033

252681

53 mm

7.5 mm

252682

93 mm

7.5 mm

252681  **High-Speed Handpiece**, medium, angled, 100,000 rpm, for use with High-Speed Micro-Motor 20712033

252682  **High-Speed Handpiece**, long, angled, 100,000 rpm, for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB
High-Speed Handpieces, angled, 60,000 rpm

For use with High-Speed Drills, shaft diameter 2.35 mm and with High-Speed Micro Motor 20712033

252661 High-Speed Handpiece, short, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
252662 High-Speed Handpiece, medium, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
252663 High-Speed Handpiece, long, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB
High-Speed Handpieces, straight, 60,000 rpm

For use with High-Speed Drills, shaft diameter 2.35 mm and with High-Speed Micro Motor 20712033

20712033

51 mm
5.5 mm

252691

High-Speed Handpiece, short, straight, 60,000 rpm, for use with High-Speed Micro-Motor 20712033

71 mm
5.5 mm

252692

High-Speed Handpiece, medium, straight, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
UNIDRIVE® S III ENT SCB
High-Speed Handpieces, malleable, slim, angled, 60,000 rpm

For use with High-Speed Drills, shaft diameter 1 mm
and with High-Speed Micro Motor 20712033

The handpieces have malleable shafts that can be bent up to 20° according to user requirements.

252671  High-Speed Handpiece, extra long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033

252672  High-Speed Handpiece, super long, malleable, slim, angled, 60,000 rpm, for use with High-Speed Micro-Motor 20712033
**UNIDRIVE® S III ENT SCB**

High-Speed Standard Burrs, High-Speed Diamond Burrs

For use with High-Speed Handpieces, 100,000 rpm

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
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<td>350110 M</td>
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<tr>
<td>2</td>
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<td>350130 L</td>
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<tr>
<td>4</td>
<td>350140 M</td>
<td>350140 L</td>
</tr>
<tr>
<td>5</td>
<td>350150 M</td>
<td>350150 L</td>
</tr>
<tr>
<td>6</td>
<td>350160 M</td>
<td>350160 L</td>
</tr>
<tr>
<td>7</td>
<td>350170 M</td>
<td>350170 L</td>
</tr>
</tbody>
</table>

100,000 rpm, diameter 7.5 mm

**High-Speed Diamond Burrs, 100,000 rpm, for single use, sterile, package of 5**

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
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<tbody>
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<td>350260 M</td>
<td>350260 L</td>
</tr>
<tr>
<td>7</td>
<td>350270 M</td>
<td>350270 L</td>
</tr>
</tbody>
</table>

Diameter in mm
**UNIDRIVE® S III ENT SCB**

*High-Speed Diamond Burrs, High-Speed Acorn, High-Speed Barrel Burrs, High-Speed Neuro Fluted Burrs*

For use with High-Speed Handpieces, 100,000 rpm

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
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<td>350360 L</td>
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<td>7</td>
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<td>350370 L</td>
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<thead>
<tr>
<th>Diameter in mm</th>
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<tr>
<td>9</td>
<td>350690 M</td>
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<table>
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<th>Diameter in mm</th>
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<tr>
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<td>350960 M</td>
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<tr>
<td>9.1</td>
<td>350991 M</td>
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<td>350718 L</td>
</tr>
<tr>
<td>3</td>
<td>350730 M</td>
<td>350730 L</td>
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</tbody>
</table>
### UNIDRIVE® S III ENT SCB

#### High-Speed Standard Burrs, High-Speed Diamond Burrs

For use with High-Speed Handpieces, 60,000 rpm

60,000 rpm  
diameter 5.5 mm

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
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<tr>
<td>1</td>
<td>330110 S</td>
<td>330110 M</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330120 S</td>
<td>330120 M</td>
<td>330120 L</td>
</tr>
<tr>
<td>3</td>
<td>330130 S</td>
<td>330130 M</td>
<td>330130 L</td>
</tr>
<tr>
<td>4</td>
<td>330140 S</td>
<td>330140 M</td>
<td>330140 L</td>
</tr>
<tr>
<td>5</td>
<td>330150 S</td>
<td>330150 M</td>
<td>330150 L</td>
</tr>
<tr>
<td>6</td>
<td>330160 S</td>
<td>330160 M</td>
<td>330160 L</td>
</tr>
<tr>
<td>7</td>
<td>330170 S</td>
<td>330170 M</td>
<td>330170 L</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6</td>
<td>330206 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>1</td>
<td>330210 S</td>
<td>330210 M</td>
<td>–</td>
</tr>
<tr>
<td>1.5</td>
<td>330215 S</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>2</td>
<td>330220 S</td>
<td>330220 M</td>
<td>330220 L</td>
</tr>
<tr>
<td>3</td>
<td>330230 S</td>
<td>330230 M</td>
<td>330230 L</td>
</tr>
<tr>
<td>4</td>
<td>330240 S</td>
<td>330240 M</td>
<td>330240 L</td>
</tr>
<tr>
<td>5</td>
<td>330250 S</td>
<td>330250 M</td>
<td>330250 L</td>
</tr>
<tr>
<td>6</td>
<td>330260 S</td>
<td>330260 M</td>
<td>330260 L</td>
</tr>
<tr>
<td>7</td>
<td>330270 S</td>
<td>330270 M</td>
<td>330270 L</td>
</tr>
</tbody>
</table>
UNIDRIVE® S III ENT SCB
High-Speed Diamond Burrs, High-Speed Cylinder Burrs,
LINDEMANN High-Speed Fluted Burrs

For use with High-Speed Handpieces, 60,000 rpm

### High-Speed Coarse Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
<th>medium</th>
<th>long</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>330330 S</td>
<td>330330 M</td>
<td>330330 L</td>
</tr>
<tr>
<td>4</td>
<td>330340 S</td>
<td>330340 M</td>
<td>330340 L</td>
</tr>
<tr>
<td>5</td>
<td>330350 S</td>
<td>330350 M</td>
<td>330350 L</td>
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<tr>
<td>6</td>
<td>330360 S</td>
<td>330360 M</td>
<td>330360 L</td>
</tr>
<tr>
<td>7</td>
<td>330370 S</td>
<td>330370 M</td>
<td>330370 L</td>
</tr>
</tbody>
</table>

### High-Speed Cylinder Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>330440 S</td>
</tr>
<tr>
<td>6</td>
<td>330460 S</td>
</tr>
</tbody>
</table>

### LINDEMANN High-Speed Fluted Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Size in mm (diameter x length)</th>
<th>short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter 2.1/11</td>
<td>330511 S</td>
</tr>
<tr>
<td>Diameter 2.3/26</td>
<td>330526 S</td>
</tr>
</tbody>
</table>
UNIDRIVE® S III ENT SCB
High-Speed Diamond Burrs

For use with High-Speed Handpieces, 60,000 rpm

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320220 EL</td>
<td>320220 SL</td>
</tr>
<tr>
<td>3</td>
<td>320230 EL</td>
<td>320230 SL</td>
</tr>
<tr>
<td>4</td>
<td>320240 EL</td>
<td>320240 SL</td>
</tr>
</tbody>
</table>

High-Speed Coarse Diamond Burrs, 60,000 rpm, for single use, sterile, package of 5

<table>
<thead>
<tr>
<th>Diameter in mm</th>
<th>extra long</th>
<th>super long</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>320320 EL</td>
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</tr>
<tr>
<td>3</td>
<td>320330 EL</td>
<td>320330 SL</td>
</tr>
<tr>
<td>4</td>
<td>320340 EL</td>
<td>320340 SL</td>
</tr>
</tbody>
</table>
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

**IMAGE1 S Camera System**

**Economical and future-proof**
- Modular concept for flexible, rigid and 3D endoscopy as well as new technologies
- Forward and backward compatibility with video endoscopes and FULL HD camera heads
- Sustainable investment
- Compatible with all light sources

**Innovative Design**
- Dashboard: Complete overview with intuitive menu guidance
- Live menu: User-friendly and customizable
- Intelligent icons: Graphic representation changes when settings of connected devices or the entire system are adjusted
- Automatic light source control
- Side-by-side view: Parallel display of standard image and the Visualization mode
- Multiple source control: IMAGE1 S allows the simultaneous display, processing and documentation of image information from two connected image sources, e.g., for hybrid operations

**Dashboard**

**Live menu**

**Intelligent icons**

**Side-by-side view: Parallel display of standard image and Visualization mode**
**IMAGE1 S Camera System**

**NEW**

**Brilliant Imaging**
- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

- Reflection is minimized
- Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting

---

**FULL HD image**

**CLARA**

**FULL HD image**

**CHROMA**

**FULL HD image**

**SPECTRA A**

**FULL HD image**

**SPECTRA B**

---

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

TC 200EN

**IMAGE1 S CONNECT**, connect module, for use with up to 3 link modules, resolution 1920 x 1080 pixels, with integrated KARL STORZ-SCB and digital Image Processing Module, power supply 100–120 VAC/200–240 VAC, 50/60 Hz including:

- **Mains Cord**, length 300 cm
- **DVI-D Connecting Cable**, length 300 cm
- **SCB Connecting Cable**, length 100 cm
- **USB Flash Drive**, 32 GB, USB silicone keyboard, with touchpad, US

*Available in the following languages: DE, ES, FR, IT, PT, RU

For use with **IMAGE1 S**

**IMAGE1 S CONNECT Module TC 200EN**

TC 300

**IMAGE1 S H3-LINK**, link module, for use with IMAGE1 FULL HD three-chip camera heads, power supply 100–120 VAC/200–240 VAC, 50/60 Hz, for use with **IMAGE1 S CONNECT TC 200EN** including:

- **Mains Cord**, length 300 cm
- **Link Cable**, length 20 cm

For use with **IMAGE1 S**

**IMAGE1 S CONNECT Module TC 200EN**

TC 300

**IMAGE1 S H3-LINK**, link module, for use with IMAGE1 FULL HD three-chip camera heads, power supply 100–120 VAC/200–240 VAC, 50/60 Hz, for use with **IMAGE1 S CONNECT TC 200EN** including:

- **Mains Cord**, length 300 cm
- **Link Cable**, length 20 cm

**TC 300 (H3-Link)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>TC 300 (H3-Link)</th>
<th>TC 200EN*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Camera System</strong></td>
<td><strong>Supported camera heads/video endoscopes</strong></td>
<td><strong>TH 100, TH 101, TH 102, TH 103, TH 104, TH 106, TH 110, TH 111, TH 112, TH 113, TH 114, TH 115, TH 116 (fully compatible with IMAGE1 S)</strong></td>
</tr>
<tr>
<td><strong>LINK video outputs</strong></td>
<td>1x</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>100–120 VAC/200–240 VAC</td>
<td></td>
</tr>
<tr>
<td><strong>Power frequency</strong></td>
<td>50/60 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Protection class</strong></td>
<td>I, CF-Defib</td>
<td></td>
</tr>
<tr>
<td><strong>Dimensions w x h x d</strong></td>
<td>305 x 54 x 320 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>1.86 kg</td>
<td></td>
</tr>
</tbody>
</table>

* **SPECTRA A**: Not for sale in the U.S.

**SPECTRA B**: Not for sale in the U.S.
### IMAGE1 S Camera Heads

**For use with IMAGE1 S Camera System**

**IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300**

and with all IMAGE1 HUB™ HD Camera Control Units

<table>
<thead>
<tr>
<th>Specifications</th>
<th>IMAGE1 S H3-Z</th>
<th>IMAGE1 S H3-ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product no.</strong></td>
<td>TH 100</td>
<td>TH 104</td>
</tr>
<tr>
<td><strong>Image sensor</strong></td>
<td>3x 1/3” CCD chip</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td><strong>Dimensions w x h x d</strong></td>
<td>39 x 49 x 100 mm</td>
<td>39 x 49 x 100 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>270 g</td>
<td>299 g</td>
</tr>
<tr>
<td><strong>Optical interface</strong></td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td><strong>Min. sensitivity</strong></td>
<td>F 1.4/1.17 Lux</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td><strong>Grip mechanism</strong></td>
<td>standard eyepiece adaptor</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>non-detachable</td>
<td>non-detachable</td>
</tr>
<tr>
<td><strong>Cable length</strong></td>
<td>300 cm</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

**For use with IMAG1 S Camera System**

**IMAGE1 S CONNECT Module TC 200EN, IMAGE1 S H3-LINK Module TC 300**

and with all IMAGE1 HUB™ HD Camera Control Units

<table>
<thead>
<tr>
<th>Specifications</th>
<th>IMAGE1 S H3-Z</th>
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<tbody>
<tr>
<td><strong>Product no.</strong></td>
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<td>39 x 49 x 100 mm</td>
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<tr>
<td><strong>Weight</strong></td>
<td>270 g</td>
<td>299 g</td>
</tr>
<tr>
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<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
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<td><strong>Min. sensitivity</strong></td>
<td>F 1.4/1.17 Lux</td>
<td>F 1.4/1.17 Lux</td>
</tr>
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<td>standard eyepiece adaptor</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td><strong>Cable</strong></td>
<td>non-detachable</td>
<td>non-detachable</td>
</tr>
<tr>
<td><strong>Cable length</strong></td>
<td>300 cm</td>
<td>300 cm</td>
</tr>
</tbody>
</table>
Monitors

9619 NB

19" HD Monitor,
color systems PAL/NTSC, max. screen resolution 1280 x 1024, image format 4:3,
power supply 100–240 VAC, 50/60 Hz,
wall-mounted with VESA 100 adaption,
including:
External 24 VDC Power Supply
Mains Cord

9826 NB

26" FULL HD Monitor,
wall-mounted with VESA 100 adaption,
color systems PAL/NTSC,
max. screen resolution 1920 x 1080,
image format 16:9,
power supply 100–240 VAC, 50/60 Hz
including:
External 24 VDC Power Supply
Mains Cord
Monitors

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
</tbody>
</table>

**Inputs:**
- DVI-D
- Fibre Optic
- 3G-SDI
- RGBS (VGA)
- S-Video
- Composite/FBAS

**Outputs:**
- DVI-D
- S-Video
- Composite/FBAS
- RGBS (VGA)
- 3G-SDI

**Signal Format Display:**
- 4:3
- 5:4
- 16:9
- Picture-in-Picture
- PAL/NTSC compatible

**Optional accessories:**
- 9826 SF Pedestal, for monitor 9826 NB
- 9626 SF Pedestal, for monitor 9619 NB

**Specifications:**

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop with pedestal</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td>Product no.</td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
<tr>
<td>Brightness</td>
<td>200 cd/m² (typ)</td>
<td>500 cd/m² (typ)</td>
</tr>
<tr>
<td>Max. viewing angle</td>
<td>178° vertical</td>
<td>178° vertical</td>
</tr>
<tr>
<td>Pixel distance</td>
<td>0.29 mm</td>
<td>0.3 mm</td>
</tr>
<tr>
<td>Reaction time</td>
<td>5 ms</td>
<td>8 ms</td>
</tr>
<tr>
<td>Contrast ratio</td>
<td>700:1</td>
<td>1400:1</td>
</tr>
<tr>
<td>Mount</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
</tr>
<tr>
<td>Weight</td>
<td>7.6 kg</td>
<td>7.7 kg</td>
</tr>
<tr>
<td>Rated power</td>
<td>28 W</td>
<td>72 W</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>0–40°C</td>
<td>5–35°C</td>
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<tr>
<td>Storage</td>
<td>-20–60°C</td>
<td>-20–60°C</td>
</tr>
<tr>
<td>Rel. humidity</td>
<td>max. 85%</td>
<td>max. 85%</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
</tr>
<tr>
<td>Certified to</td>
<td>EN 60601-1, protection class IPX0</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
</tr>
</tbody>
</table>
Data Management and Documentation
KARL STORZ AIDA® – Exceptional documentation

The name AIDA stands for the comprehensive implementation of all documentation requirements arising in surgical procedures: A tailored solution that flexibly adapts to the needs of every specialty and thereby allows for the greatest degree of customization.

This customization is achieved in accordance with existing clinical standards to guarantee a reliable and safe solution. Proven functionalities merge with the latest trends and developments in medicine to create a fully new documentation experience – AIDA.

AIDA seamlessly integrates into existing infrastructures and exchanges data with other systems using common standard interfaces.

WD 200-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, power supply 100-240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

WD 250-XX* AIDA Documentation System, for recording still images and videos, dual channel up to FULL HD, 2D/3D, including SMARTSCREEN® (touch screen), power supply 100-240 VAC, 50/60 Hz including:
- USB Silicone Keyboard, with touchpad
- ACC Connecting Cable
- DVI Connecting Cable, length 200 cm
- HDMI-DVI Cable, length 200 cm
- Mains Cord, length 300 cm

*XX Please indicate the relevant country code (DE, EN, ES, FR, IT, PT, RU) when placing your order.
Workflow-oriented use

Patient
Entering patient data has never been this easy. AIDA seamlessly integrates into the existing infrastructure such as HIS and PACS. Data can be entered manually or via a DICOM worklist. All important patient information is just a click away.

Checklist
Central administration and documentation of time-out. The checklist simplifies the documentation of all critical steps in accordance with clinical standards. All checklists can be adapted to individual needs for sustainably increasing patient safety.

Record
High-quality documentation, with still images and videos being recorded in FULL HD and 3D. The Dual Capture function allows for the parallel (synchronous or independent) recording of two sources. All recorded media can be marked for further processing with just one click.

Edit
With the Edit module, simple adjustments to recorded still images and videos can be very rapidly completed. Recordings can be quickly optimized and then directly placed in the report. In addition, freeze frames can be cut out of videos and edited and saved. Existing markings from the Record module can be used for quick selection.

Complete
Completing a procedure has never been easier. AIDA offers a large selection of storage locations. The data exported to each storage location can be defined. The Intelligent Export Manager (IEM) then carries out the export in the background. To prevent data loss, the system keeps the data until they have been successfully exported.

Reference
All important patient information is always available and easy to access. Completed procedures including all information, still images, videos, and the checklist report can be easily retrieved from the Reference module.
Accessories for Video Documentation

- 495 NL: **Fiber Optic Light Cable**, straight connector, diameter 3.5 mm, length 180 cm
- 495 NA: **Same**, length 230 cm

Cold Light Fountain XENON 300 SCB

- 20133101-1: **Cold Light Fountain XENON 300 SCB**, with built-in antifog air-pump, and integrated KARL STORZ Communication Bus System SCB power supply: 100–125 VAC/220–240 VAC, 50/60 Hz including:
  - **Mains Cord**
  - **SCB Connecting Cord**, length 100 cm
- 20133027: **Spare Lamp Module XENON** with heat sink, 300 watt, 15 volt
- 20133028: **XENON Spare Lamp**, only, 300 watt, 15 volt

Cold Light Fountain XENON NOVA® 300

- 20134001: **Cold Light Fountain XENON NOVA® 300**, power supply: 100–125 VCA/220–240 VAC, 50/60 Hz including:
  - **Mains Cord**
- 20132028: **XENON Spare Lamp**, only, 300 watt, 15 volt
The Endoscopic Surgical Technique “Two Nostrils – Four Hands”

Equipment Cart

**Equipment Cart**
wide, high, rides on 4 antistatic dual wheels equipped with locking brakes 3 shelves, mains switch on top cover, central beam with integrated electrical subdistributors with 12 sockets, holder for power supplies, potential earth connectors and cable winding on the outside,

**Dimensions:**
Equipment cart: 830 x 1474 x 730 mm (w x h x d),
shelf: 630 x 510 mm (w x d),
caster diameter: 150 mm

**Inclusive:**
- **Base module equipment cart**, wide
- **Cover equipment**, equipment cart wide
- **Beam package equipment**, equipment cart high
- 3x **Shelf**, wide
- **Drawer unit with lock**, wide
- 2x **Equipment rail**, long
- **Camera holder**

Monitor Swifel Arm,
height and side adjustable, can be turned to the left or the right side, swivel range 180°, overhang 780 mm, overhang from centre 1170 mm, load capacity max. 15 kg, with monitor fixation VESA 5/100, for usage with equipment carts UG xxx
Recommended Accessories for Equipment Cart

**Isolation Transformer,**
200 V–240 V; 2000 VA with 3 special mains socket, expulsion fuses, 3 grounding plugs, dimensions: 330 x 90 x 495 mm (w x h x d), for usage with equipment carts UG xxx

**Earth Leakage Monitor,**
200 V–240 V, for mounting at equipment cart, control panel dimensions: 44 x 80 x 29 mm (w x h x d), for usage with isolation transformer UG 310

**Monitor Holding Arm,**
height adjustable, inclinable, mountable on left or right, turning radius approx. 320°, overhang 530 mm, load capacity max. 15 kg, monitor fixation VESA 75/100, for usage with equipment carts UG xxx

Please note that the described products in this medium may not be available yet in all countries due to different regulatory requirements.