LAPAROSCOPIC SUTURING SYSTEM WITH
THE SZABO-BERCI NEEDLE DRIVER SET
including an Illustrated Slip Knot Demonstration

Zoltán SZABÓ
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Laparoscopic Suturing System with the SZABO-BERCI Needle Driver Set

Introduction

The evolution of laparoscopic surgery leaped forward when hand suturing became a feasible technique. The crucial breakthrough came only due to the development of appropriate special instruments and techniques. Instrumentation consists generally of a uniquely designed coaxial instrument pair which allows an easy handling of the two-handed approach. The Minimal Invasive Technique is based on precise intracorporal single stitches (no running suture).

To facilitate the proper application of technique, the selection of high quality equipment for maximum effectiveness and ease of use is vital. High-end monitors as well as HOPKINS® laparoscopes are necessary in order to obtain the optimum quality of pictures (depth of view and clarity). Reliable, re-usable instruments and devices are by proper cleaning and sterilisation more cost-effective than single-use products in the long-term. Well-matched video-endoscopic instruments and devices are substantial for successful surgery.

Furthermore, the development of the laparoscopic knotting technique is tightly linked with specific instrument sets. The SZABO-BERCI laparoscopic suturing instrument set was developed taking the virtues of traditional open suturing instruments, combining it with microsurgical instrument design features and adapting it to the laparoscopic surgical field.

The instruments themselves have only to be seen as one part of the whole concept of knot-suturing.

Formal training utilizing a systematic approach with progressive stages builds the necessary fundamental skills required for reconstructive laparoscopic surgery. Learning to make slowed and calculated movements, which are assembled into a tightly choreographed sequence is of significant importance. Taking into account the principle of less movements by full concentration and the highest possible accuracy, this enables to compensate the additionally required time; i.e., slow but error-free working results in faster completed laparoscopic surgeries.

The proper handling of the instruments and the correct learning of suturing gives the surgeon a legitimated confidence in laparoscopic techniques. At the same time, the learned laparoscopic advantages can be applied in open techniques. Finally the outcome of a less invasive treatment, the shortened hospital stay and the cost-effective therapy are also positive for the patient.

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Characteristically for these instruments is the coaxial design, which means that the handle, the sheath and the distal tip are aligned along a straight line.

The straight handles are ergonomically rounded and have their maximum leverage at the proximal end: They can be held like a screw-driver or like a knob and being operated by rotating movements of the fingers as well as of the wrist. The jaws are opened and closed by squeezing the handles, permitting precise control of the grasping force.

In the closed position the needle-holders can be locked by a ratchet. Only an experienced surgeon can properly work with this feature.
Endoscopical suturing requires high ability and experience of the surgeon. Ergonomic design, easy handling and functionality are the features required for such suturing instruments.

With the SZABO-BERCI needle holders, KARL STORZ offers instruments with a multifunctional design that enables needle driving, suturing and grasping of fine tissues. A specially developed coaxial handle allows complete rotation of the instruments. The angulated jaws enable omni-directional grasping. The well designed set consists of a needle driver and an assistant needle holder which facilitates coordinated and efficient movement.

Various types of the round coaxial handle. The jaws are opened and closed by squeezing the handles, permitting precise control of the grasping force.
Fig. 1:
The PARROT-JAW® needle driver is designed to handle, hold, and drive the needle optimally. Its short, powerful jaws will hold a laparoscopic needle securely, in the worst case the needle will be bent, but will not fall down (and not getting lost). Although proper needle driving depends more on the surgeon’s skill than on brute force, the jaws can vary their grip from delicate to powerful. Its jaws can handle different sizes of needles and sutures, from 2/0 to 7/0; it can also handle tissues if used carefully (less force).

Fig. 2:
The assisting FLAMINGO-JAW® grasper, with its long curved jaws, is exceptionally well-suited for gathering the elusive thread with its broad, opening jaws. The bending allows tissue edges to be grasped sideways and provides stability for entering or withdrawing of the needle. When looping the thread in the process of knot tying, the angled tip easily hooks and retains the suture. It is especially helpful for novices and special situations; however, some surgeons may prefer the shorter, jawed 5 mm version of this instrument.

Figs. 3 + 4:
The unique jaw shape promotes two important functions. (3) The slightly bent and spooned jaws hold the thread during knotting while looping the suture, which will decrease the chance of dropping the suture. (4) The distal tip permits the gripping of smaller needles and accurate retrieval of suture material.
Roeder Knot

As with all types of extracorporeal knots, the needle is threaded through the trocar, leaving the thread ends outside the trocar.

The needle is passed through the tissue and then taken out through the trocar.

Fig. 1:
An extracorporeal knot is formed loosely. Then the index finger is placed on top of the trocar between the two threads.

Figs. 2–3:
The thread without the needle is coiled around the flat knot loop 8 times in a downward spiral (toward the trocar). Both tails are now on the same side of the knot (i.e., both are on the right side).

Fig. 4:
After this has been completed, the same tail is threaded back through the last loop (2) . . .
Fig. 5:  
... and pulled taut; simultaneously, the other thread (top) is also pulled taut, forming the knot.

Fig. 6:  
The top thread is threaded through a knot pusher (a hollow, atraumatic tube with a tapered end facing the knot). The lower thread is cut short.

Fig. 7:  
Afterwards the knot is slid downward by pulling the top thread upward and pushing the knot pusher downward through the trocar toward the tissue...

Fig. 8:  
... to the target site and cinched down. The thread is cut short, and the knot pusher is withdrawn from the trocar.
Jamming Anchor Knot
A semi-extracorporeal knot used for continuous suturing.

**Fig. 1:** Extracorporeally, a 2½ revolution coil is made near the tail of the thread and positioned so that the end of the thread is on the top position, and the needle end rests on the surface.

**Fig. 2:** The tail end is brought in front of the coil (nearest to the needle) and...

**Fig. 3:** ...folded, and then backed into the coil.

**Fig. 4:** The coil is then cinched down onto the loop. The entire suture is passed through the trocar. The knot is formed by passing the needle through the loop after it has passed through the tissues being sutured.
Entrance and exit bites are made, and then the needle is threaded through the loop.

The assisting grasper grasps the tail (with the needle) near the loop, and the PARROT-JAW™ needle holder grasps the tail of the loop.

The two instruments pull in opposite directions parallel to the stitch...

... and the knot is cinched down. The needle driver regrasps the needle in preparation of subsequent stitches.
Aberdeen Knot

An intracorporeal knot for continuous suturing – a type of crocheting knot popularized by A. CUSCHIERI.

Figs. 1–4: The first of three loops is created.

Fig. 1:
The last stitch is pulled up to form a loop.

Fig. 2:
The assisting grasper grasps the long tail, lifts it up, and positions it on the left side (or “behind” the loop). From the right side (“front” of the loop), the needle driver enters the loop and grasps the thread from the assisting grasper.

Fig. 3:
The needle drivers pull it partially downward (and toward the right), and the assisting grasper pulls downward (and toward the left).

Fig. 4:
The original loop is cinched down and a new loop is formed.
Fig. 5: The second loop is created in the same manner as the first.

Fig. 6: The third, and last loop, is created as before …

Fig. 7: … with the entire thread, including needle, pulled through the final loop.

Fig. 8: Then the knot is cinched tight.
Square/Slip Knot

An intracorporeal convertible locking/slip knot for interrupted and continuous suturing. This knot can be tied tight (beginning with the first flat knot) or left loose in the case of the suspension slip knot technique. For continuous suturing, the last loop is pulled up and is treated like the short tail in the procedure described below.

Figs. 1–4: First flat knot.

Fig. 1:
After the needle has passed through the tissue, the PARROT-JAW® needle driver crosses over to the opposite side of the field and grasps the long tail (with the needle), and positions it below the short tail in a “C” configuration. (If using monofilament suture, it is imperative that the needle driver be rotated counterclockwise until the C-loop is laid in a horizontal plane).

Fig. 2:
The assisting grasper is placed over the C-loop, and the needle driver wraps once over and under the assisting grasper.

Fig. 3:
The assisting grasper grasps the short tail of the thread. This process is facilitated by bringing both instruments toward the short tail.

Fig. 4:
The instruments pull in an opposite direction, parallel with the stitch, to cinch down the first flat knot. The assisting grasper releases its hold, and the needle driver while still holding the thread, crosses over and hands the thread to the assisting grasper.
Figs. 5–8: Second, opposing flat knot.

Fig. 5:
A reversed C-loop has now been created. (If using monofilament suture, the assisting grasper should rotate the thread counterclockwise until a horizontal plane for the reversed C-loop is created.) The needle driver is placed over this loop...

Fig. 6:
... and the long tail is wrapped around it once, over and then under the needle driver and reaches to grasp the short tail.

Fig. 7:
The instruments pull the tails in opposite directions...

Fig. 8:
... and cinches the knot down into a locking configuration.
Figs. 9–12: Converting the locked square knot into its sliding configuration and reconverting it back to its original locking position.

Fig. 9:
To convert the (locking) square knot into its sliding configuration, the knot should first be divided mentally into left and right sides. Using the left side, the assisting grasper grasps the loose suture loop above the knot (between the knot and the tissue). Also on the left side, the needle driver grasps the long tail (with the needle) below the knot. The two instruments pull the thread vertically in opposite directions and do not release the thread.

Figs. 10–11:
The needle driver maintains its hold, and the assisting grasper repositions below the knot with a gentle grasp pushing the knot toward the tissue and cinching it down to the desired position and tension. Again, the instruments should maintain their hold on the threads. The knot can be shifted so that the knot stays centered, rather than locking the entrance or exit point.

Fig. 12:
To reconvert the slipping knot into the locking square knot, the assisting grasper grasps the thread near the PARROT-JAW® needle driver, and the needle driver is repositioned on the short tail (on the right side). The two instruments pull horizontally in opposite directions. The locking square knot has been recreated. A third opposing flat knot can be added if desired, but it is optional. This is accomplished in the same manner as the first flat knot.
Laparoscopic Nissen Fundoplication – Suturing the Wrap

Introduction of the needle

Using the PARROT-JAW® needle holder (NH, right hand) the needle is introduced into the left limb of the fundus (Fig. 1).

The needle is then driven into the esophageal musculature; and afterward into the right limb of the fundus (Fig. 2).

After the needle has been passed through the tissues, the thread is further introduced with the NH (right hand) toward the right. The assisting grasper (AG, left hand) serves as a pulley to anchor the passing thread against the tissue to minimize trauma (Fig. 3). The thread is put forward until a short tail remains; the needle is placed somewhere in or out of the field in a safe position with the long tail on the left side and the short tail on the right.
**First Flat Knot**

The NH (right hand) crosses over to the left side of the field and grasps the long tail. It is then brought over to the right side of the field, opposite the short tail and below it. The two tails combine to form a C configuration (Figs. 4 a+b). If tying with monofilament suture material, the NH should be rotated counterclockwise so that the C loop is positioned horizontally and lays flat against the tissue.

**NB:** A 3:1 ratio or greater between the length of the long tail and the short tail is recommended.

While holding the long tail with the NH (right hand), the AG (left hand) is placed over the C, and the long tail is wrapped once over and then under the assistant grasper (Figs. 5 a–c). The AG reaches over to the right side to grasp the short tail. (It is best to move both instruments simultaneously toward the short tail rather than having the NH “choke back” the AG during its reach.)

Then the two instruments pull the thread in opposite directions, the AG to the left and the NH to the right, tying parallel with the stitch (Figs. 6 a+b). The NH (right hand) should maintain its grasp of the long tail but the AG (left hand) now drops the short tail.
Second (Opposing) Flat Knot

The NH (right hand), still grasping the long tail, brings it over to the left side and hands it over the AG (left hand). The AG (left hand) then creates a “reversed C” configuration (Fig. 7).

The NH (right hand) is placed over the reversed C, and the thread is wrapped once over, and then under the instrument. The NH (right hand) reaches to the left side and grasps the short tail (again, move both instruments together toward the short tail) (Fig. 8).

The second flat knot is tightened with each instrument remaining on its respective side (i.e., without crossing them over in the field) (Figs. 9 a–c).
Repositioning of Knot (converting square knot to slip knot)

The knot can be repositioned closer to the tissue by converting the square knot to a slip knot. Grasp the thread between the tissue and knot with the AG (left hand) and pull firmly on the long tail with the NH (right hand) on the ipsilateral side (Figs. 10 a+b). As the knot is converted from its locking configuration to its slipping configuration, a sudden snapping can be detected.

Once the square knot is converted, the NH (right hand) continues to hold the long tail and the AG (left hand) then serves as a knot pusher. This is accomplished with the AG releasing the thread and being repositioned on the thread above the knot, closing the jaws gently around the thread without actually grasping it (Figs. 11 a+b).
The AG then pushes the knot closer to the tissues until the desired tension is achieved (Figs. 12 a+b).

After it is positioned properly, the knot is reconverted to its locking configuration by holding the long tail of the knot with the AG (left hand) and the short tail with the NH (right hand) and pulling in opposite directions, parallel to the stitch (like tightening the original square knot) (Figs. 13 a+b). The suture tails are then cut (Fig. 13c).
Laparoscopic Repair of Hiatal Hernia

The hiatal hernia is repaired by approximating the crura (Fig. 1).

Three to four interrupted sutures are placed and secured by intracorporeal knots as described previously (Fig. 2).
Ligature of the Cystic Duct

After the thread has been passed behind the vessel, it is pushed forward with the AG (left hand), serving as a pulley (upper left) (Fig. 1).

Securing the first flat knot (Fig. 2). The AG (left hand) pulls the short tail to the left while the NH (right hand) pulls the long tail to the right, parallel to the stitch.

Grasping the short tail of the second flat knot (Fig. 3).

Shorten the tails (Fig. 4).
SZABO-BERCI Needle Holders PARROT-JAW®

SZABO-BERCI Needle Holders PARROT-JAW®
26173 SC/SE/CQ/CE, with ratchet.

SZABO-BERCI Needle Holders PARROT-JAW®
26173 SP, with adjustable ratchet.

SZABO-BERCI Assistant Needle Holders FLAMINGO-JAW®

SZABO-BERCI Needle Holders FLAMINGO-JAW®
26173 QR, with ratchet.

SZABO-BERCI Needle Holders FLAMINGO-JAW®
26173 DO/SD, without ratchet.
SZABO-BERCI Needle Holder PARROT-JAW<sup>®</sup> with Diamond-Coated Jaws

SZABO-BERCI Needle Holder PARROT-JAW<sup>®</sup>,
diamond-coated jaws,
straight handle with adjustable ratchet,
for use with suture material 2/0–4/0,
needle sizes SH (Ethicon), EN-S (Ski), V 20 (USSC)

26173SP

SZABO-BERCI Needle Holders PARROT-JAW<sup>®</sup>

Size 5 mm
Operating instruments, length 33 cm,
for use with trocars size 6 mm or 11 mm with reduction sleeve

26173SC

SZABO-BERCI Needle Holder PARROT-JAW<sup>®</sup>,
straight handle, with ratchet,
for use with suture material 2/0–4/0,
needle sizes SH (Ethicon), EN-S (Ski), V 20 (USSC)

26173SE Same, with tungsten carbide insert

26173CQ SZABO-BERCI Needle Holder PARROT-JAW<sup>®</sup>,
small, straight handle, with ratchet, for use with suture material 4/0–6/0, needle sizes RB (Ethicon), CV-23 (USSC)

26173CE Same, with tungsten carbide insert

Please note:
Using the needle holder with a needle larger than recommended may result in a mechanical damage to the instrument.
**SZABO-BERCI Assistant Needle Holders FLAMINGO-JAW®**

**Size 5 mm**
Operating instruments, length 33 cm,
for use with trocars size 6 mm or 11 mm with reduction sleeve

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**26173QR**

SZABO-BERCI Assistant Needle Holder
FLAMINGO-JAW®, straight handle, with ratchet,
for use with suture material 4/0–6/0,
needle sizes RB (Ethicon), CV-23 (USSC)

**26173DQ**

Same, without ratchet

**26173SD**

SZABO-BERCI Assistant Needle Holder
FLAMINGO-JAW®, straight handle, without ratchet,
for use with suture material 2/0–4/0,
needle sizes SH (Ethicon), EN-S (Ski), V 20 (USSC)
Nadelgrößen SH (Ethicon), EN-S (Ski), V-20 (USSC)

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It is recommended to check the suitability of the product for the intended procedure prior to use.
Basic Instrument Set for General Surgery

Telescopes and Instruments

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<th>Item Code</th>
<th>Description</th>
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<tr>
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<td>HOPKINS® Straight Forward Telescope 0°, enlarged view, diameter 10 mm, length 31 cm, autoclavable, fiber optic light transmission incorporated, color code: green</td>
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<td>26003BA</td>
<td>HOPKINS® Forward-Oblique Telescope 30°, enlarged view, diameter 10 mm, length 31 cm, autoclavable, fiber optic light transmission incorporated, color code: red</td>
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<td>495NCS</td>
<td>Fiber Optic Light Cable, with straight connector, extremely heat-resistant, enhanced light transmission, diameter 4.8 mm, length 250 cm</td>
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Suction and Irrigation Tube, with lateral holes, two-way stopcock for single-hand control, size 5 mm, length 36 cm

26173BN

KOH Macro Needle Holder, with tungsten carbide insert, ergonomic pistol handle with disengageable ratchet, ratchet position right, jaws curved to right, size 5 mm, length 33 cm

26173KPR

KOH Macro Needle Holder, with tungsten carbide insert, ergonomic pistol handle with disengageable ratchet, ratchet position right, jaws curved to right, size 5 mm, length 33 cm

26172AE

Endo-Loop Ligature, with ROEDER knot, for bleeding stumps, with absorbable synthetic suture, for single use, sterile, USP 0, size 3 mm, length 33 cm, package of 12
HOPKINS® Forward-Oblique Telescopes 30° – autoclavable

Diameter 10 mm, length 31 cm
Diameter 5 mm, length 29 cm

HOPKINS® Forward-Oblique Telescope 30°, enlarged view, diameter 10 mm, length 31 cm, autoclavable, fiber optic light transmission incorporated, color code: red

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

Diameter 10 mm, length 32 cm

ENDOCAMELEON® HOPKINS® Telescope, diameter 10 mm, length 32 cm, variable direction of view from 0° – 120°, twisting controller to select the desired view of direction, fiber optic light transmission incorporated, color code: gold
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

Same, size 11 mm and working length 10.5 cm

Same, size 13 mm and working length 11.5 cm

Reduction Sleeve, reusable, instrument diameter 5 mm, trocar cannula outer diameter 11 mm, color code: green

Double Reducer, 13/10 mm, 13.5/10 mm, 13/5 mm and 13.5/5 mm

BERCI Fascial Closure Instrument

BERCI Fascial Closure Instrument, size 2.8 mm, length 17 cm, for closure of trocar incision wounds
CLICKLINE Dissecting and Grasping Forceps, Scissors

CLICKLINE – rotating, dismantling
with and without connector pin for unipolar coagulation

Size 5 mm

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CLICKLINE Dissecting and Grasping Forceps

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CLICKLINE Dissecting Forceps, right angled

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CLICKLINE Grasping Forceps, atraumatic, fenestrated

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CLICKLINE METZENBAUM Scissors, curved, length of blades 12 mm

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Please note:
For CLICKLINE instruments only the individual component parts are numbered. The catalog number for the complete instrument is not on the instrument. Instruments with insulated handles with connector pin for unipolar coagulation, are shown against the red background, instruments with handles without connector pin for unipolar coagulation are shown against the blue background. The colour green indicates the inserts.
CLICKLINE Dissecting and Grasping Forceps
CLICKLINE – rotating, dismantling

Size 10 mm

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Please note:
For CLICKLINE instruments only the individual component parts are numbered. The catalog number for the complete instrument is not on the instrument. Instruments with handles without connector pin for unipolar coagulation are shown against the blue background. The colour green indicates the inserts.
ROBi® Bipolar Grasping Forceps and Scissors
ROBi® – rotating, dismantling
with connector pin for bipolar coagulation, CLERMONT-FERRAND Model

Size 5 mm

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ROBi® Grasping Forceps, CLERMONT-FERRAND Model, fenestrated, with fine atraumatic serration

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<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>38610MD</td>
<td>38651MD</td>
</tr>
<tr>
<td>38710MD</td>
<td>38751MD</td>
</tr>
</tbody>
</table>

ROBi® KELLY Grasping Forceps, CLERMONT-FERRAND Model, suitable for dissection

<table>
<thead>
<tr>
<th>Insert No.</th>
<th>Catalog number for the complete instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>38610MW</td>
<td>38651MW</td>
</tr>
<tr>
<td>38710MW</td>
<td>38751MW</td>
</tr>
</tbody>
</table>

ROBi® METZENBAUM Scissors, CLERMONT-FERRAND Model, curved jaws, thinner scissor blades, double-action jaws

Please note:
For ROBi® Bipolar Grasping Forceps instruments only the individual component parts are numbered. The Catalog number of the complete instrument, as shown above against the red background is not on the instrument. The colour green indicates the inserts.
Handle for Suction and Irrigation

**37112A**  
*Suction and Irrigation Handle*, straight, with clamping valve, for suction and irrigation, *autoclavable*, for use with Suction and Irrigation Tubes diameter 3 mm, 5 mm, 10 mm, 37360 LH, 37560 LH

**37113A**  
*Suction and Irrigation Handle*, pistol grip, with clamping valve, for suction and irrigation, *autoclavable*, for use with Suction and Irrigation Tubes diameter 3 mm, 5 mm, 10 mm, 37360 LH, 37560 LH
**Tubing Set**

for use with Handles 37112 A and 37113 A

031133-10* **Tubing Set**, for single use, sterile, package of 10, for use with Suction and Irrigation Handles 37113 A and 37112 RV

031218-10* **Tubing Set**, with two puncture cannulas, for single use, package of 10, for use with Handles 37112 A (straight) and 37113 A (pistol grip) in combination with HAMOU® KARL STORZ ENDOMAT®

031219-10* **Tubing Set**, with two puncture cannulas, for single use, sterile, package of 10, for use with Handles 37112 A (straight) and 37113 A (pistol grip) in combination with ENDOMAT® LC KARL STORZ

031134-10* **Tubing Set**, for single use, sterile, package of 10, for use with Suction and Irrigation Handles 37112 A (straight) and 37113 A (pistol grip) in combination with silicone tube inner diameter 5 mm at the patient end
Surgical Sponge Holder
Size 5 mm

32340PT

Surgical Sponge Holder, self-retaining, size 5 mm, length 30 cm including:
Handle
Outer Sheath, insulated
Sponge Holder Insert

Spherical sponges recommended for size 5 mm:
DIN 61630/VM 20 (4 x 4 cm) or spherical sponge for similar geometry and basis weight.
Laparoscopic Suturing System with the SZABO-BERCI Needle Driver Set

**IMAGE1 S Camera System**

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

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

**Dashboard**

**Live menu**

**Intelligent icons**

**Side-by-side view: Parallel display of standard image and Visualization mode**
Laparoscopic Suturing System with the SZABO-BERCI Needle Driver Set

**IMAGE1 S Camera System**

**Videoendoscopic Imaging**
- Very high quality of endoscopic images in FULL HD
- Natural color rendition

**Multiple IMAGE1 S technologies for homogeneous illumination, contrast enhancement and color shifting**

---

**FULL HD image**

**CLARA**

**FULL HD image**

**CHROMA**

**FULL HD image**

**SPECTRA A***

**FULL HD image**

**SPECTRA B****

* SPECTRA A: Not for sale in the U.S.
** SPECTRA B: Not for sale in the U.S.
Laparoscopic Suturing System with the SZABO-BERCI Needle Driver Set

**IMAGE1 S Camera System**

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>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD video outputs</td>
<td>- 2x DVI-D</td>
</tr>
<tr>
<td></td>
<td>- 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 TC200EN**

TC300

TC300 **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 TC200EN** including:

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

**Specifications:**

<table>
<thead>
<tr>
<th>Camera System</th>
<th>TC 300 (H3-Link)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supported camera heads/video endoscopes</td>
<td>TH100, TH101, TH102, TH103, TH104, TH106 (fully compatible with IMAGE1 S) 22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220086-3 (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>
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</tbody>
</table>

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

**For use with IMAGE1 S Camera System**  
**IMAGE1 S CONNECT Module TC200EN, IMAGE1 S H3-LINK Module TC300**  
and with all IMAGE1 HUB™ HD Camera Control Units

**TH100**  
**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>TH100</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>

**TH104**  
**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>TH104</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>
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</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

9619NB
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

9826NB
26" FULL HD Monitor,
wall-mounted with VESA 100 adaption,
color systems PAL/NTSC,
max. screen resolution 1920 x 1080,
image format 16:9,
power supply 100–240 VAC, 50/60 Hz
including:
External 24 VDC Power Supply
Mains Cord
## Monitors

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619NB</td>
<td>9826NB</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:
- 9826SF Pedestal, for monitor 9826NB
- 9626SF Pedestal, for monitor 9619NB

### 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>9619NB</td>
<td>9826NB</td>
</tr>
<tr>
<td>Brightness</td>
<td>200 cd/m² (typ)</td>
<td>500 cd/m² (typ)</td>
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<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>
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<tr>
<td>Mount</td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
</tr>
<tr>
<td>Weight</td>
<td>7.6 kg</td>
<td>7.7 kg</td>
</tr>
<tr>
<td>Rated power</td>
<td>28 W</td>
<td>72 W</td>
</tr>
<tr>
<td>Operating conditions</td>
<td>0–40°C</td>
<td>5–35°C</td>
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<tr>
<td>Storage</td>
<td>-20–60°C</td>
<td>-20–60°C</td>
</tr>
<tr>
<td>Rel. humidity</td>
<td>max. 85%</td>
<td>max. 85%</td>
</tr>
<tr>
<td>Dimensions w x h x d</td>
<td>469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
</tr>
<tr>
<td>Power supply</td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
</tr>
<tr>
<td>Certified to</td>
<td>EN 60601-1, protection class IPX0</td>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
</tr>
</tbody>
</table>
Accessories for Video Documentation

For use with telescopes, diameter 10 mm:
495NCS Fiber Optic Light Cable,
with straight connector, extremely heat-resistant,
enhanced light transmission, diameter 4.8 mm,
length 250 cm

For use with telescopes, diameter 5 mm:
495NA 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 Cord, length 100 cm
20133027 Spare Lamp Module XENON
with heat sink, 300 watt, 15 volt
20133028 XENON Spare Lamp, only,
300 watt, 15 volt

Cold Light Fountain XENON NOVA® 175

20131501 Cold Light Fountain XENON NOVA® 175,
power supply:
100–125 VAC/220–240 VAC, 50/60 Hz
including:
Mains Cord
20132026 XENON Spare Lamp,
175 watt, 15 volt
HAMOU ENDOMAT® with KARL STORZ SCB
Suction and Irrigation System

26331101-1 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.

ENDOFLATOR® 40 with KARL STORZ SCB
with High Flow Insufflation (40 l/min.)

UI400S1 ENDOFLATOR® 40 SCB
including:
ENDOFLATOR® 40 with KARL STORZ SCB
power supply 100–240 VAC, 50/60 Hz
Mains Cord
*6x Single-use insufflation tubing set with gas filter, sterile
Universal Wrench
SCB Connecting Cable, length 100 cm

Please note: For fully utilizing maximum insufflation capacity of the ENDOFLATOR® 40 the use of KARL STORZ HiCap® Trocars is recommended. For additional information see catalog LAPAROSCOPY.
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

Incl:ing:
- **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 75/100, for usage with equipment carts UGxxx
Recommended Accessories for Equipment Cart

**Isolation Transformer**, UG310
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 UGxxx

**Earth Leakage Monitor**, UG410
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 UG310

**Monitor Holding Arm**, UG510
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 UGxxx
Notes:
Notes: