BEST PRACTICES IN HYSTEROSCOPIC TRAINING

A Tutorial Based on the EVE Realistic Simulator for Hysteroscopy

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Preface

This manual summarizes the essence of the author’s experience as a tutor in the field of endoscopic training since the inception of the first realistic simulator for hysteroscopy in 2002.

Carefully going through the content of this tutorial and practicing on the EVE hystrotainer in order of difficulty and complexity will establish in the learner’s mind the basic principles, concepts and maneuvers used in various procedures of diagnostic and operative hysteroscopy. The trainee is encouraged to shape attitudes, readjust habits and develop new skills that subsequently need to be translated into routine ambulatory or clinical practice. In former times, this could only be achieved by performing real procedures on live patients or human cadavers, which is now feasible by practicing on a realistic life size simulator.

Marcos Lyra

About the Author

Marcos Lyra, Bachelor of Medicine from the Federal University of Pernambuco (Brazil), is a specialist in obstetrics, gynecology, laparoscopy and hysteroscopy. He is an active member of the Brazilian Federation of Gynecology and Obstetrics (FEBRASGO) and the Brazilian Society of Laparoscopic Surgery (SOBRACIL).

Being the CEO of Pro Delphus Surgical Simulators, Marcos Lyra developed and introduced to the market the EVE system of realistic simulation for hysteroscopy and laparoscopy. He is an educational researcher of adaptive learning and training systems and works in close cooperation with various Brazilian and foreign universities.
Introduction to Realistic Simulation

Based on the breadth and depth of our expertise as teachers, we draw upon years of experience with realistic simulators. As a result, we have developed and compiled a series of standardized practices, that can be performed in the same way as in a real patient scenario. For those who are interested in learning new techniques, we have set up simplified and standardized procedural principles and concepts. This step-by-step tutorial is intended to serve as a guideline for the student to facilitate the transition from simulation training to real hysteroscopic procedures.

In hands-on training courses, the use of modern and effective teaching methods is geared towards enabling our students to develop a level of skills that allows them to reproduce exercises in a similar or superior manner as presented by a tutor. A good teacher should be able to interact at a student’s level, while the opposite is rarely seen. Modernization of endoscopic training demands the adoption of modern, safe and ethical methods. Great teachers constantly strive to learn new teaching methods that promote behavioral changes in their trainees.

“The art of learning leads to the pleasure of teaching”.

Don. A. Blackerby, Professor of Neurolinguistics, held a course titled “Rediscover the Joy of Learning.” This slogan in itself connotes the need to review our teaching principles and promotes the development of a safe and effective method suited to build skills and facilitate a change of attitudes that are later translated in the routine practice of a trainee. The success achieved at the end of a course must reflect what has been imprinted in the mind of the learner. Right from the start, the trainee should be encouraged to become an enthusiastic learner. Being a student or just attending classes does not make a trainee an ardent follower of principles. A true disciple follows and reproduces the lessons and has pleasure in doing so. An ideal professor must have the ability to make disciples; or classes will be full of listeners, only.

1.1 A Hands-On Training Concept

A Chinese proverb says:

“I hear and I forget. I see and I remember. I do and I learn!”

The teaching of surgical techniques demands more than holding theoretical lectures. From the author's point of view, the revision and updating of training courses and demonstration models used for this purpose is overdue. Ex-cathedra training courses, in which experts speak endlessly to a passive audience unable to repeat the demonstrated maneuvers are already long outdated. The hands-on training concept has marked a new teaching era, especially when it comes to surgical training.

1.2 The R.E.S.T. Simulators (Realistic Endo Surgical Trainers)

In mid-2001, gynecological endoscopy was observed with critical eyes, by the author, to what at the time represented the laparoscopic and hysteroscopic teaching model. A course of diagnostic and operative hysteroscopy involving the use of the resectoscope was drawn up, while at the same time, there was a quest for new training options that obviated the use of human cadaver specimens. How is it possible to practice hysteroscopy without the need for having available a human uterus?

Many attempts in creating models of an artificial uterus have already been made. Uteruses composed of synthetic material, ceramic, rubber, silicone, and other materials, allowed the creation of a mock-up of the uterine cavity and the replication of some endometrial pathologies, however it was not possible to resect or cauterize. Furthermore, tactile sensations within the uterine cavity, upon contact with tumors or other lesions, were all but impossible. It was at this moment that the biological model labeled as ETH8 was created. The underlying concept on which this model was based proved to be a milestone and benchmark for subsequent solutions offered to hundreds of courses worldwide. Observations and feedback of KARL STORZ experts was instrumental in the enhancement and redesign of other models used for various training purposes.

When it comes to specific surgical procedures, it is possible to practice endometrial ablations with a resectoscope using monopolar or bipolar high frequency current. Tumor removal can also be trained by simulating maneuvers required for polypectomy and myomectomy.

However, in view of the biological material intended for use with the model, there were a few drawbacks with the ETH8 uterus, mainly associated with complicated export procedures imposed by sanitary and hygienic regulations applicable in various countries. This problem was resolved with the change from biological to synthetic material. After seven years of research and development, SURGICAL NEODERMA® was introduced on the market.
Neoderma® is a product that allows the creation of an anatomical model simulating and mimicking the inherent properties and outer structure of a real uterus, which, in fact, is not feasible when using a cow’s tongue for this purpose. Neoderma® – a thermoretractable rubber that is composed of eight different polymers – permits the artificial emulation of human organs, which today are a core component of all trainers designated as R.E.S.T. The first realistic hysteroscopy trainer that accommodated an artificial uterus was named EVE. This tutorial describes the advantages offered by the use of such an endotrainer.

The EVE Trainer, similar to a life size flight simulator, is a versatile, dynamic tool that is completely different from virtual simulators, where most visual components are displayed on a screen using computer graphics.

EVE permits touch and depth sensation and allows the production of anatomical images of tissues mimicking those seen in humans. Apart from that, the trainer permits the use of the same instruments as in a real surgical situation and makes it possible to add multiple pathologies to the artificial anatomical structures utilized for training purposes.

These special features underpin the differences between the use of a virtual simulator only and a life size mannequin.
Assembly of the EVE Hysterotrainner

Two types of vagina models are available for use with the EVE Hysterotrainner:

- A small-sized vagina (ETH4/2G) for training with a resectoscope,
- A longer vagina (ETH5/2G, recommended for use with small-caliber hysteroscopes) for training vaginohysteroscopy.

Fig. 2.1 The EVE simulator ETH/2G comprises a neutral electrode pad with a connecting cable that is plugged into a designated socket at the AUTOCON® high frequency (HF) unit. Care must be taken that the other connecting cable – coming from the EVE system – be plugged in the socket of the pad that has been attached to the AUTOCON® HF unit. This is most important, when using biological material with a monopolar circuitry system.

Fig. 2.2a,b Artificial uterus ETH7/2G (a) and vagina ETH5/2G (b).
The item number of each type of Neoderma® vagina is shown on the back side.

There are various uterus models that are designed for training specific procedures. At the end of this tutorial, pictures are shown of each uterus model, and recommendations are given regarding the level of training they are suggested for. Subject to the type of use, a gross distinction is made between diagnostic procedures – performed with scissors or forceps during vaginohysteroscopy – and operative procedures, performed with a resectoscope and involving the use of electrosurgery.

Some uterus models can be used in a ‘hybrid state’, i.e., that the Neoderma® model serves as a base that can be loaded with biological material for training electrosurgical procedures with a monopolar or bipolar resectoscope. The assembly instruction of these models is the following:

![Image](image1.png)

**Fig. 2.3** The opening of the vagina ETH5/2G is located on the back. This is where the artificial uterus model and the simulator’s neutral electrode are introduced.

![Image](image2.png)

**Fig. 2.4** The ETH9/2G is an artificial uterus especially equipped with openings that may be used to introduce biological specimens. The use of chicken hearts is recommended to simulate a condition involving the presence of polyps. The presence of myomas can be simulated by the use of bovine tendon or penis, if available. Another option is the use of a swine foot, because of its white color and fibrous texture (a). Using scissors, a circumferential cut is made on the specimen, that will later be implanted in the Neoderma® uterus (b). The chicken heart is attached to the uterine wall with the circumferential cut serving as a notch (c). To avoid leaks, the specimen must be attached to the Neoderma® uterus using a quick-setting glue, such as Loctite® (SuperBond or ThreeBond). This helps the internal portion that needs to be resected to maintain its original position (d).
2.1 Maintaining Cleanliness at the Training Site

Fig. 2.5 The specimen should be dried using a clean towel or compress before being glued because otherwise humidity of the meat will impede proper adhesion (a). Once the specimen has been affixed, the uterus is mounted on a special metal fitting delivered with the simulator. Care should be taken that the specimen is in contact with the fitting. The connector of the fitting must be plugged in one of the sockets of the neutral electrode pad, which is attached to the AUTOCON® HF generator using a connecting cord commonly supplied by the manufacturer of the unit (b). The uterus and neutral electrode set should be introduced from the rear side of the vagina, dilating the Neoderma® model until the cervix is shown to assume its proper anatomical position (c). Endovaginal view with the cervix in its place (d).

Fig. 2.6 EVE is a hysterotrainer that allows realistic training of endometrial ablation, myomectomy, and polypectomy. Using specific models made of Neoderma®, it is possible to fashion a customized artificial uterus that incorporates pathologies of the endometrial cavity, including synechiae, malformations, fibroids, adenomyosis and neoplasms (a). A 100-liter plastic bag, attached with tape to the EVE trainer, allows the fluid — simulating the distension medium — to be drained into a receptacle (b).
It is not enough in hands-on training to provide participants with an endotrainer and an artificial uterus model that allows the simulation of the presence of pathologies. The trainees should also be instructed about standardized algorithms and training sequences specifically designed to gradually increase the level of difficulty. As a matter of course, hands-on training sessions should take place immediately after completion of theoretical lessons.

It is not an easy task at all to teach endoscopic maneuvers to gynecologists who are already familiar with the use of conventional techniques. The force exerted on the material, the speedy pace of surgical maneuvers and the size of instruments used in an open surgery approach, are additional sources of difficulty when presenting a minimally invasive technique using micro-instruments. The earlier a young gynecologist decides to attend a hands-on training course of hysteroscopy, the faster desired results will be achieved.

Any attempts to build a viable curriculum for endoscopic training courses must be geared to the objective of providing the trainee with exercises that are suited to solve the problems described above by changing inappropriate behaviors and habits. The standard sequence and basic principles explained below have been set up to create a hands-on training concept that truly deserves to be called a new method of learning and propagation of knowledge.

### 3.1 Importance of a Standardized Teaching Method in Hysteroscopic Training

Before initiating any didactic procedures, the lesson objective must be shared, directing the student’s attention to the goal of learning, avoiding distractions that might cause confusion and a waste of time through focusing on irrelevant topics.

The author will first address the main topics of the curriculum that must be learned before turning to other themes. The topics of primary importance are as follows:

#### a) Familiarity with Instruments and Units

Any professional must be well-acquainted with the material that will be used during a diagnostic and / or operative procedure. Not infrequently, a hysteroscopist in the operating room is found to have difficulties with assembling a resectoscope or another type of endoscopic equipment. Such preliminary steps are often delegated to assisting personnel already present in the operating room. This is roughly comparable to a situation of someone who has a driver’s license, but lacks experience with steering a car during rush hours in a big city. Any course on hysteroscopy should be preceded by detailed explanations addressing the set of instruments later to be used, and should cover the basic rules of proper care and handling that need to be observed inside and outside the operating room.

What is the best instrumentation matched to being used in a specific procedure? The answer to this question must be
given to the learner prior to beginning any practical training, because adequate planning and proper handling of instruments is of paramount importance for success. Any learner must fully understand the significance of acquiring familiarity with all instruments used in the course of an operative procedure.

In a patient who appears to have an atrophic and narrowed cervix, attempting to widen the cervical opening with dilators to facilitate introduction of a resectoscope may prove to be a mistake. In these cases, vaginohysteroscopy by use of a 2.0 or 2.9-mm hysteroscope would be the best option. However, attempting to remove tumors of more than 2 cm in diameter through a vaginohysteroscopic approach could complicate and prolong a procedure, that otherwise would be of low complexity if a resectoscope was used instead.

Endoscopic instruments and equipment cannot be handled in the same manner as conventional medical devices. Endoscopes and videoendoscopic components are fragile and costly. Instruments, like micro-scissors, biopsy and grasping forceps, need to be handled with special care during a surgical procedure. This also applies to cleaning and reprocessing of endoscopes and instruments, which is why some professionals enjoy the advantage of operating with the same devices for years while others are constantly faced with the need to renew them.

b) Pace of Movements
The surgeon must be aware of the pace of movements at which hysteroscopes and instruments are used. It can be said that “The faster a hysteroscope is used, the more a hysteroscopic procedure will be protracted. The slower the movements, the better the chances for a maneuver not to be repeated”.

c) Range of Motion
Apart from the importance of working at a reduced pace, the range of motion is another important issue that deserves to be discussed (Fig. 3.2). Most commonly, a hysteroscope of 35 cm in length is used. Once the cervical canal has been passed, an overall picture of the intrauterine cavity is obtained by panning with the hysteroscope from one side to the other. On account of the site of the ‘pivot point’, the internal movements will be much smaller than those conducted outside the patient’s body. Based on the fact that the cervix is the ‘pivot point’, the uterine cavity commonly takes up an average of 7–8 cm from the 35 cm, which is the total length of a standard hysteroscope. The portion that is introduced in the intrauterine cavity is much shorter than the exterior portion, from where the scope is guided using the cervix as a fulcrum. External movements must be inherently larger to match with those seen on the video screen. Lifting or lowering the hysteroscope for 10 cm will be translated to a movement of 1–2 cm inside the uterine cavity. Usually, the mind of a beginner of hysteroscopic training does not adjust to this easily.

d) Adherence to Discipline
Not least in importance is adherence to discipline in handling and control of instruments. As a rule, a surgeon-in-training is strictly advised to maintain focus on the video screen. The uterine walls are fragile and prone to bleed on contact, which is why care must be taken to preserve the integrity of healthy anatomical structures. By remaining concentrated on the video screen, the hysteroscopist is able to reduce the risk of losing orientation and missing the site where pathology needs to be removed. A trained assistant should take care of the needs of handling instruments during a simulated operative procedure, while the surgeon-in-training should maintain focus on what is shown on the video screen. It is important to understand that in hysteroscopy there is no improvising. It is very important to have available state-of-the-art, fully operational medical devices and equipment or otherwise the procedure will not be completed in a satisfactory manner. The hysteroscope is the extension of vision. An endoscope of low quality, poor illumination, improvised monitors or those of low resolution, will cause difficulties that can be avoided.

The reader must be able to define the following principles before proceeding to the next step:

a) Familiarity with instruments and units.
b) Pace of movements during operative maneuvers in hysteroscopy.
c) Range of motion.
d) Adherence to discipline in the use of instruments and equipment.
3.2 Training of Standard Procedures

The author suggests actively memorizing each theoretical principle before moving to practice. This is done first by describing all instruments and devices that will later be used. In a second step, the trainee should explain the anticipated course of the exam and verbally describe maneuvers while actually performing them. This mental or verbal reenactment should cover the entire motion sequence performed with the hysteroscope and enhance awareness for the significance of all movements to be carried out in an unhurried, controlled manner.

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- Assembly of instruments and equipment.
- Proper adjustment of instruments and equipment.
- Mental or verbal reenactment of the logical and chronological order of the motion sequence prior to commencing a simulated surgical procedure.
- Proper insertion of the hysteroscope during vagino-hysteroscopy in case of a ‘difficult cervix’. Use of a specific uterus model (ETH7-AM/2G) is recommended for simulating the presence of an atrophic cervix.
- Identification of lesions (a suitable uterus model needs to be chosen for this purpose).
- Proper choice of hysteroscopes, instruments and further equipment.
- Training hysteroscopy using close-up, intermediate and panoramic views.
- Assessment of the actual motion sequence and discussion with mentors.

**Recommended Instruments and Equipment** (see addendum section of the tutorial).
One of the objectives of hysteroscopic training is to enable the determination of dimensions of pathologies found during an exam and to give an estimate of the overall size of the uterine cavity. The basic visual cues to which the following descriptions refer, are as follows:

**a) ’Principle of Proportionality’ or ‘Familiar Size Cue’**

Upon completion of diagnostic hysteroscopy, the gynecologist should on the one hand be able to determine the type of operative procedure to be adopted. Secondly, they should be able to select the set of instruments indicated for use with the chosen treatment modality. As a matter of course, application of this principle allows the measurement of objects that can be seen and touched. Outside the uterine cavity, one can see and touch all parts of the instruments used in the course of a procedure. Knowledge of sizes of objects allows the trainee to assess the individual dimension of a tumor and/or lesion detected in the endometrial cavity. This is called the **principle of proportionality or familiar size cue** (Fig. 4.1). If the opened jaws of a grasping forceps have a span of 5 mm, knowledge of this value allows us to determine the size of a fibroid or polyp by establishing close contact with the relevant structure and comparing sizes proportionally. In this way, any novice is able to estimate the size of an anatomical structure, provided the precise dimensions of the jaws at the instrument tip are known.

**b) Determination of Depth**

Familiarity with the size of jaws at the instrument tip has another advantage, which is related to the lesion that is being removed. The principle of proportionality can be used effectively to determine how deep a surgical instrument has been inserted in the endometrium, myometrium or into a scar. Another useful aspect of this cue is that it permits the determination of the depth to which a fibroid has developed in relation to the endometrial lining.

It is necessary to know in advance the precise dimensions of the uterus to be operated on. There is a significant variety in size. A uterine body with adenomyosis can be 2 cm thick or more. A normal or atrophic uterus is usually 1.5 cm in thickness. Near the openings of the fallopian tubes into the uterine cavity, the lumen decreases to 1.0 cm in diameter and tapers even more in close proximity to the tubal ostia. This knowledge is useful when it comes to deciding whether it is possible to penetrate deeper or not.

The student should also be well familiar with anatomy of uterine vascularization. Vascularization is richer and more superficial near the openings of fallopian tubes, than in the uterine body. Resection of scars and isthmoeceles is a procedure reserved for the most advanced students, taking into account the proximity of these lesions to the uterine serosa.
c) Angle of View
Familiarizing the trainee with spatial orientation in the uterus should also include a description of the fixed angle of view – a distinct feature of any standard hysteroscope. Standard scopes usually come with a 30° or 12° angle of view. Accordingly, the image provided by such a hysteroscope will not show what is located in front of the distal tip, but what is in a more oblique position. Therefore, the trainee must understand the impact of the angle of view of the scope to be used. Only a 0° hysteroscope provides a straight ahead view.

A 30° scope provides a 30% forward-oblique view, not a straight ahead view. While introducing the scope more deeply, one should not get baffled by the image provided on the screen, but should understand how it is formed inside the uterine cavity. Awareness of the fact that the screen image of a 30° scope actually shows a forward-oblique view should enable the user to safely guide the scope further into the cavity to be inspected.

Example: The angle of view is directed upward and therefore shows a site that is different from where the longitudinal axis of the hysteroscope’s instrument channel is directed to. In case the scope has been rotated to the right of the surgeon, the instrument will also be viewed on the right side.

d) Keeping the Camera in a Fixed Position
The camera must always maintain a fixed position. On-axis rotation of the camera will result in an upside-down image, which is an unacceptable maneuver! The student must bear in mind that the camera remains in a neutral position while the endoscope is rotated around the longitudinal axis. This allows for visualization of all uterine angles that need to be inspected.
e) Panoramic Vision
Whenever an anatomical site shown on the video screen cannot be identified properly, the scope must resume its previous position by moving it downwards, upwards or sideways and undoing any rotary motion until a panoramic view is restored. These maneuvers can be used effectively to facilitate identification of anatomical structures or lesions that need to be further inspected or treated.

f) Mirrored View
Another difficulty that frequently arises when viewing a hysteroscopic image is based on the fact that the mindset of an inexperienced trainee, most commonly, is not prepared for a mirrored view. The hysteroscopic image provided on the video screen is exactly of that kind. When viewing the image of a tubal ostium on the left side of the screen, the correct anatomical orientation is on the right, and vice-versa. While rotating the scope to the left – as seen from outside – the hysteroscopic image actually shows the opposite side, i.e., the right. This also applies when lowering the camera, i.e., anatomical structures on the video screen will ‘scroll up’. It takes some time for the brain to get accustomed to the discrepancy between the anticipated mental image and what is actually seen on the video screen.

g) Constant Identification of More Than One Anatomical Structure
If proper identification of anatomical structures fails during hysteroscopy, this most frequently occurs when the scope is in near contact with the walls of the vagina, cervix or uterus. As a result, the hysteroscopist is faced with the problem of which route to take next. This underpins the necessity of maintaining, as a means of last resort, the chance to resume a previous position and to identify more than one anatomical structure that is situated in the uterus, cervix or vaginal canal. This strategy, ensuingly, helps to restore a panoramic view. Special care should also be given to the liquid distension medium. If flow is blocked or fluid is finished, dilation of the uterine cavity will fail, causing inadequate visualization of anatomical structures because the scope is in near contact with the vaginal canal or uterine wall.

The reader should be able to define the following principles before proceeding:

- Principle of proportionality or familiar size cue
- Determination of depth
- Angle of view
- Keeping the camera in a fixed position
- Panoramic vision
- Mirrored view
- Constant identification of more than one anatomical structure

4.1 Summary of Learning Objectives
Successful definition of the principles above should enable the trainee:

- to use a uterus simulator for training on measurement of tumors,
- to understand and determine the depth of resection,
- to identify the fixed angle of view of a standard hysteroscope,
- to demonstrate a good panoramic view,
- to explain the characteristics of a mirrored image that is viewed while holding the camera in a fixed position,
- to explain the need for keeping the camera in a fixed (neutral) position,
- to explain the need for constant identification of more than one anatomical structure.
In the guidelines presented so far, some aspects of hysteroscopy and associated preliminary measures have been described that are suited to establishing and improving vision as well as to facilitating the use of instruments and equipment. In the following section, useful information will be given on a series of procedures to be learned.

### 5.1 Dynamic Vaginohysteroscopy

This type of procedure is initiated by introducing the scope in the vagina without using a speculum or a tenaculum forceps. This is performed under constant fluid irrigation preferably using an automated irrigation-suction system, (e.g., KARL STORZ HAMOU® ENDOMAT®), and not a gaseous distension medium, because the former causes distension and lavage while the latter may only be employed for distension. The use of CO₂ as gaseous distension medium in the era of ‘dynamic vaginohysteroscopy’ is outdated.

A diagnostic vaginohysteroscopic examination must always be the first step prior to planning and initiating any operative treatment. A panoramic vision of the vaginal, cervical or uterine walls should enable the trainee to identify the site of a targeted biopsy excision as well as to spot an area that needs to be treated in the course of a more complex operative procedure. The exercises below are listed in order of increasing level of complexity and difficulty.

### 5.2 Biopsy Sampling

#### a) Biopsy Through Traction and Countertraction

This exercise first involves the use of a grasping forceps, that assists in accessing the site of biopsy sampling by exposing the tissue to be excised. In a second step, the jaws of a biopsy forceps are advanced for 2 to 3 mm and are finally closed to retrieve the tissue to be sampled. The forceps should be rotated to allow removal of the tissue on its endometrial layer. Another similar maneuver, that can be used instead of rotation, would be forward and backward traction and is also intended to remove the lesion from its underlying layer. Any biopsy excision should be performed through the endocervical canal under direct hysteroscopic vision. The tissue fragment captured by the forceps should be located at 2 to 3 mm from the distal tip of the scope. Advancing the outer sheath of the hysteroscope to the target site will create a shielded space that is used to retrieve the collected biopsy sample without compromising integrity of the uterine walls, cervix or vagina.
b) Biopsy Excision Using Scissors

The best time for biopsy sampling is in the proliferative phase of the cycle, allowing, e.g., an adequate amount of tissue to be obtained from a lesion that needs to be examined. A micro-scissors may also be used for this maneuver. Commonly, the tissue sample is excised from the inside of the endometrial cavity with a grasping forceps. Following insertion into the uterine cavity, and subject to the angle of vision, the scope's position is readjusted in such a way that a good panoramic view is accomplished. The principle of proportionality should be applied to decide whether the size of the tissue to be removed allows it to be retrieved through the cervical canal. The trainee should bear in mind that all principles already explained above, need to be strictly followed during simulated surgical maneuvers. If a tumor is larger than the inner diameter of the cervical canal, it should be divided to allow piecemeal removal.

c) Biopsy through Electrosurgery

Application of 5-Fr electrodes, monopolar or bipolar, offers the advantage of improved destruction of the tumor base as compared to that caused by purely mechanical instruments. The underlying mode of action of this modality is thermolysis, providing coagulation, cauterization or vaporization down to the bed of the lesion that needs to be removed. The propagation characteristics of this type of energy offer better results than those yielded by use of ‘cold’ techniques. Lesions of 5 mm or less are removed at their base and extracted via the cervical canal. Lesions of 1 cm (Fig. 5.2) should be divided into halves that can be removed via the same route. Lesions of 2 cm, at most, should be fragmented into four pieces. Tumors greater than 2 cm should be treated hysteroscopically by use of a resectoscope, which is particularly suited for this purpose due to its large caliber, facilitating complete resection of a tumor in less time.

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**Fig. 5.2** Division into halves (a) and quarters (b). Removal of fragments (c).
5.3 General Principles of Resection

a) Surgical Planning and Subdivision into a Sequence of Steps
As in any type of operative procedure, operative hysteroscopy can be subdivided into a sequence of steps. It is recommended that any decision-making with regard to selection of instrumentation be preceded by an initial diagnostic examination. Any hysteroscopic training should be geared toward generating self-confidence in the mind of the participant, who thus will be keen on finding the correct solution to a given problem. Nowadays, a standardized and well-structured protocol of practices must be an integral part of any hysteroscopic training course as it significantly helps to promote a modification of behavior on account of growing knowledge and experience. A thorough understanding of the entire sequence of steps included in an operative procedure will generate new habits, determination and commitment to the objectives of the course, whereas a trainee who prefers to adopt an improvising, chaotic approach will go through a longer learning curve and produce less convincing results.

Proper organization of instruments and a structured layout of operating room equipment is another ultimate responsibility of the surgeon. Not knowing how to place the neutral electrode of the electrosurgical device, not knowing how to adjust the irrigation pump and lack of understanding which type of electrode should be mounted on the resectoscope, all these deficiencies in expertise are risk factors contributing to complications, incomplete termination of surgery, flawed treatment and even malpractice. These occurrences may also be correlated with insufficient knowledge of instruments and the indications they are used for.

Entering the uterine cavity and finding a uterine septum should give reason to choose scissors or needle electrodes as ideal instruments, whereas other operative instruments are indicated when faced with a 4 cm myoma. Being able to make the right choice concerning the anticipated operative maneuvers used in the treatment of a specific condition is of key importance for the outcome of surgery.

In this chapter, the pros and cons of each type of resectoscope will not be discussed. The author will focus only on techniques, concepts and principles imparted to attendees of a hands-on training course on use of the resectoscope in operative hysteroscopy.

b) Fixation of the Cervix
It is important to be well-acquainted with adequate stabilization of the uterine cervix. Placing a tenaculum or Pozzi forceps on the surface of the cervix is a precautionary measure that may be taken to prevent iatrogenic cervical laceration, an incident that will impede continuation of the procedure. The tenaculum should be placed as deep as possible, taking care not to transfix the cervical canal. Even though frequently chosen for fixation of the cervix during operative hysteroscopy involving the use of a resectoscope, the 12 o’clock position requires the help of an assistant who constantly keeps the tenaculum in place, and prevents it from falling over the resectoscope. The 9 o’clock position for fixation of the cervix does not have a drawback of that kind. Deep placement of the tenaculum in the fibrous tissue of the cervix is recommended to avoid injury to the lower branches of uterine vessels. Secondary to this maneuver, cervical dilatation should be performed up to a size of 1 mm above the outer diameter of the resectoscope to be used.

c) Margin of the Plane of Resection
By strictly observing the principle of proportionality, the known size of the electrode employed should enable the surgeon-in-training to visually control the depth of penetration to which resection should be carried down to the endometrial base layer or myometrium. If there is an indication suggesting a greater depth of penetration, the electrode should be guided towards the myometrium with due pressure, whereas if a more superficial plane of resection should be maintained, the pressure exerted on the electrode must be reduced and adjusted accordingly. If half of the size of a 5mm electrode has been penetrated into the tissue to be removed, this will result in a resection depth of 2.5mm. Visual surveillance of resection allows the slice of tissue to be removed in a controlled manner, constantly comparing its size with that of the uterine wall thickness commonly measuring from 1.5 to 2.0cm in the uterine body.
d) Uniformity of Cutting
At this stage of training, a new principle will be introduced: Prior to starting with resection, one should have a clearly structured concept regarding the maneuvers to be performed. Special attention should be paid to the uniform thickness of all serial slices obtained in the course of resection. Commonly, slicing is initiated at a site that is readily accessible, and carried out with regular movements in a clockwise, or counter-clockwise fashion, always maintaining logical consistency in the course of action. Upon completion, a maximum portion of the lesion to be removed should have been resected. Cuts that are made at various sites in a random pattern, will end up in a disorganized surgical procedure, with tissue fragments piling up inside the uterine cavity and resulting in poor visibility.

If the need arises to deepen resection by slicing off a second tissue layer, the recommended trajectories should be placed in the boundary zones, that are left behind upon completion of the first serial passes of the resectoscope. This is where the myometrium will be thicker and therefore the risk of ‘overshooting’ and penetrating beyond the intended level can be reduced.

Fig. 5.3

e) Sequential Methodology
It is commonplace that a surgical procedure has a beginning, middle and end. Not knowing where to start will result in problems that are prone to arise when moving on to the final phase. Any lesion that has been diagnosed to be treated by operative hysteroscopy must have its own methodology of removal, starting with the choice of instruments, technique and the ideal approach to be adopted. Moreover, one should opt for an angle of resection or dissection that is associated with a reduced risk of difficulty.

The fragments to be removed should be as large as possible, but nonetheless should permit extraction through the cervical canal. Serial cuts must be placed adjacent to each other and should follow a consistent scheme. The sequential order of resection clearly helps to structure the procedure and aids in reducing the time needed for its completion. The accumulation of tiny endometrial fragments resulting from haphazardly performed resections will give rise to impaired visualization and can impede proper maneuvering of instruments in the uterine cavity. Apart from that, excess intravasation of distension fluid and entrainment of fragments of debris has been found to be associated with systematic absorption and elimination through the pulmonary tract, an adverse event that may trigger bronchial spasms in asthma patients and prompt the immediate suspension of the procedure. A sequential and clearly structured removal of tissue fragments can help prevent this complication by reducing the volume and concentration level of ‘contaminated’ distension fluid and shortening the overall duration of the procedure.

f) Unidirectional Trajectory of Cut
At this point, the trainee should learn another important principle, the ‘unidirectional trajectory of the cut’. Whenever possible, it is recommended to cut from the uterine fundus to the isthmus. Even though this is a first-line strategy, for lesions located on the sidewalls and on the uterine fundus, occasionally, a latero-lateral direction of cut may be indicated. Utmost care must be paid to maintain proper alignment of the camera by holding it in the center (neutral) position. The camera head perse must never be rotated! While the hysteroscope can be rotated to facilitate visualization of the operative site to be inspected, rotation of the camera will cause the point of reference to swing out of the range of vision, and lead to a loss of anatomical bearings.

g) Direct Hysteroscopic Vision
Whenever possible, passage of the resectoscope into the uterine cavity should be performed under direct vision and constant irrigation. The cervix exhibits a range of anatomic variations that have been found to hamper introduction of the resectoscope. At the start of insertion of the resectoscope, the rounded, atraumatic tip of the obturator will facilitate introduction. Prior to retrieval of slices of tissue, reinserion should be performed without an obturator while maintaining a free flow of distension fluid and advancing the resectoscope through the cervical canal. In this way, any obstacles and difficulties that may impede passage of the instrument can be detected.
5.4 Recommended Protocol of Standard Exercises in Endometrial Ablation

Considering the general principles outlined above, training of endometrectomy should involve the following sequence of exercises:

Before initiating the surgical procedure itself, the trainee must make sure that all auxiliary devices and technical components that will be used for irrigation, videendoscopic imaging and electrosurgery, should be in fully operational state and adjusted correctly. As regards the recommended settings to be made on the irrigation-suction system HAMOU® ENDOMAT®, the mean set value of intrauterine pressure should be at 100 mmHg, and irrigation flow rate should be adjusted to 200–300 ml/min.

- Place the speculum and visualize the cervix;
- Stabilize the cervix at a 9 o’clock position using a tenaculum forceps that is applied deeply in the cervical fibrous tissue. Next, remove the speculum to allow for a free movement, since slight traction applied to the tenaculum enables the cervix to be mobilized toward the vulvar region. With the speculum inserted in the vagina, this kind of maneuver is not possible.
- Dilate the cervix until it exceeds the internal cervical orifice, using dilators up to 1 mm above the outer diameter of the resectoscope to be used.
- Introduce the resectoscope until it has passed beyond the internal cervical orifice. Make sure that the tip of the resectoscope is not in near contact with the uterine fundus because this will increase the risk of perforation and may put at risk integrity of endometrial anatomy and specific landmarks utilized throughout the procedure.

- Once the obturator has been removed, the working element is introduced in the internal sheath of the resectoscope. Make sure that any air bubbles entrained in the irrigation tubings and channels of the resectoscope have escaped prior to releasing inflow of the irrigation / distension fluid.
- Start with resection in the nearest possible proximity to the uterine fundus, until reaching up to 1 cm above the internal cervical orifice. Beginning at a predefined point, serial adjacent passes of the resectoscope are made – a technique that helps to reduce the duration of the operative procedure. Once the first cut is made, one should continue laterally using repeated passes until complete resection of the uterine endometrium is accomplished (see Fig. 5.3c).
- Cauterize the uterine fundus with a rollerball electrode. The fundus and the uterotubal junction (or cornual region), forming a funnel-shaped entrance to the fallopian tube, should be cauterized, preventing iatrogenic perforations from occurring in this region, where wall thickness is smaller than in the uterine body. Proper endometrial ablation of the cornual region is of crucial importance for the outcome of resection. The region is rich in estrogen and progesterone receptors that account for restoring the endometrium if incompletely removed. The endometrium may also be resected with a loop electrode, however, the author strongly advises a novice against using this method. For advanced gynecologists, the use of simulators can be valuable in training endometrial resection of the uterine fundus and ostium region with loop electrodes. Ablation in this area should be performed at a shallow depth only until myometrial tissue is visualized, confirming that the basal layer of the endometrium has been reached.

Recommended Instruments and Equipment (see addendum section of the tutorial).
6.1 Special Maneuvers

Many authors share the opinion that myomectomy is the most complicated hysteroscopic procedure to be performed. Considering the level of difficulty, a series of twelve maneuvers – used for training removal of myomas during a hands-on workshop and arranged in approximate order of increasing difficulty – are given below:

a) Devascularization

In the presence of large fibroids surrounded by a dense vascular layer (also termed ‘pseudocapsule’), the latter can be cauterized prior to proceeding with myomectomy. The technique offers the benefit of reduced bleeding and improved visual conditions, thus considerably facilitating tumor dissection.
b) Hydrodynamic Massage
As described by Professor Hamou (1993), the maneuver is intended to promote migration of a deeply implanted myoma toward the uterine cavity. ‘Massage of the uterus’ should be performed by intermittent suspension of inflow of the distension medium. As a result, rapid changes in intruterine pressure will induce a hydrodynamic motion that will ‘massage’ the myoma, and cause it to migrate toward the endometrial cavity, where it can be resected.

Fig. 6.2
c) Divulsion
The technique, similar to the one described above, is geared at reducing to a minimum the need for employing electrosurgical energy. In order to meet this goal, one should first remove the endometrium covering the myoma by using grasping forceps, scissors or ‘cold’ electrodes. The technique is intended to cause the myoma to abandon the deepest layer of implantation and to promote its migration towards the uterine cavity. An electrosurgical modality should be applied only if integrity of the surrounding healthy endometrium/myometrium is preserved during removal of the fibroid tumor.

Fig. 6.3
d) Bipartition or Quadripartition
A vaginohysteroscopic approach with the use of a BETTOCCHI® Hysteroscope or a CAMPO Compact Hysteroscope (TROPHYscope®) mandates that myomas measuring 1–2 cm must be fractionized first to allow fragments to be retrieved through the cervical orifice. The tumors need to be divided into 2 or 4 components. A bipolar needle electrode should be used to fractionize the myoma, whereas for removal of fragments from the uterine cavity, the use of a grasping forceps is recommended. Considering their delicacy, the use of scissors in the removal of myomas is not indicated. The myoma's rounded shape usually needs to be broken up to create angles. These angles allow for a firm grip of the grasping forceps. The typical round surface of a fibroid tumor prevents it from being seized securely.

Fig. 6.4
**e) Removal of Myoma from Lateral Implantation Site**

In patients who no longer maintain a desire to give birth to a child, resection of a myoma with a lateral attachment is usually facilitated by a targeted surgical exposure of the base of implantation. Subsequently, the myoma tends to migrate to the inside of the uterine cavity where it can be resected.

![Fig. 6.5](image-url)
f) Slicing Technique
Using this technique, serial cuts are made with the electrode starting at the distal-most free margin of the myoma. Traction is applied to the electrode that is guided along the surface of the myoma towards the isthmus, while activating the electrical current.

Fig. 6.6
g) Lateral Cut
For fibroid tumors deeply implanted in the myometrium of the lateral uterine wall, use of the latero-lateral resection technique is a good choice. Care must be taken not to move the electrode towards the uterine fundus, but rather from the lateral side to the center of the uterus, while it is activated. The cleavage plane that opens up between the myometrium and myoma should become visible, facilitating the visually controlled completion of this maneuver.
h) Lever
Using this technique a cold electrode is introduced between the myoma and the myometrium once the proper cleavage plane is identified. The method is essentially based on a mechanical disruption of the fibroid’s connection to the myometrium at its base of implantation, causing it to migrate to the center of the uterine cavity where it can be resected safely. The key aspect of this method is that the electrode is not activated. It is a purely mechanical maneuver offering the benefit of enhanced preservation of healthy tissue.

Fig. 6.8
i) Mechanical Traction and Countertraction

The technique can be used to meet the objective of preserving endometrial anatomy for future pregnancy. The smaller the size of a myoma, the more its mobilization is accomplished with ease when using a grasping forceps. Larger myomas need to be treated with special forceps or a tenaculum grasper that is introduced instead of the working element of the resectoscope. The instruments used in this maneuver have been specifically designed for this purpose. Mechanical traction and countertraction are applied to facilitate removal of the myoma.

Fig. 6.9
j) Vaporization
The technique is preferentially employed using bipolar electrodes. The goal of vaporization is to facilitate removal of small fibroids which are reduced in size, allowing the smaller fragments to be extracted through the cervical canal.

Fig. 6.10
k) Retrograde Cutting
In the presence of intramural fibroids, embedded up to 0.5 cm away from the serosa, hysteroscopic myomectomy should be performed only by an advanced operative gynecologist. The technique initially involves the use of a ‘cold loop’, that is introduced and advanced towards the implantation base, followed by electrosurgical resection of the myoma. Subsequently, a loop electrode is placed deeply between the myoma and myometrium. By activating the high frequency current, the loop is guided in a retrograde fashion along the cleavage plane, moving from the base to the center of the uterus. Electrodes of smaller caliber are better suited for this maneuver.
1) Tunneling
Intramural fibroids of G2 type located in the uterine fundus, close to the ostium of the fallopian tubes, are difficult to handle. Using small caliber electrodes, preferably in conjunction with a bipolar electrosurgery unit, the technique can be used efficiently to dissect the myoma, which is encroached upon centrally using a ‘tunnelling approach’. Accordingly, resection is essentially performed inside the fibroid, which offers a certain degree of safety. Continuing with resection, the hollow space created inside the myoma facilitates its piecemeal removal. Once the myometrial layer is reached, the remaining fibroid pseudocapsule is removed by traction.

Fig. 6.12
m) Morcellation
Use of the Intrauterine Bigatti Shaver (IBS®) – which is mainly composed of a wide-angle 6° hysteroscope introduced through a 24-Fr operating sheath that houses a uterine morcellator – has been shown to facilitate myoma removal. The IBS® system comprises a rotating shaver blade, shielded by a sheath and connected to an irrigation and suction system that allows microfragments, generated by morcellation of the fibroid, to be evacuated rapidly.
6.2 Current Range of Neoderma® Uterus Models and Designated Procedures/Maneuvers

The following chapter is dedicated to the description of various types of Neoderma® uterus models and the presentation of a series of procedures and maneuvers grouped according to the level of the trainee’s competence, from the simplest to the most complex exercises. The author holds the opinion that advanced courses should not be offered to students who have not completed a basic hysteroscopic training, because this will impede progress of learning and often hampers the trainee’s readiness to maintain a sense of commitment to the learning objectives of the course.

Please note that no more than 3 students should share one EVE simulator during the course.

Recommended Instruments and Equipment (see addendum section of the tutorial).
There is a wide range of standard procedures that can be trained on an artificial uterus model. In the following, we will describe the various types of Neoderma® uterus models and a series of standard procedures and maneuvers that can be practiced with them.

### 7.1 Course Level: Basic

**Recommended instrumentation:**

- Scissors and grasping forceps, BETTOCCHI® hysteroscopy set or CAMPO TROPHYscope® set.
- Use of the ETH5/2G vagina with the EVE simulator is recommended.

#### a) Uterus Model ETH7-AM/2G

**Simulated Condition:**
Stenosed and irregular cervix with normal uterine cavity.

**Purposes:** Suited for novice learners of vaginohysteroscopy. Recommended for teaching the following maneuvers: Insertion of the hysteroscope into a narrowed and tortuous cervix. Demonstration of anatomical landmarks commonly observed in a normal uterine cavity. Biopsy sampling performed on the endometrial wall of the uterine cavity. Not recommended for training electrosurgery.

#### b) Uterus Model ETH7-GEST/2G

**Simulated Condition:**
Stenosed cervix, uterine cavity with an early ectopic pregnancy implanted in the cervix. The simulated condition is used for differential diagnosis against the presence of polypoid lesions.

**Purposes:** Recommended for teaching insertion of the hysteroscope into a narrowed and tortuous cervix. Demonstration of an early ectopic pregnancy implanted in the cervix. Not recommended for training electrosurgery. The uterus can be used in simulating multiple conditions to be examined for diagnostic assessment.
c) Uterus Model ETH7–2P/2G

Simulated Condition:
Uterine cavity with two polyps.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Resection of polyps with scissors used for bipartition. Removal performed with a grasping forceps. Collection of multiple samples obtained from the uterine wall. Simulated occurrence of bleeding. Not recommended for training electrosurgery.

d) Uterus Model ETH7–4P/2G

Simulated Condition:
Uterine cavity with four polyps.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Resection of polyps with scissors by bipartition or quadripartition. Collection of multiple samples obtained from the uterine wall. Dilation of the cervical canal and removal of all tissue fragments of the polyps with grasping forceps. Simulated occurrence of bleeding. Not recommended for training electrosurgery.

e) Uterus Model ETH7–S/2G

Simulated Condition:
Septum into the uterine cavity.

Purposes:
Recommended for beginners of vaginohysteroscopy courses who are trained on the following maneuvers: Insertion of the hysteroscope into the cervix. Removal of uterine septum. Collection of multiple samples obtained from the uterine wall. Not recommended for training electrosurgery.

f) Uterus Model ETH7–PS/2G

Simulated Condition:
Uterine cavity with one polyp and septum.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Resection of the polyp with scissors for bipartition and use of a grasping forceps. Removal of uterine septum. Collection of multiple samples obtained from the uterine wall. Simulated occurrence of bleeding. Not recommended for training electrosurgery.
7.2 Course Level: Advanced

Recommended Simulator, Hysteroscopes and Instrumentation:

- BETTOCCHI® Hysteroscopy Set or CAMPO TROPHYscope® Set with monopolar or bipolar electrodes for cutting or coagulation, scissors and grasping forceps. EVE hysterotrainer with vagina model ETH5/2G.
- Intrauterine BIGATTI Shaver (IBS®). EVE hysterotrainer with vagina model ETH5/2G.
- Monopolar or bipolar resectoscope. EVE hysterotrainer with vagina model ETH4/2G.

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**g) Uterus Model ETH7-ADH/2G**

**Simulated Condition:**
Uterine cavity with adhesions (synechia).

**Purposes:**
Recommended for beginners and students with some experience in vaginohysteroscopy who will be trained on: Differential diagnosis of synechia against a uterine septum. Iatrogenic injury to the uterine wall occurring while retracting scissors and grasping forceps.

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**h) Uterus Model ETH7-ADM/2G**

**Simulated condition:**
Uterine cavity with focal adenomyosis.

**Purposes:**
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Focal resection of areas of adenomyosis, using scissors and grasping forceps. Collection of multiple samples obtained from the uterine wall. Simulated occurrence of bleeding while cutting.
i) Uterus Model ETH7-MT0T1/2G

Simulated condition:
Uterine cavity with myoma G0 and G1.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Resection of small-sized myomas using scissors and grasping forceps. Collection of multiple samples obtained from the uterine wall.

The artificial myomas are made of a specially formulated synthetic material that helps prevent inadvertent damage to instruments.

j) Uterus Model ETH7-MT0T2/2G

Simulated condition:
Uterine cavity with myoma G0 and G2.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Resection of small-sized myomas using scissors and grasping forceps. Collection of multiple samples obtained from the uterine wall.

k) Uterus Model ETH7-HYP/2G

Simulated condition:
Uterine cavity demonstrating polypoid hyperplasia without atypical vascularization.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Differential diagnosis of polypoid hyperplasia against adenocarcinoma. Collection of multiple biopsy samples and/or piecemeal polypectomy performed on the uterine wall.

I) Uterus Model ETH7-ADC/2G

Simulated Condition:
Uterine cavity demonstrating atypical vascularization in the presence of adenocarcinoma.

Purposes:
Recommended for teaching the following maneuvers: Insertion of the hysteroscope into the cervix. Piecemeal resection of adenocarcinoma and collection of multiple biopsy samples obtained from the uterine wall. Simulated occurrence of bleeding.
m) Uterus Model ETH9/2G

Simulated Condition:
Uterine cavity demonstrating a condition of polyposis or myomatosis. The model allows biological specimens to be inserted and attached through openings in the uterus (Assembly, see Figs. 7 to 12);

Purposes:
Recommended for advanced courses of vaginohysteroscopy including electrosurgery, use of a monopolar or bipolar resectoscope or the Intrauterine Bigatti Shaver (IBS®). Note that only the biological specimens simulating tumors will be resected.

n) Uterus Model ETH 8 (developed by Marcos Lyra)

Simulated Condition:
Uterine cavity in the absence of tumors for training endometrial ablation.

* Available for sale in Brazil only. Other countries, please contact your local KARL STORZ representative for video demonstration.
References


Recommended Instruments and Equipment
LYRA Hystero-Trainer Eve II

LYRA Hystero-Trainer Eve II
including:
- Neoderm Uterus, for bipolar resection
- Neoderm Uterus, with polyps
- Neoderm Uterus, with septum and polyps
- Neoderm Uterus, with septum without polyps

① Vaginal Block, for biological organ structures/uteri
② Vaginal Block, for artificial uteri (Neoderm)
- Neutral Electrode, for unipolar use
- Neoderm Uterus, for biological implants
- Base Body, for EVE Hystero-Trainer, 2nd generation

It is recommended to check the suitability of the product for the intended procedure prior to use.
Basic Instrument Set for Diagnostic Office Hysteroscopy, diameter 5 mm

BETTOCCHI® Hysteroscopes based on a 2.9 mm telescope

26120 BA

HOPKINS® Forward-Oblique Telescope 30°, diameter 2.9 mm, length 30 cm, autoclavable, fiber optic light transmission incorporated, color code: red

With working channel

26153 BI

BETTOCCHI® Inner Sheath, size 4.3 mm, with channel for semirigid 5 Fr. operating instruments, with 1 stopcock and 1 LUER-Lock adaptor, for use with Outer Sheath 26153 BO

26153 BO

BETTOCCHI® Outer Sheath, size 5 mm, with 1 stopcock and 1 LUER-Lock adaptor, for use with Inner Sheath 26153 BI

Without working channel

26161 VB/VC

Inner Sheath, diameter 3.8 mm, with 1 LUER-Lock adaptor, for use with Outer Sheath 26161 VC

26161 VB

Outer Sheath, diameter 4.5 mm, with 1 LUER-Lock adaptor, for use with Inner Sheath 26161 VB
Basic Instrument Set for Diagnostic Office Hysteroscopy, diameter 4 mm

**BETTOCCHI® Mini-Hysteroscopes based on a 2.0 mm telescope**

**With working channel**

- **26152 BI**
  - **BETTOCCHI® Inner Sheath**, size 3.6 mm, with channel for semirigid 5 Fr. operating instruments, with 1 stopcock and 1 LUER-Lock adaptor, for use with **Outer Sheath 26152 BO**

- **26152 BO**
  - **BETTOCCHI® Outer Sheath**, size 4.2 mm, with 1 stopcock and 1 LUER-Lock adaptor, for use with **Inner Sheath 26152 BI**

**Without working channel**

- **26161 RN**
  - **Inner Sheath**, diameter 2.8 mm, with 1 stopcock and 1 LUER-Lock adaptor, for use with **Outer Sheath 26161 R**

- **26161 R**
  - **Continuous-Flow Outer Sheath**, diameter 3.6 mm, with 1 stopcock and 1 LUER-Lock adaptor, for use with **Inner Sheath 26161 RN and 26162 RN**
BETTOCCHI® Integrated Office Hysteroscope (B.I.O.H.)™, diameter 4 mm
based on an integrated 2.0 mm telescope

26252 BL

BETTOCCHI® B.I.O.H.® Compact Hysteroscope,
HOPKINS® telescope 30°, size 4 mm, with channel for
semirigid 5 Fr. operating instruments, with suction and
irrigation valves for single or continuous-flow use, long handle,
including:
Outer Sheath
2x Suction and Irrigation Valve
Adapter Monobloc
Sealing for instrument ports (10 pcs.)

Recommended accessories

39501 XC Wire Tray, for cleaning, sterilization and storage of one
KARL STORZ B.I.O.H.™ Compact Hysteroscope

26252 SP Sealing Set for B.I.O.H.™ Compact Hysteroscope
(5 x Spare Sealing Caps, 3 x 10 Spare O-Rings for valve,
5 x O-Rings for sheath)
**TROPHYscope – CAMPO Compact Hysteroscope**

based on an integrated 2.0 mm telescope

Without working channel

![Image of TROPHYscope with irrigation connector](image1)

26008 BAC  CAMPO **TROPHYscope**®, HOPKINS® telescope 30°,
size 2.9 mm, length 24 cm,
with irrigation connector, for use with Examination Sheath
26152 DA and Operating Sheath 26152 DB

26152 DA  **Continuous-Flow Sheath**, size 3.7 mm, length 18 cm,
with suction adaptor, for use with
CAMPO **TROPHYscope**® 26008 BAC

With working channel

![Image of TROPHYscope with working channel](image2)

26008 BAC  CAMPO **TROPHYscope**®, HOPKINS® telescope 30°,
size 2.9 mm, length 24 cm,
with irrigation connector, for use with Examination Sheath
26152 DA and Operating Sheath 26152 DB

26152 DB  **Continuous-Flow Operating Sheath**, size 4.4 mm, length 18 cm,
with channel for semirigid instruments 5 Fr.,
with 1 stopcock and 1 Luer-Lock adaptor,
for use with CAMPO **TROPHYscope**® 26008 BAC

**NEW** 26152 DS  **TROPHY Curette**, for use with Continuous-Flow
Sheaths 26152 DA and 26152 DN Sheath 26152 DA
and Operating Sheath 26152 DB
Basic Instrument Set for Diagnostic Office Hysteroscopy
Reusable Mechanical Surgical Instruments, Length 34 cm, 5 Fr.

26159 EHW  **Scissors**, semirigid, blunt, single action jaws, 5 Fr., length 34 cm

26159 SHW  **Scissors**, semirigid, pointed, single action jaws, 5 Fr., length 34 cm

26159 UHW  **Biopsy and Grasping Forceps**, semirigid, double action jaws, 5 Fr., length 34 cm

26159 H  **HESSELING Tenaculum Grasping Forceps**, semirigid, double action jaws, 5 Fr., length 34 cm

26159 DHW  **Punch**, semirigid, through-cutting, single action jaws, 5 Fr., length 34 cm

26159 BHW  **Biopsy Spoon Forceps**, semirigid, double action jaws, 5 Fr., length 34 cm

26159 DS  **DI SPIEZIO SARDO Grasping Forceps**, semirigid, double action jaws, 5 Fr., length 34 cm

26159 HS  **HESSELING/DI SPIEZIO SARDO Tenaculum Grasping Forceps with Spike**, semirigid, double action jaws, 5 Fr., length 34 cm

26159 M  **BETTOCCI® Myoma Fixation Instrument**, semirigid, 5 Fr., length 34 cm

26159 G  **BETTOCCI®/DI SPIEZIO SARDO Palpation Probe**, semirigid, millimeter division, 5 Fr., length 34 cm

Reusable Bipolar Electrodes, Length 36 cm, 5 Fr.

26158 BE  **Bipolar Dissection Electrode**, semirigid, 5 Fr., 90 degree angled, length 36 cm

26158 BE  **Bipolar Dissection Electrode**, semirigid, 5 Fr., length 36 cm

26159 GC  **GORDTS/CAMPO Bipolar Ball Electrode**, semirigid, 5 Fr., length 36 cm
Basic Instrument Set for Operative Hysteroscopy, 26 Fr.

Reusable Unipolar Working Element Set

26050 EG  Working Element Set,
Cutting by means of a spring. Movable thumb ring.
In rest position the tip of the electrode is inside the sheath,
including:
Working Element
Cutting Loop, angled
Coagulating Electrode, ball end
Coagulating Electrode, unipolar, pointed
2x Unipolar High Frequency Cord
Protection Tube

Reusable Unipolar Electrodes (24 Fr.), for use with 26050 EG

26050 G  Cutting Loop, unipolar, angled, 24 Fr.,
for use with HOPKINS® Telescope 26105 FA,
color code: yellow

26050 J  Cutting Loop, unipolar, straight, 24 Fr.,
for use with HOPKINS® Telescope 26105 FA,
color code: yellow

26050 N  Coagulating Electrode, unipolar, ball end, diameter 3 mm,
for use with HOPKINS® Telescope 26105 FA,
color code: yellow

26050 L  Coagulating Electrode, unipolar, pointed, 24 Fr.,
for use with HOPKINS® Telescope 26105 FA,
color code: yellow

280  Protection Tube, for sterilization and storage
of electrodes, curettes and knives
Basic Instrument Set for Operative Hysteroscopy, 26 Fr.
Reusable Resectoscopes for intrauterine HF-Surgery

26050 SL  **Resectoscope Sheath**, including connecting tube for in- and outflow, for continuous irrigation and suction, 26 Fr., oblique beak, **rotatable** Inner Sheath 26050 XA with ceramic insulation, for use with Working Elements 26050 E, 26050 D, 26050 V, 26040 EB and 26050 EB, color code: yellow

or

26040 SL  **Resectoscope Sheath**, including connecting tube for in- and outflow, for continuous irrigation and suction, 26 Fr., oblique beak, **fixed** inner sheath 26040 XA with ceramic insulation, for use with Working Elements 26050 E, 26050 D, 26050 V and 26050 EB, color code: yellow

or

26050 SC  **Resectoscope Sheath**, including connecting tubes for in- and outflow, 26 Fr., oblique beak, inner tube with ceramic insulation, **quick release lock**, for use with resectoscope working elements 26050 E, 26050 D, 26050 V, 26040 EB and 26040 DB, color code: yellow

26040 OC  **Standard Obturator**, for use with Resectoscope Sheaths 26040 SL, 26050 SL and 26050 SC, color code: yellow
Basic Instrument Set for Operative Hysteroscopy, 26 Fr.
Reusable Bipolar Working Element Set

26040 EBH Working Element Set, bipolar,
Cutting by means of a spring. Movable thumb support.
In rest position the electrode tip is inside the sheath,
including:
Working element, bipolar
2x Cutting loop, bipolar
Coagulation Electrode, bipolar, pointed
HALF MOON Coagulation Electrode, bipolar, ball end
High frequency cable, bipolar
Protection tube

Reusable Bipolar Electrodes (24 Fr.), for use with 26040 EBH

26040 GP1 Cutting Loop, bipolar, 24/26 Fr.,
for use with HOPKINS® Telescopes 26105 FA/BA,
color code: yellow

26040 BL1 Coagulating Electrode, bipolar, pointed, 24/26 Fr.,
for use with HOPKINS® Telescope 26105 FA/BA,
color code: yellow

26040 NB1 HALF MOON Coagulation Electrode, bipolar, ball-shaped, 24 Fr.,
for use with HOPKINS® Telescope 26105 FA,
color code: yellow

26040 JB1 Cutting Loop, bipolar, longitudinal, 24/26 Fr.,
for use with HOPKINS® Telescopes 26105 FA/BA,
color code: yellow-orange

280 Protection Tube, for sterilization and storage
of electrodes, curettes and knives
Basic Instrument Set for Operative Hysteroscopy, 22 Fr.
Reversible Unipolar Slender Working Element Set

26055 ES  Working Element Set, unipolar,
(Cutting by means of a spring. Movable thumb support.
In resting position, the electrode tip is inside the sheath)
including:
Working Element
2x Cutting Loop, angled
Coagulating Electrode, pointed
Coagulating Electrode, ball end, diameter 3 mm
2x High Frequency Cord
Protecting Tube

Reusable Unipolar Electrodes (21 Fr.), for use with 26055 ES

26055 G  Cutting Loop, angled
26055 H  Cutting Loop, angled 25°
26055 N  Coagulating Electrode, ball end, diameter 3 mm
26055 L  Coagulating Electrode, pointed

280  Protection Tube, for sterilization and storage
of electrodes, curettes and knives
Basic Instrument Set for Operative Hysteroscopy, 22 Fr.
Reusable Slender Resectoscopes for intrauterine HF-Surgery

26020 FA

**HOPKINS® Telescope 12°**, diameter 2.9 mm, length 30 cm, autoclavable, fiber optic light transmission incorporated, color code: black

26020 FA

26055 SC

26055 SL **Resectoscope Sheath**, including connecting tube for in-and outflow, for continuous irrigation and suction, 22 Fr., oblique beak, fixed inner sheath 26055 XB with ceramic insulation, for use with working element 26055 E, color code: white

or

26055 SC **Resectoscope Sheath**, including connecting tubes for in- and outflow, 22 Fr., oblique beak, inner tube with ceramic insulation, quick release lock, for use with resectoscope working element 26055 E color code: white

or

26055 LD **Resectoscope Sheath**, including connecting tube for in- and outflow, for continuous irrigation and suction, 22 Fr., oblique beak, rotatable sheath tube 26055 XE with ceramic insulation, for use with working element 26055 E, color code: white

26055 CO **Standard Obturator**, for use with resectoscope sheaths 26055 SL/SC/LD color code: white
Basic Instrument Set for Operative Hysteroscopy, 22 Fr.
Reusable Bipolar Slender Working Element Set

26055 EBH  Working Element Set, bipolar,
(Cutting by means of a spring. Movable thumb support.
In resting position, the electrode tip is inside the sheath)
including:
Working element, bipolar
2x Cutting loop, bipolar
Coagulation Electrode, bipolar, pointed
HALF MOON Coagulation Electrode, bipolar, ball end
High frequency cable, bipolar
Protection tube
Connector with tube

Reusable Bipolar Electrodes (21 Fr.), for use with 26055 EBH

26055 GP  Cutting Loop, bipolar, 21 Fr.,
for use with HOPKINS® telescope 26020 FA,
color code: white

26055 NB  HALF MOON Coagulation Electrode, bipolar, ball end, 21 Fr.,
for use with HOPKINS® telescopes 26020 FA,
color code: white

26055 BL  Coagulation Electrode, bipolar, pointed, 21 Fr.,
for use with HOPKINS® telescopes 26020 FA,
color code: white

280  Protection Tube, for sterilization and storage
of electrodes, curettes and knives
Intrauterine BiGATTI Shaver (IBS®)
For Mechanical Resection of Polyps And Myomas

**HOPKINS® Wide Angle Straight Forward Telescope 6°**, with parallel eyepiece, length 20 cm, **autoclavable**, fiber optic light transmission incorporated, with working channel, with Luer-Lock connector for inflow, color code: yellow

**Operating Sheath**, 24 Fr., rotating, for continuous irrigation and passive outflow, with Luer-Lock stopcock, color code: white

**Hollow Obturator**, color code: white

**DRILLCUT-X® II Shaver Handpiece GYN**, for use with UNIDRIVE® S III

**Handle**, adjustable, for use with DRILLCUT-X® II 26702050
Intrauterine BIGATTI Shaver (IBS®)
For Mechanical Resection of Polyps And Myomas

26208 SA

**Shaver Blade GYN**, straight, sterilizable, concave cutting edge, double serrated, oval cutting window, diameter 4 mm, length 32 cm, for use with DRILLCUT-X® II Handpiece 26 7020 50, color code: blue-green

26208 SB

**Shaver Blade GYN**, straight, sterilizable, double serrated cutting edge, rectangular cutting window, diameter 4 mm, length 32 cm, for use with DRILLCUT-X® II Handpiece 26 7020 50, color code: blue-yellow

26208 SZ

**Coagulation Electrode**, bipolar, for use with Intrauterine Bigatti Shaver (IBS)

**Bipolar High Frequency Cord**

<table>
<thead>
<tr>
<th>KARL STORZ Instrument</th>
<th>High Frequency Surgery Unit</th>
</tr>
</thead>
</table>

26176 LE

**Bipolar High Frequency Cord**, length 300 cm, for AUTOCON® II 400 SCB system (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® series (50, 200, 350), Erbe-Coagulator, T and ICC series.
Unique benefits of the KARL STORZ TELE PACK X LED at a glance

**Crystal clear image**
- 15" LCD monitor with LED backlight
- Rotatable image display
- 24 Bit color intensity for natural color rendition
- DVI video input for pristine picture quality
- DVI video output for connecting HD monitors

**Easy control combined with highest safety**
- Membrane keyboard approved for wipe disinfection
- Hot-Keys assuring fast and direct adjustment
- Arrow keys for intuitive control
- Pedal control available

**Flexible storage possibilities**
- SD card-slot allows high storage capacity
- USB-slot for external HDDs and flash drives
- Picture gallery for records
- Playback of saved videos
- Print-ready patient report documentation

**Additional information**
- Sturdy, portable casing
- Ergonomic design allows comfortable transport
- Universal power supply unit: 100–240 VAC, 50/60 Hz
- Measurement (H x W x D): 450 mm x 350 mm x 150 mm
- Weight: 7 kg

**Natural illumination**
- LED high-performance light source
- Natural colour rendition close to sunlight with a colour temperature of 6400 K
- Up to 30,000 hours lamp operating time

**Ordering Information**
TP100 EN **TELE PACK X LED**, endoscopic video unit for use with all KARL STORZ TELECAM one-chip camera heads and video endoscopes, incl. LED-light source on a similar niveau as the Power LED 175, with integrated digital Image Processing Module, 15" LCD monitor with LED backlight, USB/SD memory module, color systems PAL/NTSC, power supply 100 - 240 VAC, 50/60 Hz, including:
- **USB Silicone Keyboard** with Touchpad, with US character set
Unique benefits of the KARL STORZ TELE PACK X LED at a glance

Compatible camera heads

| 202120 40 (PAL) | TELECAM One-Chip Camera Head, **autoclavable**, with integrated Parfocal Zoom Lens, $f = 14 – 28$ mm (2x), 2 freely programmable camera head buttons, including plastic container for sterilization |
| 202121 40 (NTSC) |
| 202120 30 (PAL) | TELECAM One-Chip Camera Head, with integrated Parfocal Zoom Lens, $f = 25 – 50$ mm (2x), 2 freely programmable camera head buttons |
| 202121 30 (NTSC) |
| 202120 34 (PAL) | TELECAM C-Mount One-Chip Camera Head, 2 freely programmable camera head buttons |
| 202121 34 (NTSC) |
| 202120 32 (PAL) | TELECAM-B Beamsplitter One-Chip Camera Head with 2 freely programmable camera head buttons and **rotating** CCD sensor, $f = 25$ mm |
| 202121 32 (NTSC) |
| 202120 31 (PAL) | TELECAM-B Beamsplitter One-Chip Camera Head with 2 freely programmable camera head buttons and **rotating** CCD sensor, $f = 30$ mm |
| 202120 30 (PAL) | DCI® II One-Chip Camera Head, $f = 16$ mm, for use with DCI® HOPKINS® telescopes |
| 202621 30 (NTSC) |

Compatible Video-Endoscopes

**ENT**

| 11101 VP (PAL) | Video Rhino-Laryngoscope |
| 11101 VN (NTSC) |

**Pneumology**

| 11900 BP (PAL) | Video Bronchoscope |
| 11900 BN (NTSC) |

**Urology**

| 11272 VP (PAL) | Video-Cysto-Urethroscope |
| 11272 VN (NTSC) |
| 11272 VPU (PAL) |
| 11272 VNU (NTSC) |
Unique benefits of the KARL STORZ TELE PACK X LED at a glance

Accessories

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2000 43</td>
<td>C-Mount Lens, f = 38 mm</td>
</tr>
<tr>
<td>20</td>
<td>2000 42</td>
<td>C-Mount Lens, f = 30 mm</td>
</tr>
<tr>
<td>20</td>
<td>2301 41</td>
<td>C-Mount Lens, f = 25 mm</td>
</tr>
<tr>
<td>20</td>
<td>2301 45</td>
<td>C-Mount Lens, f = 12 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0142 30</td>
<td>One-pedal-Footswitch, digital, two stage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0143 30</td>
<td>Two-pedal Footswitch, one step</td>
</tr>
</tbody>
</table>

Fiberscope adaptors for other manufacturers

<table>
<thead>
<tr>
<th>No.</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>020 GM</td>
<td>Adaptor for Machida fiberscopes</td>
</tr>
<tr>
<td>29</td>
<td>020 GN</td>
<td>Adaptor for Olympus fiberscopes, new type</td>
</tr>
<tr>
<td>29</td>
<td>020 GO</td>
<td>Adaptor for Olympus fiberscopes, old type</td>
</tr>
<tr>
<td>29</td>
<td>020 GP</td>
<td>Adaptor for Pentax and Fujinon fiberscopes</td>
</tr>
</tbody>
</table>
**IMAGE1 S Camera System**

**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

**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

**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

**Sustainable investment**
- Compatible with all light sources
Brilliant Imaging
- Clear and razor-sharp endoscopic images in FULL HD
- Natural color rendition

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

FULL HD image

CLARA

FULL HD image

CHROMA

FULL HD image

SPECTRA A*

SPECTRA B**

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

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

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:**

| Camera System | TC 300 (H3-Link) |
| Supported camera heads/video endoscopes | TH 100, TH 101, TH 102, TH 103, TH 104, TH 106  
| | (fully compatible with IMAGE1 S)  
| | 22220055-3, 22220056-3, 22220053-3, 22220060-3, 22220061-3, 22220054-3, 22220085-3  
| | (compatible without IMAGE1 S technologies CLARA, CHROMA, SPECTRA*) |
| LINK video outputs | 1x |
| Power supply | 100–120 VAC/200–240 VAC |
| Power frequency | 50/60 Hz |
| Protection class | I, CF-Defib |
| Dimensions w x h x d | 305 x 54 x 320 mm |
| Weight | 1.86 kg |

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

For use with IMAGE1 S Camera System

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

and with all IMAGE1 HUB™ HD Camera Control Units

**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

**TH 103**

**IMAGE1 S H3-P Three-Chip FULL HD Pendulum Camera Head**, 50/60 Hz, IMAGE1 S compatible, with pendulum system and fixed focus, progressive scan, soakable, gas- and plasma-sterilizable, focal length $f = 16$ mm, 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>
<th>IMAGE1 S H3-P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product no.</td>
<td>TH 100</td>
<td>TH 103</td>
</tr>
<tr>
<td>Image sensor</td>
<td>3x 1/3&quot; CCD chip</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>
<td>35 x 47 x 88 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>270 g</td>
<td>226 g</td>
</tr>
<tr>
<td>Optical interface</td>
<td>integrated Parfocal Zoom Lens, $f = 15–31$ mm (2x)</td>
<td>pendulum system, fixed focus $f = 16$ mm</td>
</tr>
<tr>
<td>Min. sensitivity</td>
<td>F 1.4/1.17 Lux</td>
<td>F 1.4/1.17 Lux</td>
</tr>
<tr>
<td>Grip mechanism</td>
<td>standard eyepiece adaptor</td>
<td>standard eyepiece adaptor</td>
</tr>
<tr>
<td>Cable</td>
<td>non-detachable</td>
<td>non-detachable</td>
</tr>
<tr>
<td>Cable length</td>
<td>300 cm</td>
<td>300 cm</td>
</tr>
</tbody>
</table>
Monitors

9619 NB

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

9826 NB

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

<table>
<thead>
<tr>
<th>KARL STORZ HD and FULL HD Monitors</th>
<th>19&quot;</th>
<th>26&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wall-mounted with VESA 100 adaption</strong></td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
<tr>
<td><strong>Inputs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVI-D</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Fibre Optic</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>3G-SDI</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td>RGBS (VGA)</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S-Video</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Composite/FBAS</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td><strong>Outputs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DVI-D</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>S-Video</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>Composite/FBAS</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>RGBS (VGA)</td>
<td>●</td>
<td>–</td>
</tr>
<tr>
<td>3G-SDI</td>
<td>–</td>
<td>●</td>
</tr>
<tr>
<td><strong>Signal Format Display:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:3</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>5:4</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>16:9</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Picture-in-Picture</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>PAL/NTSC compatible</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

**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><strong>Desktop with pedestal</strong></td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td><strong>Product no.</strong></td>
<td>9619 NB</td>
<td>9826 NB</td>
</tr>
<tr>
<td><strong>Brightness</strong></td>
<td>200 cd/m² (typ)</td>
<td>500 cd/m² (typ)</td>
</tr>
<tr>
<td><strong>Max. viewing angle</strong></td>
<td>178° vertical</td>
<td>178° vertical</td>
</tr>
<tr>
<td><strong>Pixel distance</strong></td>
<td>0.29 mm</td>
<td>0.3 mm</td>
</tr>
<tr>
<td><strong>Reaction time</strong></td>
<td>5 ms</td>
<td>8 ms</td>
</tr>
<tr>
<td><strong>Contrast ratio</strong></td>
<td>700:1</td>
<td>1400:1</td>
</tr>
<tr>
<td><strong>Mount</strong></td>
<td>100 mm VESA</td>
<td>100 mm VESA</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>7.6 kg</td>
<td>7.7 kg</td>
</tr>
<tr>
<td><strong>Rated power</strong></td>
<td>28 W</td>
<td>72 W</td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td>0–40°C</td>
<td>5–35°C</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>-20–60°C</td>
<td>-20–60°C</td>
</tr>
<tr>
<td><strong>Rel. humidity</strong></td>
<td>max. 85%</td>
<td>max. 85%</td>
</tr>
<tr>
<td><strong>Dimensions w x h x d</strong></td>
<td>469.5 x 416 x 75.5 mm</td>
<td>643 x 396 x 87 mm</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
</tr>
<tr>
<td><strong>Certified to</strong></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

Fiber Optic Light Cable, with straight connector, diameter 2.5 mm, length 180 cm

Fiber Optic Light Cable, with straight connector, diameter 3.5 mm

AUTOCON® II 400 SCB

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:

Mains Cord
SCB Connecting Cable, length 100 cm

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.
HYSTEROMAT E.A.S.I.®

26340001-1  HYSTEROMAT E.A.S.I.® Set,
   power supply 100 – 240 VAC, 50/60 Hz,
   HYSTEROMAT E.A.S.I.®: SCB ready,
   compatible from RUI Release 44,
   including:
   Mains Cord
   SCB Connecting Cable, length 100 cm
   Basic Tubing Set, for single use

   Recommended accessories:
   031717-10  IRRIGATION tubing set, for single use,
               sterile, package of 10, for use with
               KARL STORZ HYSTEROMAT E.A.S.I.®
   031217-10  SUCTION tubing set, for single use,
               sterile, package of 10, for use with
               KARL STORZ HYSTEROMAT E.A.S.I.®

   Optional accessories:
   26340330  Two-Pedal Footswitch, one-stage, digital,
              for use with HYSTEROMAT E.A.S.I.®

UNIDRIVE® S III SCB

26701001-1  UNIDRIVE® S III SCB, GYN Set,
   motor system, with KARL STORZ-SCB,
   power supply 100 –120/230 – 240 VAC, 50/60 Hz,
   including:
   Mains Cord
   One-Pedal Footswitch, two-stage,
   with proportional function and pump switch function
   SCB Connecting Cable, length 100 cm

20701070  Control Cable, connectors 2x LEMO 5-pol 0°,
           length 100 cm, for transmission of foot switch
           control signal between UNIDRIVE® S III 20701020-1
           and HYSTEROMAT E.A.S.I.®
Data Management and Documentation

KARL STORZ AIDA® – Exceptional documentation

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

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

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

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

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

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

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

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

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

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

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

**Reference**
All important patient information is always available and easy to access. Completed procedures including all information, still images, videos, and the checklist report can be easily retrieved from the Reference module.
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
Notes
with the compliments of
KARL STORZ — ENDOSKOPE