THE EasyGO!® II SYSTEM
FOR THE FULLY ENDOSCOPIC TREATMENT OF DISEASES OF THE CERVICAL AND LUMBAR SPINE

Joachim M. K. OERTEL
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First edition
© 2017 Endo:Press® GmbH
P.O. Box, 78503 Tuttlingen, Germany
Phone: +49 (0) 74 61/1 45 90
Fax: +49 (0) 74 61/708-529
E-mail: endopress@t-online.de

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Editions in languages other than English and German are in preparation. For up-to-date information, please contact Endo:Press® GmbH at the address shown above.

Design and Composing:
Endo:Press® GmbH, Germany

Printing and Binding:
Straub Druck + Medien AG
Max-Planck-Straße 17, 78713 Schramberg, Germany

03.17-0.75

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The EasyGO!® II System for the Fully Endoscopic Treatment of Diseases of the Cervical and Lumbar Spine

The Concept of Minimally Invasive Endoscopic Spinal Surgery

Back pain secondary to degenerative disease of the spine is the second most common reason for doctor visits in Germany. Factors responsible for the rising incidence of degenerative spinal disease in western industrialized countries include an aging population, gains in average body weight, and a decline in daily physical activity. Our goal as practitioners is to formulate an optimum, individualized treatment plan based on an appropriate diagnostic evaluation.

Minimally invasive spinal surgery means achieving the best possible clinical result for the patient while inflicting a minimal degree of surgical trauma. Endoscopic techniques are excellent for this goal as they can often provide a significant reduction in surgical trauma. The known advantages for patients are less pain, faster recovery, and a smaller surgical scar.

Numerous endoscopic surgical systems have been devised for the treatment of degenerative spinal diseases. The known drawbacks of these systems include the need for rigorous patient selection, relatively poor image quality, and an operating technique that is difficult to learn and differs substantially from the bimanual microsurgical technique that is familiar to most surgeons. The EasyGO!® II endoscopic system was developed in response to these challenges. It combines the established bimanual microsurgical technique with the advantages of endoscopic visualization.

The EasyGO!® II system can be used for the most common degenerative conditions of the cervical and lumbar spine without the need for strict patient selection criteria. It employs a dilator system that can atraumatically dilate the posterior spinal muscles at the cervical and lumbar levels and establish access through a smaller skin incision with minimal trauma.

Because the system allows the use of the familiar bimanual microsurgical operating technique, relatively little training is needed to master the new technique and achieve excellent results.
Instrumentation

EasyGO® II is a second-generation system that consists of various endoscopes, working attachments, endoscope holders, access trocars in various lengths and diameters, and standard instruments.

Three new HOPKINS® endoscopes form the core part of the EasyGO® II system. They come in different lengths designed for use with specific trocars.

All three endoscopes are 4 mm in diameter and have a 25° viewing angle that provides the surgeon with a wide-angle view of the operative site.

The eyepiece of the new HOPKINS® endoscopes is angled 90° to promote ergonomic handling of the EasyGO® II system and allows the surgeon to work in a comfortable position. This design places the camera head and light cord in a low position that avoids any conflict between the surgeon’s hands and the system components.

The EasyGO® II system includes an assortment of trocars that function as an access port for the endoscope and operating instruments. Each trocar consists of a tubular sleeve and a handle element that connects to the articulated holder arm and endoscope holder. The trocars are color-coded in orange, green, and black to indicate their diameters, and each diameter is available in three different lengths:

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<tr>
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It is best to use the shortest possible trocar in any given case, as the shorter working channel will make more space available for maneuvering instruments.

The long trocars are used mainly in obese patients. The shorter versions are used mainly in very thin patients and for the cervical Frykholm approach.

Once in place, the trocar connects by a snap-in mechanism (KS Lock) to the arm of the table-mounted holder, locking the optical system in position.

Fig. 2.1 The three HOPKINS® endoscopes of the EasyGO® II system.

Fig. 2.2 The EasyGO® II trocars are available in three different lengths and diameters.

Fig. 2.3 The trocar connects to the holder arm by a snap-in mechanism.

Fig. 2.4 EasyGO® II endoscope holder, with turn-screw for locking the holder in place.
Once the endoscope has been placed in its holder, it can be rotated over a range of 0°–280° inside the trocar sleeve and locked in any desired position with a turnscrew. The endoscope can easily be withdrawn at any time through a guide slot (e.g., to clean the distal lens) and quickly reinserted.

Owing to the new trocar attachments and endoscope holder, the EasyGO!® II system has a working channel of larger inner diameter than the previous version. This larger working channel not only improves handling and maneuverability of the instruments but also expands the range of indications for applications that require a smaller trocar diameter.

In the inter- and intralaminar approaches, the skin and muscle layers are retracted by the color-coded dilators to establish minimally invasive access to the target site while also reducing the risk of iatrogenic muscle injuries.

Except for the first two dilators (white and yellow), the color codes of the dilators correspond to those of the trocars and attachments.

The other instruments in the EasyGO!™ II system are like the standard instruments used in spinal surgery. They range from instruments for removing soft disc material (grasping forceps, punch forceps, small hooks, dissectors) to the instruments necessary for effective coagulation.

The treatment of spinal stenosis often requires the use of a motorized drill. KARL STORZ offers an angled handpiece for use with the UNIDRIVE® S III NEURO, that is optimally designed for this purpose. It is compatible with all lengths of components in the EasyGO!® II system. The handpiece operates at speeds up to 60,000 rpm for the targeted removal of bone material.

2.1 Advantages of the EasyGO!® II System

The EasyGO!® II is a highly versatile, fully endoscopic system that combines the traditional bimanual microsurgical technique with endoscopic visualization. It does not require strict patient selection and is particularly recommended for degenerative diseases of the cervical and lumbar spine. The dilator system provides minimally invasive access to the spinal column while sparing the muscles and other soft tissues. The endoscopic visualization provides an optimum, high-definition view of the surgical site on a 16:9 video screen. Since the site is approached directly, the anatomy is displayed in a familiar form that does not require the surgeon to adjust to an unusual orientation. Owing to the bimanual microsurgical technique and the choice between various trocar options, surgery with the EasyGO!® II system can be adapted to the individual skills of the surgeon, eliminating the need for a prolonged learning curve.

The EasyGO!™ II system covers a broad range of surgical indications in patients with degenerative spinal diseases. It can be used for the removal of medial, mediolateral, intra- and extraforaminal disc herniations and for the decompression of lumbar and cervical spinal stenosis including lateral recess and foraminal stenosis.
3 Operative Technique

In this section we will explore the various possible applications of the EasyGO!® II system in the cervical and lumbar spine. We will cover bimanual operating technique, patient positioning, planning the surgical approach, and the intraoperative technique practiced by the authors in the great majority of their operations. Please note, however, that these procedural steps are intended only to illustrate the possible options. The procedure should always be tailored to the specific needs of the patient and must be performed individually by the operating surgeon.

3.1 Lumbar Spine

This section deals with positioning and operative technique in a patient with lumbar spine disease. The case depicted is illustrative only, and the procedure should always be tailored to case requirements based on an analysis of individual patient- and disease-related factors.

Generally the patient is placed on the operating table in a modified prone position under general endotracheal anesthesia (Fig. 3.1). Other possible options would be a lateral position with the hips and knees flexed, a kneeling position, or a Wilson frame. A major goal is to relieve pressure on the abdomen and reduce the pressure on the epidural vessels. This can be achieved, for example, by placing bolsters beneath the patient’s chest and hips. Optimum positioning is essential, for unlike an open microsurgical procedure, even minor bleeding during endoscopic surgery can greatly increase the difficulty of the procedure or even require conversion to open microsurgery.

Following skin preparation and draping of the operative field, a C-arm fluoroscope is used to locate the level of the lesion and identify the affected segment. The localizing needle should be projected at a 90° angle to the targeted segment (Fig. 3.2a).

![Fig. 3.2 The segment is localized fluoroscopically with a guide needle (arrow, a). The dilation system is introduced (b). Final lateral view after trocar placement (c).](image)

![Fig. 3.1 Patient position for endoscopic spinal surgery. This position relieves pressure on the abdomen.](image)
An accurate skin incision is essential for successful surgery. The minimal skin incision leaves very little room for correcting a less-than-optimal approach during the operation.

When surgery requires access to the spinal canal (medial or mediolateral disc herniation, spinal stenosis), the skin incision should be placed approximately 1.5–2 cm lateral to the midline (Figs. 3.4a, b). For treatment of a lateral extra- or intraforaminal disc herniation, the incision should be placed approximately 6–7 cm from the midline on the affected side (Fig. 3.5).

The skin incision may be from 1.4 to 2.3 cm long, based on the diameter of the selected working sheath (Fig. 3.3a). If two affected segments will be treated through one incision, the skin incision is usually placed midway between the two segments.

After the skin has been incised, the incision in the muscle fascia should be long enough to permit dilation of the muscle fibers and avoid compression of muscle tissue at the trocar tip. The next step is serial dilation of the soft tissues and intrinsic muscles under continuous fluoroscopic guidance. This is done with the color-coded dilator set using incremental tube diameters (Figs. 3.3b, 3.6a–e).

Fig. 3.3 The incision line is marked on the skin (a). The color-coded dilation system is introduced (arrows, b).

Fig. 3.4 Approach to the medial spinal canal (a, b).

Fig. 3.5 Approach to the lateral spinal canal.
Fig. 3.6 Serial dilatation with the color-coded dilator system (a–e).

Correct placement of the trocar is checked by anteroposterior fluoroscopy.
The end of the dilators should be kept in firm contact with the bony lamina as the dilation proceeds. This is necessary to prevent accidental interlaminar or paravertebral deviation of the dilator tip (Figs. 3.2b, 3.7a–c).

The selected trocar is introduced over the corresponding dilator and advanced to the surgical site (Figs. 3.2c, 3.11a, 3.8).
After correct placement has been verified, the trocar is connected to the arm of the table-mounted holder to stabilize its position (Fig. 3.9).

After a final fluoroscopic check, the dilators are withdrawn (Fig. 3.10).

Fig. 3.9 The trocar is locked in position.

Fig. 3.10 The dilators should always be held in contact with the lamina. This will minimize the amount of residual tissue left on the lamina after trocar insertion (a, b).

Fig. 3.11 The trocar is connected to the table-mounted articulated holder arm (arrow, a). The trocar position is secured by the holder arm following removal of the dilation system (arrow, b).
Next, the holder for the endoscope is mounted on the trocar.

To begin with, the rubber ring at the endoscope holder is slightly pressed into its seat at the trocar rim. The holder-attachment assembly (see Fig. 2.4) is positioned at a 90° angle to the trocar and hooked over the trocar side posts. Then it is swiveled down and pressed firmly onto the proximal end of the trocar until it snaps securely into place with an audible click (Fig. 3.12c). The endoscope holder can be freely rotated on the proximal end of the trocar until it is locked in place with the turnscrew. The endoscope can now be introduced (Fig. 3.12d).

The surgeon can choose among three different endoscopes, depending on the selected trocar length. Once the endoscope has been introduced, the operation is performed entirely under endoscopic vision (Figs. 3.13b, 3.14a, b).
3.1.1 Disc Herniations

3.1.1.1 Interlaminar Approach

After its holder has been locked in position, the endoscope is inserted. The operation is then continued using bimanual technique under fully endoscopic vision. The working length of the endoscope should be conform to the length of the selected trocar. First the bony lamina and medial part of the facet joint are explored with a probe. Then the tissue remaining on those surfaces (connective tissue and residual muscle) is removed with bimanual technique to expose the upper bony lamina and the medial portion of the facet joint.

The ligamentum flavum is now identified. It may be possible to incise the ligament directly, depending on individual anatomy, or adjacent bony structures such as laminae and the medial part of the facet joint can be thinned and resected with a diamond burr (Fig. 3.16a), under constant irrigation, and with various punch forceps.

Due to the confined space and limited capacity for instrument triangulation, it is often easier to use a small diamond burr than a bone punch at this stage of the operation (Figs. 3.16c, d).

Once the ligamentum flavum has been exposed, it is resected in stepwise fashion, proceeding laterally away from the dura. The working direction for this step should always be medial-to-lateral and cranial-to-caudal to avoid injury to the dura and nerve root.

Fig. 3.15 Residual tissue on the lamina (a). The residual tissue is coagulated with a bipolar forceps (b). The tissue is removed with a grasping forceps (c). Representation of the lamina (arrow, d).

Fig. 3.16 The lamina is thinned with a diamond burr (a). Exposed ligamentum flavum (b). The approach is extended laterally with a bone punch (c, d).

Fig. 3.17 Ligamentum flavum and inferior laminar border (arrow, a). The interlaminar window is enlarged laterally and inferiorly with a Kerrison punch (b–d).
The dural sac and the nerve root shoulder are then carefully exposed and decompressed with the small nerve hook and dissector, again proceeding in small steps (Fig. 3.18b). It may be possible to mobilize the nerve root and dural sac in the medial direction, depending on local findings (Fig. 3.18c). Epidural veins should be coagulated with bipolar forceps before they are incised (Fig. 3.18d).

In the case of a subligamentous disc herniation, the posterior longitudinal ligament can simply be incised and the herniated disc material extracted (Fig. 3.19a). This may be followed by a nucleotomy. If a sequestered disc fragment is present, it can be directly grasped and extracted (Figs. 3.19c, d).

After the sequestrectomy, the surgical site and especially the nerve root and dural sac should be probed with the short and longer nerve hook to confirm adequate decompression. Any remaining free disc fragments can still be mobilized and extracted if necessary.

**Fig. 3.18** The exposed dura (a). The intraspinal space is explored with a small nerve hook (b). The dural sac is mobilized medially (c). Engorged epidural veins are coagulated (d).

**Fig. 3.19** The posterior longitudinal ligament is incised (arrow, a). The disc space is probed and incised with a scissors (b). The sequester is mobilized (arrow, c). The sequester is grasped and shelled out of surrounding tissue (d).

**Fig. 3.20** The previously mobilized sequester is extracted (a). The intraspinal space is explored with the small nerve hook (b). If further decompression is needed, the interlaminar window is enlarged by unroofing the lateral recess (c). Additional free disc fragments are exposed (arrow, d).
Toward the end of the operation the sequestered fragment should be completely removed, and at that time the dural sac and affected nerve root should be fully decompressed.

The decompression should be followed by meticulous hemostasis, because even small bleeds and hematomas can quickly produce a mass effect due to the very small portal and wound area. Besides bipolar diathermy, venous bleeding can also be controlled by other means such as careful compression with a small gelatin sponge. The placement of a drain is optional. When the working sheath is removed, the muscle tissue should be closely inspected so that possible bleeding sites can be detected and coagulated as needed. A tight fascial suture can help prevent a subcutaneous hematoma. Finally the subcutaneous tissue and skin are closed in layers.

### 3.1.1.2 Intralaminar Approach

A purely intralaminar approach may be possible in selected cases with a sequestered disc fragment located just anterior to the lamina. As in the interlaminar approach, the first step is to expose the bony lamina and medial facet joint. The exposed lamina is then thinned with a diamond burr, working directly toward the disc fragment, as far as the anterior cortex. At this point the ligamentum flavum should present a palpable, springy resistance (Figs. 3.22–3.27).
The lamina is opened in the intralaminar plane (stars indicate the superior and inferior laminar margins) down to the ligamentum flavum (a). The remaining bony lamina is resected in the mediolateral direction (b). Dissection of the ligamentum flavum prior to its resection (c).

To keep strictly to the intralaminar plane, make sure that the burr does not penetrate the superior and inferior cortical margins. The exposed ligamentum flavum can either be incised directly or carefully dissected with a small nerve hook. Then the ligament is mobilized and resected with a punch forceps.

Again, resection of the ligamentum flavum should always proceed in a mediolateral and craniocaudal direction to minimize the risk of dural and nerve root injury (Figs. 3.24a–c).

Next, the dural sac and nerve root shoulder are carefully exposed with the small nerve hook and dissector (Figs. 3.25a–c).

The previously mobilized ligamentum flavum is resected with a Kerrison punch (a). The dura is exposed (arrow, b). The resection is extended and the lateral margin is exposed (broken line, c).

The dural sac is carefully mobilized with the small nerve hook (a). The sequestered disc fragment is exposed with the suction tip (b). The fragment is extracted (c).
In the case of a sequestered disc fragment with no apparent perforation of the posterior longitudinal ligament, the fragment can be directly grasped and extracted. Otherwise, the ligament must first be incised before the disc material is extracted. After the sequestrectomy, decompression of the nerve root should always be assessed with the small nerve hook and dissector to check for any residual nerve root compression or remaining sequestered disc material.

As noted in the previous section, hemostasis should be extremely meticulous. It is also important to inspect the muscle fascia for possible bleeding sites. If doubt exists, the wound should be closed over a suction drain.

Fig. 3.26  Sequestrectomy (a). Individual disc fragments are mobilized with the small hook (b). The site is probed to assess the decompression (c).

Fig. 3.27  Final exploration of the spinal canal with a long nerve hook (a). A small piece of gelatin sponge is applied for venous hemostasis (b). Skin incision after trocar removal (c).
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3.1.2 Lumbar Stenosis

3.1.2.1 Ipsilateral Stenosis of the Lateral Recess

The approach to the affected segment is the same as for a mediolateral disc herniation. Residual connective tissue is removed before the actual decompression. As a rule, the decompression includes the inferior portion of the superior lamina and the superior portion of the inferior lamina. Due to the narrow portal and the limited space available for instrument triangulation, decompression with a small diamond burr is often easier than classic decompression with a Kerrison punch.

After the ligamentum flavum has been exposed and identified, it is resected with the punch, proceeding in the craniocaudal direction. The dura is exposed and decompressed in the craniocaudal and mediolateral directions, proceeding in small steps. Any adhesions of the ligamentum flavum and dura can be freed with a small nerve hook or dissector.

Connective tissue over the lamina that could obscure visualization of the surgical site is resected (a). Using the diamond burr, an elliptical laminectomy is performed to the edge of the ligamentum flavum (b). The laminectomy is extended by resecting the final bony lamina and mobilizing the ligamentum flavum with the Kerrison punch (c).

View of the exposed ligamentum flavum (a). The ligament is mobilized, exposing the dura (b). The ligamentum flavum is resected, and the decompression is extended laterally and inferiorly as required (c).
Decompression of the bony structures proceeds in the craniocaudal and mediolateral directions. When the dural sac or nerve root shoulder has been exposed, the nerve root can be decompressed into the neural foramen and the lateral recess can be unroofed if required. When adequate decompression has been established, the dural sac and nerve root should be freely palpable with the small nerve hook.

Hemostasis can be obtained by irrigation and the careful use of bipolar forceps or by compressing the vessels with a small piece of gelatin sponge. As in all minimally invasive spinal approaches, hemostasis is a priority concern. If there is no evidence of an active bleeding site, the trocar can be carefully removed. The placement of a drain is optional.

**Fig. 3.31** A small, subligamentous disc herniation is removed with the grasping forceps (a). The decompression is assessed, and the dural sac is probed (b). The neural foramen is explored with small nerve hooks of increasing length (c).

**Fig. 3.32** Lateral boundary of the dural sac (a). The neural foramen and dural sac are decompressed with the punch (b). Ipsilateral decompression of the dural sac through a unilateral approach (c).
### 3.1.2.2 Bilateral or Central Stenosis

If central or bilateral compression is also present, contralateral decompression can be accomplished through a unilateral approach. The selected trocar should be appropriate for the direction of the decompression. The 25° endoscope is advantageous, as it can extend the surgeon’s view into the lateral recess on the opposite side. For bilateral decompression through a unilateral approach, the combined use of a diamond-head burr and a back-biting Kerrison punch should enable the surgeon to extend the decompression far toward the contralateral side.

![Fig. 3.33](image) Contralateral decompression of the dural sac by undercutting (a). Decompression of the contralateral neural foramen and dural sac (b). The contralateral neural foramen is probed (c).

### 3.1.3 Other Masses in the Spinal Canal

Besides a herniated disc or lumbar stenosis, other intraspinal masses can also be resected with the EasyGO!® II system. This particularly applies to extradural masses such as a synovial cyst causing intraspinal-extradural compression of the dura and nerve root. The approach to the spinal canal for resecting a synovial cyst is the same as for a mediolateral disc herniation or lumbar stenosis.

![Fig. 3.34](image) Preoperative postmyelographic CT, axial scan at the L3-L4 level (a). Postoperative lumbar CT scan after bilateral decompression (b).

![Fig. 3.35](image) Sagittal MR image (T2-weighted) of a synovial cyst (arrow, a). Axial MR image (T2-weighted) of a synovial cyst (arrow, b).
The interlaminar fenestration is followed by decompression of the dural sac and resection of the synovial cyst, proceeding in the mediolateral and craniocaudal directions. First, the intact dura is exposed. Next, the cystic tissue is resected in steps using the small hook and then the Kerrison punch.

After the synovial cyst has been mobilized, it is extracted with a punch or grasping forceps. Following meticulous hemostasis, the nerve root shoulder is again probed and assessed for adequate decompression. Finally the wound is closed in layers and covered with a sterile dressing.

The cyst wall is progressively resected in the medial-to-lateral direction. Finally the synovial cyst is largely isolated from the dura and nerve root shoulder. The cyst is sharply detached from the dura and nerve root with a microscissors.

As in the case shown, a synovial cyst can be completely resected through only a 2-cm skin incision with the EasyGO!® II system.
3.1.4 Intra- and Extraforaminal Disc Herniations (Lateral Approach)

The skin incision for approaching extraforaminal and lateral intraforaminal lesions is placed farther lateral to the midline. It is best to measure the exact distance from the neural foramen to the midline on preoperative axial MRI and CT scans. Generally, the skin incision is placed approximately 6–7 cm from the midline. Then the muscle fascia is incised, and the trocar is introduced after serial dilation of the tract with the dilator set. Contact with the lateral facet joint should be maintained during trocar insertion. Accurate trocar positioning is aided by lateral and, if necessary, anteroposterior fluoroscopic guidance. After the trocar and endoscope holder have been locked in position, the endoscope can be introduced (Fig. 3.39).

Orientation in the lateral approach is generally more difficult than in the intraspinal approach due to the extensive muscle layers. The first key landmark to be identified is the transverse process of the lower vertebral body. Next, the lower neural foramen is enlarged from the inferolateral side, at which point the disc herniation will usually be found within the lateral neural foramen. It is important to proceed with extreme care, because the spinal nerve runs freely through the soft tissues and is often compressed by the herniated disc material. After the herniation has been identified and incised, the herniated disc material can usually be extracted in one piece. After the material has been extracted, the nerve root is usually in a decompressed state and will "slip" to the center of the operative field. When successful decompression has been confirmed with the small nerve hook, meticulous hemostasis is carried out and the wound is closed in layers. Placement of a suction drain is optional and will depend on the intraoperative findings and the preference of the surgeon.

Fig. 3.39 Diagrammatic view of the lateral approach.

![Fig. 3.39 Diagrammatic view of the lateral approach.](image)

![Fig. 3.40 Coagulation of the muscle tissue (a, b). The facet joint is probed with a forceps (c). The lateral facet joint is partially thinned with a diamond burr (d).](image)
Fig. 3.41 The lateral facet joint is removed and the lateral neural foramen is enlarged with a Kerrison punch (a, b). Residual coagulated muscle tissue is resected (c). Hemostasis is established with bipolar diathermy (d).

Fig. 3.42 The spinal nerve is exposed outside the neural foramen (a). The facet joint is thinned with a diamond burr and Kerrison punch (b, c). The disc herniation is mobilized with the small nerve hook (d).

Fig. 3.43 The disc herniation (arrow) is mobilized from the lateral side in the neural foramen (a, b). The herniated disc material is extracted (arrows), and free fragments are mobilized with the small nerve hook (c, d).

Fig. 3.44 The bony neural foramen is partially unroofed with the punch (a). Exposed nerve root outside the neural foramen (b). With the neural foramen unroofed, the last free fragments can be mobilized (c). The nerve root has been cleared within the neural foramen (d).
3.2 Cervical Spine

Various lesions at the cervical spine level can also be treated endoscopically through a posterior approach with the EasyGO® II system. In the posterior approach, it is particularly important to maintain an ideal position of the trocar and dilators throughout the operation to avoid iatrogenic injury to the spinal cord. In the cervical spine as elsewhere, the techniques described here serve only to illustrate the possible options, and the procedural details should always be tailored to the specific patient, lesion, and individual anatomy.

For the posterior approach to the cervical spine, the patient is positioned prone on the operating table with the head lowered and secured in a Mayfield clamp. The head should still be above the level of the heart, however, to reduce the intraoperative bleeding risk due to venous stasis.

The patient’s shoulders may be pulled distally and secured with wide tape to improve visualization of the cervical spine on lateral fluoroscopy, depending on the affected segment and individual anatomy. Care is taken, however, not to exert too much traction on the brachial plexus. Accurate identification of the affected surgical segment is always a priority. Conversion to a larger, open approach should be considered preoperatively if that would be necessary to permit a positive identification of the targeted segment.

Fig. 3.45 The head is flexed downward and secured in a Mayfield clamp (a). “Concord” position with the head positioned at, or preferably above, the level of the heart (b).

Fig. 3.46 The midline, facet joints, and proposed skin incision (for a monosegmental operation) are drawn on the skin (a). The patient has been fully draped and the skin incision drawn for a bisegmental, unilateral operation (b).
Once the affected segment has been positively identified, the skin incision is planned. In the case of a mono-segmental operation, the proposed skin incision is drawn on the skin such that the trocar sleeve will aim directly at the targeted segment, i.e., directly at the neural foramen or interlaminar fenestration site. The skin incision for a bisegmental decompression should be placed directly between the segments that require decompression. The skin incision should be approximately 2 cm lateral to the midline to ensure that the spinal canal and neural foramen can be accessed even in patients with a large spinous process. The length of the skin incision should be appropriate for the selected trocar diameter.

The skin incision is deepened through the muscle fascia. Access to the neural foramen is established with serial dilators under continuous lateral fluoroscopic guidance. As the muscles are dilated, the dilator tip should be held in continuous, firm contact with the bony lamina to keep it from slipping into the spinal canal (Fig. 3.48).
The trocar sleeve is advanced over the dilator system until it is in contact with the lamina. The trocar is then connected to an articulated holder arm mounted on the operating table and is locked in the desired position by tightening a knob.

The dilators are removed, and the trocar sleeve should project perpendicular to the lamina when viewed in the lateral radiograph (Figs. 3.50a, b).

The endoscope holder is hooked over the two side posts on the trocar and is swung down until the plastic ring of the scope holder engages the rim of the trocar sleeve. It is then pushed farther down until it snaps into place with an audible click. Once the endoscope holder has been locked in position, the endoscope is introduced (Figs. 3.51a, b).

Fig. 3.49 The trocar is introduced over the dilator system (a, b) and connected to the holder arm (c, d).

Fig. 3.50 The targeted segment is identified before the skin is incised (a). Position check after insertion of the trocar sleeve (b).

Fig. 3.51 Intraforaminal nerve root decompression or a sequestrectomy is performed using a bimanual technique.
3.2.1 Posterior Approach to the Neural Foramen and Lateral Recess in the Cervical Spine

At this point any soft tissue that remains over the lamina is first coagulated with the bipolar forceps, then removed with the grasping forceps to expose the lamina.

The ligamentum flavum is identified. It is mobilized with a small nerve hook and then resected with a Kerrison punch, working in the mediolateral and craniocaudal directions. The exposed dural sac is carefully decompressed from medial to lateral by removing the medial facet joint until the nerve root and its shoulder from the dural sac can be identified.

At this point the nerve root can be decompressed far into the neural foramen, starting from its shoulder. When adequate decompression has been obtained, it should be possible to pass a small nerve hook freely and without resistance into the remaining foramen, and the nerve root should be decompressed for 360° around its circumference. The 25° endoscope can be rotated 180° to obtain a better view into the neural foramen.

When the absence of any active bleeding sites has been confirmed, the trocar sleeve can be carefully withdrawn under endoscopic vision. The fascia is coagulated if necessary and tightly closed, followed by closure of the subcutaneous tissue and skin. The placement of a suction drain is optional and depends on intraoperative findings and the preference of the surgeon.
Postoperative Care and Special Techniques for Avoiding Complications

Postoperative care is the same as that following open microsurgery. Adequate pain control is essential, and the postoperative treatment strategy should be tailored to the individual findings.

Basically the risks of surgery with the EasyGO!® II system are identical to those with a standard microsurgical approach, especially when a tube system is used. Owing to the very high magnification and minimally invasive approach in endoscopic surgery, the complication rate is very low and is below that in many microsurgical studies. It is important at this point to review some special issues relating to the use of minimally invasive techniques.

4.1 Infection Rate
The infection rate in spinal operations with a tube system appears to be extremely low and less than that of open microsurgery. A possible explanation for this could be the absence of skin-to-instrument contact during the operation. If an infection occurs, its treatment is the same as in microsurgical procedures.

4.2 Loss of Orientation, Inadequate Decompression
Based on experience in numerous workshops, endoscopy courses and live operations, the loss or misinterpretation of spatial orientation poses the greatest risk to a safe, successful operation. Every surgeon who plans an endoscopic procedure should first become thoroughly familiar with the instruments and equipment that will be used. It need hardly be stated that the surgeon should be as proficient with the correct handling of the camera and monitor system and with the instruments themselves. The actual intraoperative use of endoscopic equipment and devices should not be considered until this level of familiarity has been achieved.

When the system is used properly, there should be no problems with medial, lateral, cranial, and caudal orientation. On the other hand, it is often difficult to establish intraoperative orientation based on anatomic landmarks that are familiar from microsurgery. Because of the minimally invasive approach, the surgeon can view only small, very limited portions of the lamina and even the facet joints at any given time. This is why fluoroscopic guidance is so important in establishing and maintaining orientation.

Another factor to be considered besides intraoperative orientation is the very high degree of endoscopic magnification. This can mislead the surgeon into thinking that a sequestered disc fragment has been completely removed, when actually only a small portion has been extracted. Thus, the efficacy of a decompression should be evaluated carefully and in detail, especially during the first endoscopic procedures when the surgeon is less familiar with the effects of high magnification.

Caveat: As in all situations encountered during surgery, the following also applies here: If doubt exists about spatial orientation or regarding adequacy of neural decompression, prompt conversion to open microsurgery is strictly indicated.

4.3 Dural and Nerve Root Injury, Endoscopic Closure of a Dural Fistula
Available data do not indicate an increased risk of dural or nerve root injury associated with endoscopic surgery. The high magnification and high-definition view facilitate the early detection of these lesions. In endoscopic surgery as in open microsurgery, anatomic structures should always be dissected strictly in layers. If exposure is difficult due to extensive dural adhesions, for example, the risk of dural injury is just as high as in microsurgery. Because space is very limited, a dural injury usually cannot be repaired with sutures under endoscopic vision. If there is only a small defect and the arachnoid is largely intact so there is no risk of entrapping a nerve fascicle, the dural fistula can usually be repaired endoscopically with fibrin glue and a muscle graft. It is noteworthy that the dilated muscle layers will usually reapproximate when the tube is withdrawn, providing rapid closure of the access tract and effective closure of the dural fistula.

If a dural injury cannot be successfully managed endoscopically, the surgeon should convert to open microsurgery with wide exposure of the affected site.
4.4 Intraoperative and Postoperative Bleeding

The risk of bleeding in endoscopic surgery with the EasyGO® II system is very low. The total blood loss in most operations is less than 100 ml. Owing to the proximity of the endoscope tip to the surgical site, precise hemostasis can be achieved throughout the operation, avoiding loss of visualization. The combination of very high magnification and very precise hemostasis under endoscopic vision usually results in very little surgical blood loss.

If significant bleeding from the epidural veins should occur during the operation, it is sometimes difficult to maintain intraoperative orientation due to the extreme proximity of the endoscope and surgical site. If doubt exists, conversion to an open technique would be indicated.

The risk of postoperative bleeding is also very low. This does not diminish the importance of meticulous intraoperative hemostasis, however. Because the volume of the operative field is so small, even minor bleeding can quickly produce a mass effect on surrounding tissues.

Once the surgeon has mastered the special techniques for avoiding complications, the EasyGO® II system can provide excellent surgical results with a very low complication rate.

References

Original works


Book citations

Endoscopic Discectomy, Spinal Decompression
HOPKINS® Telescopes

**NEW 28095 BAA**  
HOPKINS® Forward-Oblique Telescope 25°, eyepiece angled 90°, diameter 4 mm, length 6 cm, autoclavable, fiber optic light transmission incorporated, for use with 4 cm long EasyGO!® II Trocars 28163 OTA, 28163 OTB, 28163 OTC, color code: red

**NEW 28095 BAB**  
HOPKINS® Forward-Oblique Telescope 25°, eyepiece angled 90°, diameter 4 mm, length 9 cm, autoclavable, fiber optic light transmission incorporated, for use with 7 cm long EasyGO!® II Trocars 28163 OTM, 28163 OTK and 28163 OTG, color code: red

**NEW 28095 BAC**  
HOPKINS® Forward-Oblique Telescope 25°, eyepiece angled 90°, diameter 4 mm, length 11 cm, autoclavable, fiber optic light transmission incorporated, for use with 10 cm long EasyGO!® II Trocars 28163 OTW, 28163 OTY, 28163 OTZ, color code: red
Endoscopic Discectomy, Spinal Decompression
EasyGO® II Trocar Attachments and Telescope Holders

**NEW**

28163 OAM  **EasyGO® II Trocar Attachment**, diameter 15 mm, for use with EasyGO® II Trocars 28163 OTA, 28163 OTM and 28163 OTW

28163 OBM  **EasyGO® II Telescope Holder**, diameter 15 mm, for use with EasyGO® II Trocar Attachment 28163 OAM

**NEW**

28163 OAK  **EasyGO® II Trocar Attachment**, diameter 19 mm, for use with EasyGO® II Trocars 28163 OTB, 28163 OTK and 28163 OTY

28163 OBK  **EasyGO® II Telescope Holder**, diameter 19 mm, for use with EasyGO® II Trocar Attachment 28163 OAK

**NEW**

28163 OAG  **EasyGO® II Trocar Attachment**, diameter 23 mm, for use with EasyGO® II Trocars 28163 OTC, 28163 OTG and 28163 OTZ

28163 OBG  **EasyGO® II Telescope Holder**, diameter 23 mm, for use with EasyGO® II Trocar Attachment 28163 OAG
Endoscopic Discectomy, Spinal Decompression

EasyGO® II Trocars, color code: orange, diameter 15 mm, lengths 6 cm, 9 cm and 11 cm

NEW 28163 OTA  
EasyGO® II Trocar, diameter 15 mm, working length 39 mm, for use with EasyGO® II Trocar Attachment 28163 OAM, EasyGO® II Telescope Holder 28163 OBM and HOPKINS® Forward-Oblique Telescope 25° 28095 BAA, diameter 4 mm, length 6 cm, color code: orange

NEW 28163 OTM  
EasyGO® II Trocar, diameter 15 mm, working length 69 mm, for use with EasyGO® II Trocar Attachment 28163 OAM, EasyGO® II Telescope Holder 28163 OBM and HOPKINS® Forward-Oblique Telescope 25° 28095 BAB, diameter 4 mm, length 9 cm, color code: orange

NEW 28163 OTW  
EasyGO® II Trocar, diameter 15 mm, working length 89 cm, for use with EasyGO® II Trocar Attachment 28163 OAM, EasyGO® II Telescope Holder 28163 OBM and HOPKINS® Forward-Oblique Telescope 25° 28095 BAC, diameter 4 mm, length 11 cm, color code: orange
Endoscopic Discectomy, Spinal Decompression

EasyGO® II Trocars, color code: green, diameter 19 mm, lengths 6 cm, 9 cm and 11 cm

**NEW**

- **28163 OTB** EasyGO® II Trocar, diameter 19 mm, working length 40 mm, for use with EasyGO® II Trocar Attachment 28163 OAK, EasyGO® II Telescope Holder 28163 OBK and HOPKINS® Forward-Oblique Telescope 25° 28095 BAA, diameter 4 mm, length 6 cm, color code: green

- **28163 OTK** EasyGO® II Trocar, diameter 19 mm, working length 71 mm, for use with EasyGO® II Trocar Attachment 28163 OAK, EasyGO® II Telescope Holder 28163 OBK and HOPKINS® Forward-Oblique Telescope 25° 28095 BAB, diameter 4 mm, length 9 cm, color code: green

- **28163 OTY** EasyGO® II Trocar, diameter 19 mm, working length 91 mm, for use with EasyGO® II Trocar Attachment 28163 OAK, EasyGO® II Telescope Holder 28163 OBK and HOPKINS® Forward-Oblique Telescope 25° 28095 BAC, diameter 4 mm, length 11 cm, color code: green
Endoscopic Discectomy, Spinal Decompression

EasyGO® II Trocars, color code: black, diameter 23 mm, lengths 6 cm, 9 cm and 11 cm

NEW 28163 OTC  EasyGO® II Trocar, diameter 23 mm, working length 43 mm, for use with EasyGO® II Trocar Attachment 28163 OAG, EasyGO® II Telescope Holder 28163 OBG and HOPKINS® Forward-Oblique Telescope 25° 28095 BAA, diameter 4 mm, length 6 cm, color code: black

NEW 28163 OTG  EasyGO® II Trocar, diameter 23 mm, working length 73 mm, for use with EasyGO® II Trocar Attachment 28163 OAG, EasyGO® II Telescope Holder 28163 OBG and HOPKINS® Forward-Oblique Telescope 25° 28095 BAB, diameter 4 mm, length 9 cm, color code: black

NEW 28163 OTZ  EasyGO® II Trocar, diameter 23 mm, working length 94 mm, for use with EasyGO® II Trocar Attachment 28163 OAG, EasyGO® II Telescope Holder 28163 OBG and HOPKINS® Forward-Oblique Telescope 25° 28095 BAC, diameter 4 mm, length 11 cm, color code: black
Endoscopic Discectomy, Spinal Decompression
Puncture Needle, Guide Wire and Dilation Sleeve

28163 PL
Puncture Needle, including stylet, diameter 1.8 mm, working length 18 cm, with 1.3 mm opening for guide wire

28163 KD
Guide Wire, unsterile, diameter 1.2 mm, length 31 mm, package of 10

28163 CPS
Dilation Sleeve, graduated, inner diameter 1.5 mm, outer diameter 5.2 mm, length 23 cm, color code: white

Dilation Sleeve, graduated, inner diameter 5.3 mm, outer diameter 8.9 mm, length 21 cm, color code: yellow

Dilation Sleeve, graduated, inner diameter 9 mm, outer diameter 12.7 mm, length 19 cm, color code: orange

Dilation Sleeve, graduated, inner diameter 12.9 mm, outer diameter 14.9 mm, length 17 cm, color code: red

Dilation Sleeve, graduated, inner diameter 15.1 mm, outer diameter 16.9 mm, length 15 cm, color code: green

Dilation Sleeve, graduated, inner diameter 17.1 mm, outer diameter 18.9 mm, length 14 cm, color code: blue

Dilation Sleeve, graduated, inner diameter 19 mm, outer diameter 20.9 mm, length 13 cm, color code: black
Endoscopic Discectomy, Spinal Decompression
Punches and Forceps

- **28163 CFS**
- **28163 BKU** KERRISON Punch, dismantling, bayonet-shaped, fixed, upbiting 40° forward, 2 mm, working length 17 cm
- **28163 BKD** KERRISON Punch, dismantling, bayonet-shaped, fixed, downbiting 40° forward, 2 mm, working length 17 cm
- **28163 CLS** KERRISON Bone Punch, dismantling, 90° upbiting, not through-cutting, 2 mm, working length 24 cm
- **28163 CLB** KERRISON Bone Punch, dismantling, 90° upbiting, not through-cutting, 4 mm, working length 24 cm
- **28163 CFS** KERRISON Bone Punch, dismantling, 40° upbiting, not through-cutting, 2 mm, working length 24 cm
- **28163 CFB** KERRISON Bone Punch, dismantling, 40° upbiting, not through-cutting, 4 mm, working length 24 cm

- **28163 CC**
- **28163 CC** Spoon Forceps, dismantling, robust, oval, spoon size 3 x 10 mm, single action jaws, working length 20 cm
- **28163 EC** Spoon Forceps, dismantling, curved 30°, robust, oval, spoon size 3 x 10 mm, single action jaws, working length 20 cm

- **28163 FB**
- **28163 FB** BLAKESLEY Nucleus Cutting Forceps, single action jaws, opening upwards, diameter 3.5 mm, working length 20 cm
Endoscopic Discectomy, Spinal Decompression
Hook Scissors, Surgical Handle, Suction Tube and Nasal Dressing Forceps

28163 EHK

Hook Scissors, single action jaws, diameter 2.7 mm, working length 25 cm

28163 GBM

Surgical Handle, bayonet-shaped, working length 15 cm, for Blades 208010 – 15 and 208210 – 15

28163 GX

Suction Tube, with cut-off hole, Luer, diameter 2.7 mm, working length 15 cm

28163 KT

FERGUSON Suction Tube, with cut-off hole and stylet, Luer, diameter 4 mm, working length 15 cm

28163 GXN

Suction Tube, with distal nerve retractor, with cut-off hole, Luer-Lock connector, diameter 2.7 mm, working length 15 cm

426620

GRÜNWALD Nasal Dressing Forceps, bayonet-shaped, length 20 cm
Endoscopic Discectomy, Spinal Decompression

Palpation Hooks and Dissectors

28163 GAH

Palpation Hook, straight, distally 10 mm long and angled 90°, with ball end, with round handle, working length 20 cm

28163 GBH

Palpation Hook, bayonet-shaped, distally angled 90°, with ball end, with round handle, working length 20 cm

28164 DS

Dissector, sharp, tip angled 15°, with round handle, size 2 mm, length 25 cm

28164 MDB

MORTINI Dissector, “dead hand”, bayonet-shaped, sharp, 3 mm, curved upwards, with round handle, working length 16 cm
Endoscopic Discectomy, Spinal Decompression
Nerve Hook, Nerve Retractor and Curette

28163 NSB  **Nerve Hook**, distal width 3 mm, bayonet-shaped, working length 16 cm

28163 NBB  **Nerve Hook**, distal width 5 mm, bayonet-shaped, working length 16 cm

28163 GRN  **Nerve Retractor**, angled 30°, distal width 5 mm, working length 17 cm

28163 RN   **Nerve Retractor**, hook length 2 mm, diameter 4 mm, angled sheath, working length 20 cm

28163 CKG  **Curette**, small, spoon size (l x w): 2.7 x 4 mm, bayonet-shaped, distally angled 45°, working length 20 cm
Endoscopic Discectomy, Spinal Decompression

Holding System

28272 HB  **Articulated Stand**, reinforced version, L-shaped, with one central clamp for all five joint functions, height 48 cm, operating range 52 cm, with quick release coupling KSLOCK (female)

28172 HR  **Rotation Socket** to clamp on the operating table with one already mounted butterfly nut 28172 HRS, for use with European and United States standard rails, with lateral clamping element for height and angle adjustment of the articulated stand
Endoscopic Discectomy, Spinal Decompression
TAKE-APART® Bipolar Forceps and Bipolar Coagulation Forceps

28164 BDN
TAKE-APART® Bipolar Forceps,
rounded tip, width 2 mm, outer diameter 3.4 mm,
working length 20 cm,
including:
Bipolar Ring Handle
Outer Sheath
Inner Sheath
Forceps Insert

28163 BPS
Bipolar Coagulation Forceps, insulated,
bayonet-shaped, tip 0.7 mm, length 23 cm,
for use with Bipolar High Frequency Cord
847000 E or 847000 A/M/T/V

28163 BPL
Bipolar Coagulation Forceps, insulated,
bayonet-shaped, tip 1.2 mm, length 23 cm,
for use with Bipolar High Frequency Cord
847000 E or 847000 A/M/T/V
## Accessories

Bipolar High Frequency Cords, for use with bipolar coagulation forceps

<table>
<thead>
<tr>
<th>KARL STORZ Instruments</th>
<th>High Frequency Surgical Units</th>
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<tr>
<td>847000 E</td>
<td><strong>Bipolar High Frequency Cord</strong>, length 300 cm, for AUTOCON® II 400 SCB systems (111, 113, 115, 122, 125), AUTOCON® II 200, AUTOCON® II 80, Coagulator 26021 B/C/D, 860021 B/C/D, 27810 B/C/D, 28810 B/C/D, AUTOCON® systems (50, 200, 350), Erbe-Coagulator, T and ICC series and bipolar coagulation forceps</td>
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<td><strong>Bipolar High Frequency Cord</strong>, length 300 cm, for AUTOCON® II 400 SCB systems (112, 114, 116, 122, 125), Valleylab coagulators and bipolar coagulation forceps</td>
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**Accessories**
**Bipolar High Frequency Cords, for use with TAKE-APART® Bipolar Forceps**

**Bipolar High Frequency Cords**

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UNIDRIVE® S III NEURO SCB System Components

40701701-1  UNIDRIVE® S III NEURO SCB,
motor control unit with color display,
touch screen, two motor outputs,
integrated irrigation pump and integrated SCB module,
power supply 100–240 VAC, 50/60 Hz

20712033  High-Speed Micro-Motor,
max. speed 60,000 rpm, including connecting cable,
for use with UNIDRIVE® S III NEURO motor system

Accessories

280053  Universal Spray, 6x 500 ml bottles
- HAZARDOUS GOODS – UN 1950
including:
Spray Nozzle

031131-10*  Tubing Set, for irrigation, for single use,
sterile, package of 10

* mtp medical technical promotion gmbh,
take-off GewerbePark 46, 78579 Neuhausen ob Eck/Germany,
Phone: +49 (0) 74 67 9 45 04-0, Fax: +49 (0) 74 67 9 45 04-99,
E-Mail: info@mtp-tut.com, www.mtp-tut.com
UNIDRIVE® S III NEURO SCB
High-Speed Handpieces, angled, 60,000 rpm

252663

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

High-Speed Handpieces, malleable, slim, angled, 60,000 rpm

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

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

*High-Speed Micro-Motor: 20712033*

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**Diamond Burrs, coarse**

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The EasyGO!® II System for the Fully Endoscopic Treatment of Diseases of the Cervical and Lumbar Spine

**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

**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

- Sustainable investment
- Compatible with all light sources

- 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**

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**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.
**IMAGE1 S Camera System**

**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

### Specifications:

<table>
<thead>
<tr>
<th>Feature</th>
<th>TC 200EN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD video outputs</td>
<td>- 2x DVI-D (1x 3G-SDI)</td>
</tr>
<tr>
<td>Format signal outputs</td>
<td>1920 x 1080p, 50/60 Hz</td>
</tr>
<tr>
<td>LINK video inputs</td>
<td>3x</td>
</tr>
<tr>
<td>USB interface</td>
<td>4x USB, (2x front, 2x rear)</td>
</tr>
<tr>
<td>SCB interface</td>
<td>2x 6-pin mini-DIN</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–120 VAC/200–240 VAC</td>
</tr>
<tr>
<td>Power frequency</td>
<td>50/60 Hz</td>
</tr>
<tr>
<td>Protection class</td>
<td>I, CF-Defib</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>305 x 54 x 320 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>2.1 kg</td>
</tr>
</tbody>
</table>

**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

### Specifications:

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

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

**SPECTRA B: Not for sale in the U.S.**
The EasyGO!® II System for the Fully Endoscopic Treatment of Diseases of the Cervical and Lumbar Spine

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

---

**IMAGE1 S Camera Heads**

*NEW*

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

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**TH 100**

**IMAGE1 S H3-Z Three-Chip FULL HD Camera Head**, 50/60 Hz, IMAGE1 S compatible, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15–31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

---

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 100</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 114 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>270 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
</tr>
</tbody>
</table>

---

**TH 104**

**IMAGE1 S H3-ZA Three-Chip FULL HD Camera Head**, 50/60 Hz, IMAGE1 S compatible, **autoclavable**, progressive scan, soakable, gas- and plasma-sterilizable, with integrated Parfocal Zoom Lens, focal length f = 15–31 mm (2x), 2 freely programmable camera head buttons, for use with IMAGE1 S and IMAGE1 HUB™ HD/HD

---

**Specifications:**

<table>
<thead>
<tr>
<th>IMAGE1 FULL HD Camera Heads</th>
<th>IMAGE1 S H3-ZA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 104</td>
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<tr>
<td>Image sensor</td>
<td>3x 1/3” CCD chip</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>39 x 49 x 100 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>299 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, f = 15–31 mm (2x)</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</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
The EasyGO!® II System for the Fully Endoscopic Treatment of Diseases of the Cervical and Lumbar Spine

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 (type)</td>
<td>500 cd/m² (type)</td>
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<tr>
<td>Max. viewing angle</td>
<td>178° vertical</td>
<td>178° vertical</td>
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<tr>
<td>Pixel distance</td>
<td>0.29 mm</td>
<td>0.3 mm</td>
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<tr>
<td>Reaction time</td>
<td>5 ms</td>
<td>8 ms</td>
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<tr>
<td>Contrast ratio</td>
<td>700:1</td>
<td>1400:1</td>
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<tr>
<td>Mount</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
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<tr>
<td>Weight</td>
<td>7.6 kg</td>
<td>7.7 kg</td>
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<td>Rated power</td>
<td>28 W</td>
<td>72 W</td>
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<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>
Fiber Optic Light Cable

- **495 NCS**
  - **Fiber Optic Light Cable**, with straight connector, extremely heat-resistant, diameter 4.8 mm, length 250 cm

- **495 NA**
  - **Fiber Optic Light Cable**, with straight connector, diameter 3.5 mm, 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 Cable**, 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**

- **20133028**
  - **XENON Spare Lamp**, only, 300 watt, 15 volt

Fiber Optic Light Cable

- **495 NCS**
  - **Fiber Optic Light Cable**, with straight connector, extremely heat-resistant, diameter 4.8 mm, length 250 cm

- **495 NA**
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    - power supply: 100–125 VAC/220–240 VAC, 50/60 Hz
    - including:
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      - **SCB Connecting Cable**, length 100 cm

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    - including:
      - **Mains Cord**

- **20133028**
  - **XENON Spare Lamp**, only, 300 watt, 15 volt
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.
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

including:
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 Swivel 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