NOTES CHOLECYSTECTOMY
Transvaginal Hybrid and Single-Site Multiple-Port Approaches

Carsten ZORNIG
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Introduction

The ability to perform surgical procedures through natural body orifices could bring us a step closer to achieving almost “perfect surgery.” This relatively new method, called natural orifice transluminal endoscopic surgery (NOTES), has the potential to reduce the rate of wound infections and hernias in the abdominal wall, shorten hospital stays and lost job time, and yield better cosmetic results. NOTES procedures have become a current and very interesting topic of discussion and research. Since about 2004, complex procedures using flexible endoscopes have been performed through transesophageal, transgastric, transvaginal, transcolonic, and transvesical approaches in animal models1–14. The first NOTES procedures in human patients were performed in 2007 in Europe and the United States15–20. Reports to date have described NOTES procedures as complicated, risky, and very time-consuming because they are performed with flexible endoscopes that are not designed or suitable for operations in the free abdominal cavity. While the literature includes a number of individual case reports from various centers, no reports have yet been published on larger series.

We were already familiar with the transvaginal approach based on our experience with transvaginal specimen retrieval in laparoscopic surgery (splenectomies and colon resections)21. Discussions about NOTES techniques in early 2007 led to the idea of performing a transvaginal cholecystectomy with rigid instruments. We have been working with gynecologists who regularly introduce trocars through the posterior vaginal fornix for culdoscopy and use this technique in fertility evaluations, for example. This approach has been employed in gynecology for more than 100 years22, 23. Since approximately two-thirds of all cholecystectomies are performed in women, the majority of patients would be candidates for the transvaginal approach.

In June of 2007, we used the method described here to perform our first cholecystectomy without visible scars in a female patient. Since then we have performed NOTES cholecystectomies in 140 women and have published our results24–25.
Operating Technique

The patient is placed in the Trendelenburg position. Because a steep head-down tilt is required during the initial part of the operation, shoulder rests are placed on both sides of the table. With the patient in an initial flat supine position, a deep incision is made in the umbilicus with a pointed scalpel, and a Veress needle is introduced into the abdominal cavity (Fig. 1).

A pneumoperitoneum is established to an intra-abdominal pressure of 12 mmHg. Then the Veress needle is replaced by a 6-mm trocar, and the appropriate laparoscope is inserted. Following endoscopic inspection of the abdominal cavity, the patient is brought to a steep head-down tilt to displace small bowel loops from the lesser pelvis and provide a clear view of the cul-de-sac. If necessary, the laparoscope can be used to mobilize the small bowel and displace it out of the lesser pelvis. A distended bladder may also hamper visualization of the cul-de-sac, in which case the urine should be voided through a disposable catheter.

The assistant now inserts the vaginal specula and identifies the cervix. The posterior lip of the cervix is grasped with a cervical forceps, and a uterine probe is inserted. The probe is used to anteflex the uterus, which provides an excellent laparoscopic view of the cul-de-sac (Fig. 2). The operating instruments can be introduced under clear vision in hysterectomized patients who have no adhesions in the lesser pelvis.

A pneumoperitoneum is created with a Veress needle passed through an umbilical incision.

View into the lesser pelvis past the anteflexed uterus.
Next, the stylet of an extra-long trocar is introduced through the posterior fornix under laparoscopic guidance. It is then withdrawn and an extra-long 5-mm dissector is passed into the abdominal cavity through the perforation site (Fig. 3).

An extra-long 11-mm trocar for the long 45° laparoscope is introduced next to the dissector, and the laparoscope is placed in the abdominal cavity (Figs. 4, 5).

The camera is now switched from the umbilicus to the transvaginal laparoscope, and the patient is raised from the head-down tilt. Working through the transvaginal approach, the assistant grasps the gallbladder with the long dissector and displaces it cephalad. The surgeon now carries out a one-handed dissection of Calot’s triangle using the 5-mm dissector in the umbilical portal (Fig. 6).

The posterior vaginal wall is perforated with the stylet of a 6-mm trocar.

An extra-long 11-mm trocar is introduced, and a 5-mm dissecting forceps is inserted through the perforation site.

The 11-mm trocar and extra-long 5-mm dissecting forceps are introduced through the transvaginal approach.

Dissection of Calot’s triangle with a transumbilical dissector (D). Countertraction is applied with a transvaginal dissecting forceps.
The cystic duct is occluded with metal clips and divided with a scissors.

The cystic artery is identified and occluded with metal clips.

The gallbladder is dissected from the liver with the transumbilical hook electrode.

As in a conventional laparoscopic cholecystectomy, the cystic artery and cystic duct are positively identified and are usually sealed and divided with a 5-mm clip applier (Figs. 7 and 8).

The surgeon now dissects the gallbladder from the liver using a hook electrode (Fig. 9).

The assistant exerts tension on the gallbladder in various directions. The dissector may be somewhat difficult to maneuver at this time due to instrument crowding at the vaginal introitus. Also, the long axis of the dissector handled by the surgeon may occasionally cross the long axis of the laparoscope and hamper fine instruments movements. This problem can be solved by pulling back on the laparoscope and viewing the operative site at a greater range.

After the gallbladder has been completely freed from the liver and all bleeding sites on the liver have been controlled, the camera is returned to the 5-mm laparoscope in the umbilicus. The patient is returned to a head-down tilt, and a 10-mm grasping forceps is introduced transvaginally to secure the detached gallbladder.
At this point the extra-long 5-mm dissector is no longer needed and may be withdrawn to improve vision at the vaginal introitus. The vaginal specula are reopened, and the gallbladder is retrieved by the transvaginal route. If large gallstones are present, the posterior vaginal wall can be spread open with a blunt forceps next to the specimen to facilitate retrieval (Figs. 10, 11).

If acute cholecystitis is present or if the gallbladder is accidentally opened, a retrieval bag should be introduced transvaginally for specimen retrieval.

A retrieval bag is not needed in symptomatic cholecystolithiasis without an acute inflammatory reaction.

Following gallbladder retrieval, the defects in the posterior vaginal wall are closed with 2-0 absorbable interrupted sutures. The abdomen is deflated, the umbilical trocar is removed, and the stab incision is closed with absorbable intracutaneous sutures (Figs. 12, 13).

Ordinarily, patients are given a single perioperative dose of antibiotics and are discharged on the second postoperative day. A follow-up visit with our referring gynecologist is scheduled on the fourth to seventh postoperative day. At that time the patient is asked about any difficulties, and a physical examination and transvaginal endosonography are performed. The patient should abstain from sexual intercourse for two weeks.
Results

We performed the NOTES cholecystectomy in 140 women between June of 2007 and December of 2008. The NOTES technique was used in approximately 24% of all cholecystectomies that we performed in women during that period. Each operation lasted an average of 50 minutes. As expected, the cosmetic result was perfect in all cases owing to the absence of a visible scar.

At the start of the series, we limited the NOTES procedure to simpler cases (thin patients with no prior surgery and no significant gallbladder inflammation), and we increasingly expanded the indication later on. Initially we withheld the operation from patients with a BMI greater than 35, prior surgery in the lower abdomen or lesser pelvis, significant adhesions, or prospective difficulties with trocar insertion. We performed the NOTES cholecystectomy in 14 patients with acute cholecystitis or severe chronic cholecystitis.

One patient developed a complication in the form of a cul-de-sac abscess. She presented to us at 3 weeks postoperatively with pain and fever. This patient had failed to keep her postoperative gynecologic appointment. The abscess was successfully treated by laparoscope drainage. All the other patients were free of complaints and had an uneventful postoperative course.

The NOTES cholecystectomy has now become a routine procedure at our institution.

Conclusions

Intra-abdominal surgery through natural body orifices is currently in a developmental stage. Today we cannot predict the future development of NOTES or whether it will become clinically feasible on a routine basis. With the instruments and flexible endoscopes now available, it is unrealistic to expect the implementation of NOTES on a broad scale. The transgastric and transcolonic approaches for flexible endoscopy are fraught with risks. In particular, the closure of these approaches and the maintenance of intra-abdominal asepsis pose major hurdles to their use in human patients. On the other hand, combined transvaginal-transumbilical cholecystectomy with rigid laparoscopes and instruments is a technique that is already suitable for routine clinical use.
References


Laparoscopic Cholecystectomy

Part II: Transumbilical Single-Site Multiple-Port Approach

Introduction

For years, laparoscopic cholecystectomy has been the gold standard for removal of the gallbladder. In recent years the transvaginal approach with rigid instruments has developed into a method that is useful for routine cholecystectomies. Moreover, discussions about natural-orifice transluminal endoscopic surgery (NOTES) have led to recent changes in certain details of conventional laparoscopic surgery. One goal in particular is to retain some of the advantages of NOTES without having to perforate a healthy organ or use a flexible endoscope. The whole operation is performed through one approach at the umbilicus, which some authors consider to be a “natural orifice.” This can provide an almost perfect cosmetic result, leaving only a faint scar at the edge of the umbilicus. The “single-incision” or “single-access” concept can also be applied in male patients and in female patients who refuse the transvaginal approach.

Operating Technique

The patient is positioned supine on the flat operating table. An approximately 1.5-cm incision is made at the upper edge of the umbilicus with a pointed scalpel, and the peritoneal cavity is insufflated to a pressure of 12 mm Hg with a Veress needle. Next, a 6-mm trocar is introduced through this incision into the abdominal cavity. Following diagnostic laparoscopy with an extra-long HOPKINS® II 30° laparoscope, the abdominal wall just to the left of the trocar is perforated with the stylet of a 6-mm trocar, taking care that the mandrel passes through the abdominal wall only. This creates an opening through which a curved 5-mm clamp is passed into the abdominal cavity (Fig. 1). A second 6-mm trocar is inserted just to the right of the initial trocar.

Now, the patient is placed in left lateral decubitus and moved to a slight head-up tilt. The gallbladder is grasped at the fundus with the curved clamp and retracted. Using the second 5-mm dissector, the surgeon dissects in Calot’s triangle until the cystic duct and cystic artery can be positively identified (Figs. 3a, b). They are sealed with a 5-mm titanium multiclip applicator (Fig. 4) and divided. While traction is exerted, the gallbladder is freed from its bed with a small hook electrode (Fig. 5). The abdominal wall is perforated with the tip of a 6-mm trocar.

After the gallbladder has been freed from its bed, it is retrieved with the 5-mm grasping forceps by joining the two 6-mm umbilical trocar incisions with a scalpel (Fig. 6).
If necessary, the fascia bordering the gallbladder can be stretched somewhat with a blunt clamp. After the fascia has been closed with absorbable suture material, the cutaneous sutures are placed. In patients with severe inflammation or a perforated gallbladder, it may be necessary to replace a 6-mm trocar with an 11-mm trocar and extract the specimen in a retrieval bag.

The gallbladder is retracted with the curved clamp…

…while the cystic duct and cystic artery are exposed in Calot’s triangle with a straight dissector.

When both structures have been positively identified, they are sealed with the multiclip applicator and divided.

Aided by traction with the curved clamp, the gallbladder is freed from its bed with a small hook electrode.

The gallbladder is retrieved at the umbilicus through the single incision.
Summary

Discussions on the subject of natural-orifice transluminal endoscopic surgery (NOTES) have created an impetus for further advances in minimally invasive surgery. A number of concepts have been devised for transumbilical laparoscopic procedures6–14, all of which are aimed at achieving the best possible cosmetic result. These procedures involve parallel instrument approaches and the classic laparoscopic principle of triangulation using curved instruments and an angled laparoscope in the abdominal cavity.

These procedures may employ specially designed port systems that effectively seal the CO2 pneumoperitoneum while allowing the use of curved instruments, or they may involve the parallel placement of multiple trocars through one incision. A definite advantage of these single-site methods is that they reduce costs by eliminating the need for port systems.

Because the use of multiple trocars at the umbilicus may be cumbersome due to crowding and collisions, we replace one of the trocars with a curved clamp. Used for gallbladder retraction, this clamp does not need to be replaced by a different instrument at any point during the operation and does not cause significant gas loss. We have also found it helpful to use an extra-long HOPKINS® II 30° laparoscope, as it keeps the first assistant’s hand away from the umbilicus and out of the operative field.

It should be added that single-port systems and single-access surgery tend to increase the length and difficulty of the operation. Hence they should be reserved for surgeons who are very experienced in minimally invasive operations. The obvious advantage of these methods lies in the improved cosmetic result (Figs. 7, 8). Future studies will determine whether single-site approaches offer additional advantages or perhaps even disadvantages besides the increased difficulty and longer operating time.

Wound appearance at the end of the operation.

Invisible umbilical scar on the second postoperative day.
References


NOTES Cholecystectomy – Transvaginal Hybrid and Single-Site Multiple-Port Approaches

Transvaginal Hybrid Cholecystectomy

Recommended Instrument Set

26046 BA HOPKINS® Forward-Oblique Telescope 30°, enlarged view, diameter 5 mm, length 29 cm, autoclavable, fiber optic light transmission incorporated, color code: red

26003 FEA HOPKINS® Telescope 45°, enlarged view, diameter 10 mm, length 42 cm, autoclavable, fiber optic light transmission incorporated, color code: black

26120 JL VERESS Pneumoperitoneum Needle, with spring-action blunt inner cannula, Luer-Lock, autoclavable, diameter 2.1 mm, length 13 cm

30160 MC Trocar, with conical tip, insufflation stopcock, size 6 mm, working length 10.5 cm, color code: black, including:
- Cannula, without valve
- Trocar only
- Multifunctional Valve

31103 MN Trocar for obese patients, size 11 mm, color code: green-red, including:
- Trocar only, with blunt tip
- Cannula without valve, without insufflation stopcock, length 15 cm
- Multifunctional Valve, size 11 mm

33444 AF CLICKLINE Grasping Forceps, rotating, dismantling, without connector pin for unipolar coagulation, with irrigation connection for cleaning, double action jaws, atraumatic, fenestrated, size 5 mm, length 43 cm, including:
- Metal Y-Handle, with ratchet
- Outer Sheath, insulated
- Forceps Insert

35461 BAU CLICKLINE Grasping Forceps, rotating, dismantling, with connector pin for unipolar coagulation, single action jaws, jaws open upwards, jaws with multiple teeth, fenestrated, sheath bending according to CUSCHIERI O-CON, coaxially curved downwards, size 5 mm, length 43 cm, including:
- Metal Handle, without ratchet, with larger contact area
- Outer Sheath, with Working Insert

33161 CLICKLINE Metal Handle, rotating, without ratchet, with plastic rings with larger contact area, without connector pin for unipolar coagulation

33351 ML CLICKLINE KELLY Dissecting and Grasping Forceps, rotating, dismantling, insulated, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, double action jaws, long, size 5 mm, length 36 cm, including:
- Plastic Handle, without ratchet, with larger contact area
- Metal Outer Sheath
- Forceps Insert

34351 MA CLICKLINE Scissors, rotating, dismantling, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, double action jaws, spoon-shaped blades, serrated, curved, length of jaws 20 mm, size 5 mm, length 36 cm, for use with trocars size 6 mm, including:
- Plastic Handle, without ratchet, with larger contact area
- Metal Outer Sheath
- Scissors Insert

26775 CL CADIERE Coagulating and Dissecting Electrode, insulated sheath, with connector pin for unipolar coagulation, L-shaped, tapered tip with cm-marking, size 5 mm, length 43 cm

26775 C Same, length 36 cm

26173 BN Suction and Irrigation Tube, anti-reflex surface, with two-way stopcock, for single hand control, size 5 mm, length 36 cm

533 TVA Adaptor, autoclavable, facilitates changing of telescopes in sterile conditions

Clip Applicator, 5 mm
HOPKINS® Telescopes
Diameter 5 mm, length 29 cm

HOPKINS® Forward-Oblique Telescope 30°,
enlarged view, diameter 5 mm, length 29 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: red

Diameter 10 mm, length 42 cm

HOPKINS® Telescope 45°,
enlarged view, diameter 10 mm, length 42 cm,
autoclavable,
fiber optic light transmission incorporated,
color code: black

It is recommended to check the suitability of the product for the intended procedure prior to use.
**Trocars**

*Size 6 mm, working length 10.5 cm*

30160 MC  **Trocar**, with conical tip, insufflation stopcock, size 6 mm, working length 10.5 cm, color code: black, including:
- **Cannula**, without valve
- **Trocar only**
- **Multifunctional Valve**

*Size 11 mm, working length 15 cm*

31103 MN  **Trocar** for obese patients, size 11 mm, color code: green-red, including:
- **Trocar only**, with blunt tip
- **Cannula** without valve, without insufflation stopcock, length 15 cm
- **Multifunctional Valve**, size 11 mm

**VERESS Pneumoperitoneum Needle**

26120 JL  **VERESS Pneumoperitoneum Needle**, with spring-action blunt inner cannula, LUER-Lock, autoclavable, diameter 2.1 mm, length 13 cm
Suction and Irrigation Tube

26173 BN

Suction and Irrigation Tube, anti-reflex surface, with two-way stopcock, for single hand control, size 5 mm, length 36 cm

CADIERE Coagulating and Dissecting Electrode

26775 CL

CADIERE Coagulating and Dissecting Electrode, insulated sheath, with connector pin for unipolar coagulation, L-shaped, tapered tip with cm-marking, size 5 mm, length 43 cm

26775 C Same, length 36 cm
CLICKLINE Grasping Forceps

35461 BAU

CLICKLINE Grasping Forceps, rotating, dismantling, with connector pin for unipolar coagulation, single action jaws, jaws open upwards, jaws with multiple teeth, fenestrated, sheath bending according to CUSCHIERI O-CON, coaxially curved downwards, size 5 mm, length 43 cm, including:

- Metal Handle, without ratchet, with larger contact area
- Outer Sheath, with Working Insert

33161

CLICKLINE Metal Handle, rotating, without ratchet, with plastic rings with larger contact area, without connector pin for unipolar coagulation

33444 AF

CLICKLINE Grasping Forceps, rotating, dismantling, without connector pin for unipolar coagulation, with irrigation connection for cleaning, double action jaws, atraumatic, fenestrated, size 5 mm, length 43 cm, including:

- Metal Y-Handle, with ratchet
- Outer Sheath, insulated
- Forceps Insert

33531 AF

CLICKLINE Grasping Forceps, rotating, size 10 mm, length 36 cm, atraumatic, fenestrated, double action jaws, including:

- Metal Handle, without ratchet
- Outer Tube, insulated
- Forceps Insert
CLICKLINE Dissecting and Grasping Forceps

CLICKLINE KELLY Dissecting and Grasping Forceps, rotating, dismantling, insulated, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, double action jaws, long, size 5 mm, length 36 cm, including:
- Plastic Handle, without ratchet, with larger contact area
- Metal Outer Sheath
- Forceps Insert

CLICKLINE Scissors

CLICKLINE Scissors, rotating, dismantling, with connector pin for unipolar coagulation, with Luer-Lock irrigation connector for cleaning, double action jaws, spoon-shaped blades, serrated, curved, length of jaws 20 mm, size 5 mm, length 36 cm, for use with trocars size 6 mm, including:
- Plastic Handle, without ratchet, with larger contact area
- Metal Outer Sheath
- Scissors Insert
### Single-Site Multiple-Port Cholecystectomy

**Recommended Instrument Set**

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<th>Item Description</th>
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<td>26048 BA</td>
<td>HOPKINS® Forward-Oblique Telescope 30°, diameter 5.5 mm, length 50 cm, autoclavable, fiber optic light transmission incorporated, color code: red</td>
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<tr>
<td>30160 MP</td>
<td>Trocar, with pyramidal tip, insufflation stopcock, multifunctional valve, size 6 mm, working length 10.5 cm, color code: black, including: Trocar only, with pyramidal tip Cannula, without valve, with insufflation stopcock Multifunctional Valve, size 6 mm</td>
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<tr>
<td>33351 ML</td>
<td>CLICKLINE KELLY Dissecting and Grasping Forceps, rotating, dismantling, insulated, with connector pin for unipolar coagulation with Luer-Lock irrigation connector for cleaning, double action jaws, long, size 5 mm, length 36 cm, including: Plastic Handle, without ratchet, with larger contact area Metal Outer Sheath Forceps Insert</td>
</tr>
<tr>
<td>26775 CL</td>
<td>CADIERE Coagulating and Dissecting Electrode, insulated sheath, with connector pin for unipolar coagulation, L-shaped, tapered tip with cm-marking, size 5 mm, length 43 cm</td>
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<td>35410 BAU</td>
<td>Outer Tube with working insert, with Luer-Lock adaptor for cleaning, insulated, atraumatic, jaws with multiple teeth, fenestrated, length 47 cm</td>
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<tr>
<td>33161</td>
<td>CLICKLINE Metal Handle, rotating, without ratchet, with plastic rings with larger contact area, without connector pin for unipolar coagulation</td>
</tr>
<tr>
<td>26173 BN</td>
<td>Suction and Irrigation Tube, anti-reflex surface, with two-way stopcock, for single hand control, size 5 mm, length 36 cm</td>
</tr>
</tbody>
</table>

Titan Clip Applikator, 5 mm
HOPKINS® Telescope
Diameter 5.5 mm, length 50 cm

HOPKINS® Forward-Oblique Telescope 30°,
diameter 5.5 mm, length 50 cm, autoclavable,
fiber optic light transmission incorporated,
light connection offset by 180° and angled 45°,
color code: red

Trocar
Size 6 mm, working length 10.5 cm

Trocar, with pyramidal tip, insufflation stopcock,
multifunctional valve,
size 6 mm, working length 10.5 cm,
color code: black,
including:
  Trocar only, with pyramidal tip
  Cannula, without valve, with insufflation stopcock
  Multifunctional Valve, size 6 mm

CADIERE Coagulating and Dissecting Electrode

CADIERE Coagulating and Dissecting Electrode,
insulated sheath, with connector pin for unipolar coagulation,
L-shaped, tapered tip with cm-marking,
size 5 mm, length 43 cm
**Outer Tube with working insert**

![Outer Tube with working insert](image)

**CLICKLINE Dissecting and Grasping Forceps**

![CLICKLINE Dissecting and Grasping Forceps](image)

**Suction and Irrigation Tube**

![Suction and Irrigation Tube](image)
**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: Graphical representation changes when settings of connected devices or the entire system are adjusted

**Dashboard**

**Live menu**

**Intelligent icons**

**Side-by-side view: Parallel display of standard image and Visualization mode**

**Automatic light source control**

**Sustainable investment**
- Compatible with all light sources

**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**

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**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
**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

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

**New**

TC 200EN

**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

**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) <strong>22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220085-3</strong> (compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*)</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.
**IMAGE1 S Camera Heads**

For use with IMAGE1 S Camera System

**IMAGE1 S H3-ZA 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

**TH 104**

<table>
<thead>
<tr>
<th>Specifications:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 FULL HD Camera Heads</strong></td>
<td><strong>IMAGE1 S H3-ZA</strong></td>
</tr>
<tr>
<td>Product no.</td>
<td>TH 104</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3&quot; 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>

**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**

**TH 100**

<table>
<thead>
<tr>
<th>Specifications:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IMAGE1 FULL HD Camera Heads</strong></td>
<td><strong>IMAGE1 S H3-Z</strong></td>
</tr>
<tr>
<td>Product no.</td>
<td>TH 100</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3&quot; 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>
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

KARL STORZ HD and FULL HD Monitors

<table>
<thead>
<tr>
<th></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
- RGB (VGA)
- S-Video
- Composite/FBAS

Outputs:
- DVI-D
- S-Video
- Composite/FBAS
- RGB (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>
</tr>
<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>
Cold Light Fountain XENON 300 SCB

2013101-1 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

Fiber Optic Light Cable

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

Adaptor

533 TVA Adaptor, autoclavable, permits telescope changing under sterile conditions

AUTOCON® II 400 SCB

20535201-125 AUTOCON® II 400 High End, Set SCB power supply 220 - 240 VAC, 50/60 Hz, HF connecting sockets: Bipolar combination, Multifunction, Unipolar 3-pin + Erbe Neutral electrode combination 6.3 mm, jack and 2-pin, System requirements: SCB R-UI Software Release 20090001-43 or higher including:
AUTOCON® II 400, with KARL STORZ SCB Mains Cord
SCB Connecting Cable, length 100 cm
ENDOFLATOR® 40 with KARL STORZ SCB
with High Flow Insufflation (40 l/min.)

ENDOFLATOR® 40 SCB,
Set, with integrated SCB module,
power supply 100 - 240 VAC, 50/60 Hz
including:
ENDOFLATOR® 40
Mains Cord, length 300 cm
SCB Connecting Cable, length 100 cm
Universal Wrench
Insufflation Tubing Set, with gas filter, sterile,
for single use, package of 5*

Subject to the customer’s application-specific requirements additional accessories must be ordered separately.

*This product is marketed by mtp.
For additional information, please apply to:
*mtp medical technical promotion gmbh,
Take-Off GewerbePark 46,
78579 Neuhausen ob Eck, Germany

HAMOU ENDOMAT® with KARL STORZ SCB
Suction and Irrigation System

HAMOU® ENDOMAT® SCB,
power supply 100 – 240 VAC, 50/60 Hz
including:
Mains Cord
5x HYST Tubing Set*, for single use
5x LAP Tubing Set*, for single use
SCB Connecting Cable, length 100 cm
VACUsafe Promotion Pack Suction*, 2 l

Subject to the customer's application-specific requirements additional accessories must be ordered separately.

*This product is marketed by mtp.
For additional information, please apply to:
*mtp medical technical promotion gmbh,
Take-Off GewerbePark 46,
78579 Neuhausen ob Eck, Germany
Mobile Equipment Cart

Monitor: 9627 NB
27" FULL HD Monitor

Camera System:
TC 200 DE IMAGE1 S CONNECT, connect module
TC 300 IMAGE1 S H3-LINK, link module
TH 100 IMAGE1 S H3-Z
Three-Chip FULL HD Camera Head

Light Source:
201331 01-1 XENON 300 SCB Cold Light Fountain
495 NCSC Fiber Optic Light Cable

HF-Device:
205352 01-125 AUTOCON® II 400
200178 30 Two-Pedal Footswitch

Insufflation:
UI 400 S1 ENDOFLATOR® 40
UP 501 S3 S-PILOT™

Pump System:
263311 01-1 HAMOU® ENDOMAT®

Equipment Cart:
UG 120 COR™ Equipment Cart, narrow, high
UG 500 Monitor Holder
UG 609 Bottle Holder, for CO₂-Bottles
29005 DFH Foot-Pedal Holder, for Two- and Three-Pedal Footswitches
UG 310 Isolation Transformer, 200V–240V
UG 410 Earth Leakage Monitor, 200V–240V

Additional for documentation purposes:
WD 250 AIDA® with SmartScreen®
TC 009 USB Adaptor, for ACC 1 and ACC 2
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

- **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

- **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

*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.
Notes: