FLEXIBLE URETEROSCOPY WITH THE KARL STORZ FLEX-X² URETEROSCOPE

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FLEX-X²™ URETEROSCOPE

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Recommended Set for Flexible Ureteroscopy using the KARL STORZ FLEX-X® Ureteroscope
KARL STORZ Endovision Video Camera Systems;
Accessories for Illumination, Documentation and Data Storage
Extracts from catalogues UROLOGY and TELEPRESENCE,
IMAGING SYSTEMS, DOCUMENTATION – ILLUMINATION ........ 27
1.0 Introduction

The KARL STORZ Flexible Ureteroscope has evolved with the addition of many new features. The KARL STORZ FLEX-X™ is the newest in the series of flexible ureteroscopes, all with a tip diameter of 7.5 Fr. and shaft diameter of 8.5 Fr. (Fig. 1). This progression in instrument design has helped to facilitate many ureteroscopic procedures and has simplified not only access to the ureter, but also placement of working instruments within the entire collecting system.

1.1 Features

Deflection and flexibility are the key capabilities of a flexible ureteroscope. The KARL STORZ FLEX-X™ has many convenient features that help facilitate not only access to the ureter, but placement of the tip of the ureteroscope throughout the collecting system. An easy on-and-off light post accepts a detachable light cable for illumination through the instrument (Fig. 2a). It can be removed and attached to other KARL STORZ endoscopes such as a rigid or flexible cystoscope or a nephroscope that may be used during the procedure.

Attach the green metal bayonet end of the tubing onto the vent port of the flexible fiberscope. Secure by using a clockwise push and turn motion. The leakage tester connector and the vent port on the fiberscope MUST be dry before connecting. Leakage tester attaches to fiberscope.

The shaft is 67 cm in length. The channel has a T-port with Luer-lock adaptors (Fig. 2c). As with all KARL STORZ Flexible Ureteroscopes, the working channel is maintained at 3.6 Fr. and allows placement of 3 Fr. or smaller instruments with adequate irrigation passed simultaneously.

Fig. 1
The KARL STORZ FLEX-X™ flexible ureteroscope.

Figs. 2a–c
The channel is accessed with Luer lock adaptor for irrigation or for the introduction of working devices.
1.2 Tip Deflection

The KARL STORZ FLEX-X² flexible ureteroscope represents a new concept in active tip deflection. In the past, deflection was termed either active at the tip or passive along the shaft. A combination of active and passive deflection was required to access the lower pole, for example. The current flexible instrument has continuous controlled dual deflection with increased downward and upward deflection, up to 270 degrees in both directions. The radius of deflection is also broader, thus encompassing what was once termed active tip deflection and passive shaft deflection. This larger radius of deflection and the increased deflectability help not only to facilitate access to the lower pole, but also to place working instruments into the lower pole calyces (Fig. 3c). The full range of deflection can be achieved in an adequate space, such as a dilated renal pelvis (Figs. 3a, b).

One of the instruments most commonly passed into the lower pole for intrarenal retrograde ureteroscopic therapy is a 365-micrometer laser fiber (Fig. 3e). Previously available ureteroscopes had no more than 100 degrees of active tip deflection with this instrument in the working channel. The KARL STORZ FLEX-X², however, can reach over 220 degrees of active tip deflection with the laser fiber in the channel (Fig. 3d). This helps facilitate passage of this instrument into the lower pole.

Figs. 3a, b
a Fluoroscopic image of KARL STORZ FLEX-X² ureteroscope fully deflected in a dilated renal pelvis.

b In this fully deflected portion, the KARL STORZ FLEX-X² can see itself entering the renal pelvis at the ureteropelvic junction.

Fig. 3c
Full active continuous controlled dual deflection of the tip of the KARL STORZ FLEX-X² ureteroscope brings the tip to 270° deflection in each direction.

Figs. 3d, e
Extended active deflection is reached even with a 365-micrometer laser fiber (d) or a 2.4 Fr. nitinol basket in the working channel (e).
The KARL STORZ FLEX-X™ does have a component of passive deflection as well. The shock absorber system is located proximal to the deflecting segment. This allows for gentle rolling of the entire deflecting mechanism, protecting the instrument and giving the endoscopist access more deeply into calyces (Fig. 4a).

1.3 Protecting the Working Channel

The KARL STORZ FLEX-X™ has an innovative tip design (Fig. 4b). Historically flexible ureteroscopes could be damaged by inadvertent laser energy delivery or arcing of energy from laser lithotripsy into the distal end of the working channel. The KARL STORZ FLEX-X™ has a Laserite™ ceramic liner in the distal end of the working channel for 1.5 cm. This not only protects the instrument from thermal or electrocautery damage, but allows the endoscopist to work closer to a tumor or stricture when delivering various forms of energy. This innovative tip design is unique to the KARL STORZ instrument and has increased instrument longevity.
Flexible Ureteroscopy with the KARL STORZ FLEX-X: Ureteroscope

2.0 Use of the Flexible Ureteroscope

2.1 General

The flexible ureteroscope is an essential component of urologic endoscopy. It can extend the reach of the urologist throughout the ureter as well as the intrarenal collecting system (Figs. 5 a, b). It can be passedatraumatically over the iliac vessels and psoas muscle into the mid and proximal ureter and intrarenal collecting system. The development of flexible ureteroscopes that can reach the entire collecting system and of small flexible working instruments suitable for use within the flexible endoscope has extended diagnostic and therapeutic endoscopy throughout the urinary tract. Small working devices that can be delivered through flexible ureteroscopes include biopsy forceps, baskets, graspers, snares and wire-pronged graspers. Endoscopic lithotriptors and laser fibers can be delivered through the working channel. Appropriate lasers can be employed to fragment calculi, as well as to ablate, coagulate and incise tissue. The indications for flexible ureteroscopy have increased as the capabilities of the endoscopes and working devices have advanced (Table 1).

<table>
<thead>
<tr>
<th>Indications for Flexible Ureteroscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Calculi</td>
</tr>
<tr>
<td>• Filling Defects</td>
</tr>
<tr>
<td>• Neoplasms</td>
</tr>
<tr>
<td>• Ureteral Obstructions</td>
</tr>
<tr>
<td>• Intrarenal Obstruction</td>
</tr>
<tr>
<td>• All lesions in the ureter, renal pelvis or intrarenal collecting system</td>
</tr>
</tbody>
</table>

Table 1
### 2.2 Passing Working Instruments

There are a number of important points to consider when the endoscopist is employing accessories through the working channel of the flexible ureteroscope. Accessories that are smaller inhibit the active tip deflection less. However, the material that is being placed through the working channel also affects tip deflection.

Graspers and baskets with sheaths made of polyimide tend to be stiffer and inhibit deflection more than Teflon-sheathed accessories.

Instruments should be passed through the working channel only when the tip is straight and not when it is deflected. Sharp straight accessories like a stiff guidewire or laser fiber will disrupt the soft lining of the working channel if forced through the instrument when it is significantly deflected (Fig. 6).

It is important to note that one should never force any accessory through the working channel. Working devices, laser fibers and electrosurgical instruments must extend from the channel beyond the tip of the endoscope before they are activated. It is also just as important to note that accessories that are particularly rigid or tacky and not lubriciously coated will be more difficult to pass, in general.

The working channel of the KARL STORZ FLEX-X® ureteroscope is 3.6 Fr. from the hub to the tip of the endoscope. Accessories that are smaller, specifically 2 Fr. graspers and baskets or a 230-micron laser fiber, facilitate maximal endoscope deflection (see Figs. 3a–d).

---

**Figs. 6a, b**

A working instrument can damage the channel of the shaft or tip of the ureteroscope if deflected. The device should be passed through the channel and exit beyond the tip of the endoscope into the visual field before the tip is deflected. A working device, especially a laser, **must never** be activated when the tip of the fiber is located within the channel.
2.3 Irrigation

Irrigating fluid is needed to distend the lumen and clear the visual field. It is delivered through a side arm to the same channel used for working instruments. When there is a working instrument within the channel, it may be necessary to pressurize the irrigant to achieve adequate flow through the entire endoscope. There are a variety of irrigation devices available. The simplest means of irrigating through the working channel of the flexible instrument is to use two 60 cc syringes, a three-way stopcock and arterial line tubing (Fig. 7a). The surgical assistant irrigates just enough to clear the optical field. When the optical field is clear, no irrigation is needed. The most common, and what has become the standard, irrigation solution is sterile normal saline. The entire bag of irrigant can be pressurized, but it is difficult to manage the flow through the channel (Fig. 7b). When electrocautery is being employed through the working channel, Sorbitol is commonly used. Small aliquots of sterile water can also be used to clear a bloody field during electrosurgical procedures, but the volume must always be carefully limited. Do not mix irrigants within the collecting system. As irrigants of different densities mix, the differences in refraction indices cause distortion of the visual image (Fig. 7c).

This is common when a retrograde ureteropyelogram is performed initially and contrast is left in the collecting system during the initial diagnostic ureteroscopy. This phenomenon can be avoided by first emptying the visual field of one irrigant by aspirating through the working channel before introducing the second irrigant.

Fig. 7a
Two 60 cc syringes connected through a 3-way stopcock to Luer-lock extension (arterial line) tubing are an effective irrigating device capable of infinite variations in pressure and flow.

Fig. 7b
The entire bag of irrigant can be pressurized with an inflatable cuff, but it is less easily controlled.
2.4 Flexible Ureteroscopic Access

Passage of the flexible ureteroscope into the upper urinary tract has been simplified in part by the KARL STORZ FLEX-X2 design. Earlier flexible ureteroscopes had a smaller radius of deflection at the tip and less overall deflectability. The passively deflectable segment resulted in a region of instability along the shaft that prevented direct passage of the endoscope through the intramural ureter without the added stiffening effect of a guidewire within a channel. The KARL STORZ FLEX-X2 has a larger radius of curvature and extended deflectability, as well as a shaft that is stiffer than previous endoscopes. With this design, the KARL STORZ FLEX-X2 flexible ureteroscope can frequently be passed directly into the ureteral orifice (Fig. 8) and through the intramural tunnel into the upper collecting system (Figs. 9–11, 12a–c) without the aid of a guidewire or working sheath, and without initial dilation of the ureter. A guidewire is employed as necessary through the channel of the ureteroscope to straighten the intramural tunnel or to increase the stiffness of the endoscope. Intramural dilation with the balloon is only rarely needed to pass the small diameter ureteroscope. When the ureter is too small to accept the endoscope, it is dilated to no more than 10 to 12 Fr. to minimize trauma to the ureteral wall.

2.5 Difficult Access

In clinical situations in which the endoscope cannot be placed, it is necessary to employ traditional access techniques commonly used with the earlier larger flexible ureteroscopes. A guidewire is placed initially into the ureter proximal to the area for treatment. The wire can be introduced through an angiographic or ureteral catheter. The use of an angle-tipped nickel-titanium guidewire with a lubricious coating facilitates access to the upper collecting system. Once the wire has passed the obstructing segment, the catheter can be advanced over the wire and the wire is exchanged to a more stable traditional Teflon-coated wire. The catheter is then removed, leaving the wire in place. A second working wire is then placed using a 10 Fr. dual-lumen catheter. This catheter dilates the intramural tunnel to 10 Fr. and also introduces a second channel that can be used for injection of a contrast agent to perform a retrograde ureteropyelogram or to place the second wire. The flexible ureteroscope is then passed over one of the wires to the level of interest while the second wire is maintained as a safety wire (Fig. 13).

In certain selected cases, an operating sheath can be placed over one of the wires to facilitate prompt passage of the endoscope through the intramural tunnel. The operating sheath allows easy access through the urethra and bladder and is particularly valuable in cases where multiple passage of the endoscope is required or in a situation where the distal ureter is sharply angled secondary to prostatic hypertrophy. However, the outer diameter of the sheath is significantly larger than the ureteroscope and if the sheath kinks, it may trap an endoscope and make it more difficult to remove it.
Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

Figs. 7c, d
Mixing of irrigants of 2 densities distorts the image (d).

Fig. 8
Ureteroscopic view of ureteral orifice.

Fig. 9
Normal ureter.

Fig. 10
Ureteroscopic view of renal pelvis from ureteroscope positioned at the ureteropelvic junction.

Fig. 11
Solitary papilla.

Figs. 12a–c
Various examples of compound papillae.

Fig. 13
An angled hydrophilic wire can be used to pass obstructing lesions such as an impacted calculus or stricture or sharply angled ureter. The wire can lead a catheter beyond the calculus and then be exchanged for a more stable guidewire.
2.6 Safety Wire

A safety wire should be employed when the intended procedure involves placing, removing and then again replacing the ureteroscope. This can occur during fragmentation of a large calculus or treatment of neoplasm. The safety wire is clipped to the surgical drape and remains in place for use as noted above to replace a working wire or to place a stent at the end of the procedure.

A safety wire is used less commonly with the KARL STORZ FLEX-X\textsuperscript{2} ureteroscope when it can be placed directly into the ureter. Small calculi or tumors can be treated without the need for a safety wire.

2.7 Fluoroscopy

Each step in access to the ureter is performed with simultaneous real-time fluoroscopic imaging (Figs. 14a–f). The position of the guidewire, any dilator and the ureteroscope is followed fluoroscopically. A small amount of contrast agent can be passed through the working channel of the endoscope to opacify the ureter or intrarenal collecting system for fluoroscopic monitoring. In this way, the collecting system can be mapped to direct positioning of the flexible ureteroscope.

\begin{center}
\begin{tabular}{c c c}
\textbf{14a} & \textbf{14b} & \textbf{14c} \\
\end{tabular}
\end{center}

\begin{center}
\begin{tabular}{c c c}
\textbf{14d} & \textbf{14e} & \textbf{14f} \\
\end{tabular}
\end{center}

\begin{itemize}
\item **Figs. 14a–c**
Fluoroscopic monitoring demonstrates the position of the ureteroscope as it enters the distal ureter with a guidewire in place (a) mid ureter (b) and the proximal ureter (c) after removal of the guidewire.
\end{itemize}

\begin{itemize}
\item **Figs. 14d–f**
The ureteroscope’s position can be confirmed within the renal pelvis which has been opacified with 30\% iodinated contrast.
\end{itemize}
2.8 Instruments for Ureteroscopic Procedures

Successful ureteroscopy requires the availability of a wide array of access and working instruments. Many of the devices are rarely used but they can be irreplaceable when they are needed. The endoscopy suite should be equipped with a radiolucent table, fluoroscopic monitoring equipment and the appropriate anesthetic devices.

The instruments recommended for ureteroscopic procedure are listed in Table 2.

<table>
<thead>
<tr>
<th>Endoscopy Room</th>
<th>Instrument Table</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Radiolucent table</td>
<td>• Drapes – C-arm, patient</td>
</tr>
<tr>
<td>• Fluoroscope (C-arm,</td>
<td>• Guidewires</td>
</tr>
<tr>
<td>image intensifier)</td>
<td>– 0.38 in. straight floppy tip,</td>
</tr>
<tr>
<td></td>
<td>heavy duty</td>
</tr>
<tr>
<td></td>
<td>– Hydromer coated</td>
</tr>
<tr>
<td></td>
<td>– Stiff, double floppy tip</td>
</tr>
<tr>
<td>• Personal radiation</td>
<td>• KARL STORZ Cystoscope</td>
</tr>
<tr>
<td>protection clothes</td>
<td>• KARL STORZ FLEX-X² ureteroscope</td>
</tr>
<tr>
<td>• Video camera and</td>
<td>• Saline solution for irrigation</td>
</tr>
<tr>
<td>monitor</td>
<td>• Irrigating tubing</td>
</tr>
<tr>
<td>• Cold light source</td>
<td>• Connecting tubing, Luer tip</td>
</tr>
<tr>
<td></td>
<td>• 3-way stopcock</td>
</tr>
<tr>
<td></td>
<td>• Syringes, 2–60 cc, 1–20 cc</td>
</tr>
<tr>
<td></td>
<td>• Radiographic contrast agent</td>
</tr>
<tr>
<td>Additional Instrumentation and Units to be Available</td>
<td>• Lithotriptor</td>
</tr>
<tr>
<td></td>
<td>– Holmium laser</td>
</tr>
<tr>
<td></td>
<td>(KARL STORZ CALCULASE II®)</td>
</tr>
<tr>
<td></td>
<td>• Graspers</td>
</tr>
<tr>
<td></td>
<td>• Baskets</td>
</tr>
<tr>
<td></td>
<td>• Forceps</td>
</tr>
<tr>
<td></td>
<td>• Fulgurating electrodes</td>
</tr>
<tr>
<td></td>
<td>• 10 Fr. double-lumen catheter</td>
</tr>
<tr>
<td></td>
<td>• Ureteral dilators or balloons</td>
</tr>
<tr>
<td></td>
<td>• Ureteral access sheath</td>
</tr>
</tbody>
</table>

Table 2
Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

Figs. 15a–c
A large 1.7 cm cystine stone obstructing the ureter is fragmented ...

... using a holmium laser fiber.

After lithotripsy, fragments are captured in a nitinol basket and withdrawn down the ureter.

3.0 Range of Applications

3.1 Calculi

The most common indication for ureteroscopic intervention is the treatment of an upper urinary tract calculus. The flexible ureteroscope has facilitated this therapy by allowing atraumatic access to the ureter proximal to the ureteral vessels, as well as to the entire intrarenal collecting system. The flexible ureteroscope can then be used to deliver endoscopic lithotriptors or retrieval devices. Simplified access with this newer class of endoscope shortens operative time and helps facilitate even the most complex procedures. The treatment of upper urinary calculi consists of extraction of small stones or fragments, or fragmentation of larger calculi. There is a variety of retrieval devices including three pronged graspers, two-arm nitinol grasping devices and small diameter nitinol baskets. It is clear that an impacted stone which is too large to pass should not be engaged in a grasping device and forcibly extracted.

Figs. 16 a–c
A stone found resting in a minor calyx ...

... is treated with a Holmium:YAG laser ...

... with good fragmentation.
If the stone is too large to pass, it is also too large to extract and thus endoscopic lithotripsy should be employed (Figs. 15–19). Because it is impossible to determine accurately which fragments can be removed intact, it is important to use a reversible device to grasp calculi for removal. For example, baskets with stainless-steel wires may kink and entrap the calculus and become unable to release it.

The most efficient endoscopic lithotrite currently employed is the Holmium:YAG laser (Fig. 20). The light energy is delivered through low water density quartz fibers. The two most common diameter-fibers employed through the flexible ureteroscope are either 365 or 230 microns. The larger the fiber, the more efficient the endoscopic lithotripsy. However, the larger the fiber diameter, the stiffer it is.
Therefore, in a very sharply angled intrarenal location or in a dependent lower pole calyx, the 230-micron fiber may be superior. Smaller diameter fibers also allow a greater flow of irrigant to pass simultaneously through the channel to clear the optical field and cool the fiber tip. Lower-pole calculi can be moved to the renal pelvis or upper calyx to offer easier access for lithotripsy (Figs. 21, 22).

During Holmium:YAG laser lithotripsy, the laser is initially set at 0.8 J per pulse and 6 Hz. The energy and frequency are then raised gradually to obtain the desired effect. Most commonly, the central portion of the stone is converted to fine dust initially. As the peripheral portions of the stone begin to fragment, the laser settings are lowered to decrease movement of the stone fragments. This is particularly important when the surgeon is trying to convert all of the remaining fragments into the smallest pieces that can be passed easily. Direct visualization through the ureteroscope is used to estimate the adequacy of fragmentation. A guidewire can be used as a marker (3 Fr. = 1 mm) to help estimate the size of stone fragments.

It is important to note that proper patient positioning on the operating room table may facilitate ureteroscopic lithotripsy. A stone that is in the proximal ureter may migrate into the intrarenal collecting system during the procedure. An important technique is to place the patient in a Trendelenburg position with elevation of the ipsilateral flank prior to manipulating a proximal ureteral stone. This maneuver may facilitate positioning of a migrating stone into a more easily accessible upper or middle calyx where the endoscope can be passed more readily during lithotripsy.
Flexible Ureteroscopy with the KARL STORZ FLEX-X: Ureteroscope

3.2 Diagnostic Procedures
Flexible ureteroscopy is an ideal technique for the diagnosis of many upper tract lesions. It has become an essential technique for the diagnosis of upper tract filling defects and gross unilateral hematuria. The entire upper urinary collecting system can be visualized through the ureteroscope and specific areas sampled or coagulated as indicated.

3.3 Gross Unilateral Hematuria
Benign essential hematuria or gross unilateral hematuria is defined as gross hematuria for one renal unit, the etiology of which cannot be diagnosed by standard radiologic techniques. Earlier studies with open nephroscopy showed that a small hemangioma was often a source of bleeding. Flexible ureteroscopic examination of these patients gives access through the normal urinary tract with even better ability to visualize the intrarenal collecting system. Bleeding lesions have been treated with a very high success rate with hematuria clearing in 93% of patients after endoscopic treatment with either fulguration or laser ablation (Figs. 23a, b). Benign essential hematuria became the first specific indication best suited to flexible ureteroscopic diagnosis and treatment.

3.4 Filling Defects
Filling defects within the upper urinary tract can be visualized and sampled directly with the flexible ureteroscope. With simple visualization, it is possible to distinguish neoplasms from calculi (Figs. 24, 25). Biopsy is used to obtain tissue to define the neoplasm and in the case of transitional cell carcinoma to grade the lesion. There are several devices available to obtain tissue samples through a flexible ureteroscope.

23a 23b 24 25

Figs. 23a, b
A bleeding vessel on a papillary tip is located and blood can be seen pooling in a calyx (a) in a patient with lateralizing hematuria. The bleeding tip is then coagulated with a 2 Fr. electrode (b).

Fig. 24
Grade 1 papillary transitional cell carcinoma in calyx.

Fig. 25
Papillary tumor on inter-infundibular septum.
Flexible Ureteroscopy with the KARL STORZ FLEX-X® Ureteroscope

A cup biopsy forceps (Figs. 26, 27a–d) can be used to sample any type of tissue, but severely limits the deflection of the ureteroscope. Therefore, it is useful throughout the ureter, the renal pelvis and the mid to upper calyces. More friable lesions, such as a papillary transitional cell carcinoma, can be biopsied very effectively with a flat-wire basket. It can remove a relatively larger fragment of tissue (Figs. 28, 29). Irrigation fluid within the collecting system is aspirated through the working channel of the ureteroscope for a cytology sample. Any sample obtained should be handled with cytopathologic techniques to maximize the yield and prevent tissue loss during preparation. Any visible sample is then prepared as a cell block to yield specimens that are adequate for histology and, therefore, grading.

Fig. 26
A cold cup biopsy forceps is used to sample all types of lesions in the upper urinary tract.

Fig. 27a–d
A small ureteral tumor (a) is biopsied with biopsy forceps (b). After biopsy, the remainder of the tumor is resected with holmium laser (c) achieving hemostasis and complete destruction of the remaining lesion (d).

Fig. 28
Flat wire baskets can sample friable papillary tumors and often provide a larger sample than other devices.

Fig. 29
Tumor biopsy in the ureter using a flat-wire basket.
3.5 Treatment of Upper-Tract Neoplasms

Upper-tract neoplasms can also be treated with a flexible ureteroscope. Use of these biopsy techniques have shown that a considerable volume of tumor can be removed by mechanical grasping or retrieval. The remaining base is then fulgurated or treated with the laser (Fig. 30). Larger lesions are difficult to treat with mechanical and electrosurgical instruments alone and are better suited to laser therapy. Either a holmium YAG or Nd:YAG laser can be used effectively. The Nd:YAG laser more efficiently coagulates tissue, but it leaves it in place as a pale coagulated mass of tissue that must be mechanically removed. In comparison, the holmium YAG laser can also coagulate tissue, though not as deeply as the Nd:YAG laser. It can also ablate and actually remove tissue. During this procedure, bits of tissue are released into the field that must be irrigated and aspirated to clear visibility (Figs. 30, 31a–d).

Combined application of these lasers is particularly effective for a wide range of sizes and structures of tumors in the upper tract.

Fig. 30
After mechanical removal of urothelial tumor, the base is fulgurated with a 2 Fr. or 3 Fr. electrode or a laser.

Figs. 31a–d
Renal pelvis tumor (a); same tumor undergoing treatment with neodymium laser. Note progressive blanching of the tumor (b, c); after completion of neodymium treatment, holmium laser energy is used to amputate the tumor from its base leaving site free of visible tumor (d).
3.6 Incisional Procedures

Endopyelotomy

Endopyelotomy can be performed readily with a flexible ureteroscope. The common indication includes both primary and secondary ureteropelvic junction obstruction. It is essential that imaging is performed either preoperatively or intraoperatively to rule out adjacent crossing vessels. When vessels are present, endopyelotomy is less successful and can result in hemorrhage and, therefore, laparoscopic pyeloplasty should be considered.

The direction and length of the incision is determined in large part by the anatomic variant encountered. A short, annular ureteropelvic junction stricture requires a short full-thickness incision with either an electrosurgical device or laser. This is contrasted with a ureteropelvic junction obstruction caused by a high insertion, where there is a flap valve effect. This septum forming the valve can vary in length from a few millimeters to a few centimeters and can be incised directly with a device passed through the flexible ureteroscope. The incision of an endopyelotomy should open any mechanical narrowing, open an obstructive segment of a high insertion and result in a more dependent anatomically open ureteropelvic junction.

The endoscopic incision for endopyelotomy is performed with either a small diameter (230 micron) holmium laser fiber or a 2 Fr. electrosurgical electrode (Fig. 32). Holmium laser energies of 1.0–1.2 J and a frequency of 12–15 Hz will facilitate a clean full-thickness incision. It is important to incise through the segment promptly in order to facilitate coagulation of the surrounding tissue from the thermal laser energy. Frequently, the incision is interrupted with crossing bands. This allows the cooling irrigant to pass into the periureteral tissues to separate them from the ureteral wall. When electrosurgery is employed, it should be used with a pure cutting current, and neither coagulation nor blend to minimize periureteral scarring.

Fig. 32
The holmium laser is effective for ureteroscopic ablation and coagulation of papillary tumors.
Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

Ureterotomy

Incision of ureteral strictures is facilitated with a flexible ureteroscope. It is just as important in the ureter to be sure that there are no crossing vessels prior to endoscopic incision. Preoperative or intraoperative imaging is essential to rule out crossing vessels. As with an endopyelotomy, the incision should be full thickness (Figs. 33, 34). Success of primary ureterotomy for ureteral strictures is related to the length of the stricture and the extent of periureteral fibrosis. Strictures that are longer than 2 cm rarely remain patent after incision, and other treatment should be considered. The techniques employed are similar to those noted for endopyelotomy. Again, postprocedural stenting is an essential part of the procedure.

Intrarenal Incision

Narrow segments in the ureter can also be incised. Obstructed infundibula and calyces may be incised to provide drainage or to gain access for endoscopic procedures (Figs. 35a–c).

Figs. 35a–c
A stenosed infundibulum with a proximal stone (a) is incised (b) to open the infundibulum (c) and provide access to the stone.
4.0 Other Applications

4.1 Antegrade Ureteroscopy

A flexible ureteroscope can be advanced in an antegrade fashion along the ureter where percutaneous access to the kidney is available. Any procedure that could be performed in a retrograde fashion could then be performed using the flexible ureteroscope throughout the ureter. The flexible ureteroscope is considerably smaller than a flexible nephroscope and can be passed much more easily into the undilated ureter.

4.2 Biliary

The flexible ureteroscope can also be used within the biliary tract. It has been used through a percutaneous tract into the biliary system either transhepatically or through an established biliary cystostomy. It can be placed laparoscopically, although this entails a very high risk for damage to the endoscope itself.

Techniques of irrigation, lithotripsy, biopsy and tissue ablation are very similar to those used in the urinary tract. Fluoroscopy is also used to guide positioning of the instrument.

4.3 Pediatric Endoscopy

Ureteroscopy
Flexible ureteroscopy has been used in pediatric patients for treating calculi, hematuria and for endopyelotomy in those who have failed an open pyeloplasty. The flexible ureteroscope can often be placed in the ureter without prior dilation. If the ureter does not accept the ureteroscope, however, it may be safer to place a stent for ureteral dilation rather than mechanically dilate the ureteropelvic junction.

Pediatric Endoscopy
The small flexible ureteroscope has been used effectively as a pediatric cystoscope. The length of the ureteroscope itself makes it inconvenient for positioning, but the diameter is well suited to the urethra in children and can be used to avoid rigid cystoscopy. Reduced in length for pediatric purposes the KARL STORZ Flex-X2 product line also comprises a 45-cm Cysto-Urethro-Fiberscope, diameter 7.5 Fr. (11278 AC / 11278 ACU, KARL STORZ, Germany).
5.0 Video and Photo Capabilities

The optical image from the flexible ureteroscope is ideally suited for video presentation during the procedure. The superior optics of the KARL STORZ FLEX-X® can be viewed by all members of the surgical team to maximize their understanding and participation in the procedure. Three-chip video cameras produce optimal images, they particularly provide for increased image definition compared to traditional single-chip video cameras. A beam splitter, however, allows the operating surgeon to visualize directly through the endoscope. This has become less important with the addition of computerized enhancement of optical images. There are a variety of settings on the KARL STORZ IMAGE1® 3-chip video camera system that can be employed to improve the optical image viewed on the monitor. The procedures often begin with the camera setting at baseline, without any modulation or enhancement of the image. Specific filters are available to alter the overall image and minimize the “Moiré” and “Grid” effect appearance of the fiberoptic image. Filter A or B on these camera systems are commonly employed to clarify the image (Figs. 36a–c). It is also important to adjust the gain or light sensitivity of the camera head. For most flexible ureteroscopic procedures, the gain should be at the lowest setting and only increased when the endoscope is in a large fluid-filled area like a dilated renal pelvis.

It is valuable in complex cases and those patients with upper urinary tract urothelial tumors to provide hard copy images for future comparison during serial treatment. The KARL STORZ AIDA-DVD monitoring system is a key component. This device allows the surgeon to obtain reproducible single images or complete video segments of the procedure. These are rapidly burned onto a standard writable and readable CD or DVD and can be placed either in the patient’s chart or archived. This forms an image capture superior to thermal pictures of VHS recorders since the images can be archived indefinitely, and a greater number of images are stored with superior reproducibility. All of the endoscopic images in this presentation were captured and reproduced with the KARL STORZ AIDA-DVD System.

Figs. 36a–c
A partially fragmented ureteral stone (a) as seen through filter A, (b) and filter B (c).
6.0 Care and Handling

6.1 Sterilization

The flexible ureteroscope is a delicate precision optical instrument that should be treated with care. In handling the endoscope, the shaft should not be sharply angulated. While it is on the surgical table in the operative theatre, no other instruments should ever be placed upon it. Immediately after use, the endoscope should be cleaned outside and inside to prevent drying of any bloody or protein-containing fluid on the surfaces. The vent cap on the flexible ureteroscope should be removed during use in endoscopic procedures and prior to immersion in any liquid. The vent cap should be in place before gas sterilization or before shipping. The endoscope should be stored carefully. It should never be stored in the foam-padded case unless it is completely dry. It can be stored in the sterilization tray specifically designed for the endoscope or hung suspended on the wall rack.

Refer to the Instruction Manual for specific techniques in the care and sterilization of the flexible ureteroscope. These comments are not intended to replace that manual, but only to emphasize these points in handling.

Summary

The small diameter flexible ureteroscope is an ideal instrument to access the upper portions of the ureter and the intrarenal collecting system. The KARL STORZ FLEX-X 

2TM has improved access throughout the collecting system. These endoscopes can deliver instruments capable of efficient and effective lithotripsy, tissue sampling and ablation. Flexible ureteropyeloscopy is a valuable component of urologic endoscopy. It is a current technique that extends the urologist’s diagnostic and therapeutic reach throughout the entire upper urinary tract.
Recommended Set
for Flexible Ureteroscopy using the
KARL STORZ FLEX-X™ Ureteroscope

KARL STORZ Endovision Video Camera Systems
and Accessories for Illumination, Documentation
and Data Storage

Extracts from the following catalogues:

UROLOGY
and

TELEPRESENCE, IMAGING SYSTEMS,
DOCUMENTATION – ILLUMINATION
Uretero-Reno-Fiberscopes KARL STORZ FLEX-X²

Special Features:
- The LASERITE ceramic tip at the distal end of the working channel prevents thermal damage to the flexible uretero-renaloscope during LASER treatment
- Additional passive deflection components
- Integrated shock absorber system
- Deflection 270° upwards/downwards allows the intuitive orientation and visualization of the entire renal tract
- The new angulation mechanism makes it possible to use LASER fibers with little or with no loss of the angulation properties
- Enhanced material resistance and stiffness allow easier access to the kidney
- Waterproof and fully immersible in solution
- Sterilizable with EtO and FO gas, Steris® and Sterrad®
- Minimal discomfort for the patient
- Smaller outer diameter
- Compatible with all KARL STORZ systems without the need for adaptors
- Diagnostic and therapeutic applications for the ureteral and renal tract
- Lithotripsy and stone extraction in the ureteral and renal tracts

It is recommended to check the suitability of the product for the intended procedure prior to use.
Flexible Ureteroscopy with the KARL STORZ FLEX-X® Ureteroscope

Uretero-Reno-Fiberscopes
for Access to the Entire Intrarenal Collection System

7.5 Fr.

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<th>Uretero-Reno-Fiberscopes</th>
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<th>Angle of view</th>
<th>Working length</th>
<th>Working channel inner diameter</th>
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<td>270°</td>
<td>0°</td>
<td>88°</td>
<td>67 cm</td>
<td>3.6 Fr.</td>
<td>7.5 Fr.</td>
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<tr>
<td>11278 AU</td>
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<td>270°</td>
<td>0°</td>
<td>88°</td>
<td>67 cm</td>
<td>3.6 Fr.</td>
<td>7.5 Fr.</td>
</tr>
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</table>

Following accessories are included:

- 27677 X Case
- 11025 E Pressure Compensation Cap, for ventilation during gas and plasma sterilization
- 13242 XL Leakage Tester, with bulb and manometer
- 27651 AL Cleaning Brush, round, flexible, outer diameter 2 mm, for working channel diameter 1.2 – 1.8 mm, length 150 cm
- 27014 Y Luer-Adaptor, with seal

Optional accessories:

- 11275 FE Grasping Forceps, double action jaws, flexible, 3 Fr., length 100 cm
- 11275 ZE Biopsy Forceps, double action jaws, flexible, 3 Fr., length 100 cm
- 27023 VB Stone Basket, sterile, for single use, 2.5 Fr., length 120 cm
- 11770 T Coagulation Electrode, unipolar, 3 Fr., length 110 cm
- 27025 P Guide Wire, with ball end, 3 Fr., package of 10
- 27550 N Seal, for working channel, package of 10, single use recommended
- 27001 RA Cleaning Adaptor

- 39402 AS Plastic Container for Sterilization, specially suited for gas and hydrogen peroxide (Sterrad®) sterilization and storage, perforated, with lid, for use with flexible endoscopes up to max. 95 cm working length, external dimensions (w x d x h): 550 x 260 x 92 mm
CALCULASE II SCB
LASER System for Endoscopic Stone Therapy and Soft Tissue Treatment

20 Watt LASER Power
The brand CALCULASE II SCB stands for a cost-effective and efficient Holmium:YAG LASER system for endoscopic LASER lithotripsy.

Soft Tissue Treatment
The system can be used for, among others, soft tissue treatment such as ureteropelvic junction stenosis and ablation of urethral carcinoma.

Diverse LASER Fibers and Instruments
KARL STORZ offers LASER fibers in various sizes (230, 365 and 600 µm) for both single and multiple use. Together with its wide range of rigid and flexible ureterorenoscopes equipped with fiber optic and sensor technology, KARL STORZ offers the ideal complete solution for stone therapy and soft tissue treatment.

Automatic Fiber Detection
This feature enables automatic adjustment of energy settings to the fiber sizes and, consequently, prevents damage to the fibers or the unit itself.

Mobility
Its compact design makes CALCULASE II SCB a very versatile and mobile system. With its innovative handles, the LASER system can easily be placed on the urological equipment cart and moved from one OR to the next. Alternatively, the LASER system can be placed on an equipment cart specially designed for this purpose and transported as required.
CALCULASE II SCB
LASER System for Endoscopic Stone Therapy and Soft Tissue Treatment

LASER System for the Treatment of Bladder, Ureter and Kidney Stones and for opening stenoses/strictures as well as tumor ablations

Special Features:
- 20 Watt for effective and precise treatment: precise cutting effect in the case of stenoses
- Extremely fast lithotripsy
- Automatic fiber detection:
  - High user-friendliness
  - Increased safety
- Green pilot laser: Good visibility even in challenging situations
- Special design with:
  - Mobile desktop housing
  - Automatically controlled energy output
  - Integrated low-noise cooling system

- Least possible tissue damage
- High success rate independent of stone composition
- Lithotripsy under endoscopic control
- For use with rigid, semiflexible and flexible endoscopes
- For use on endoscopic equipment carts
- Easy to maintain
- With connections to the KARL STORZ Communication Bus (KARL STORZ SCB)
CALCULASE II SCB
Holmium LASER System for Endoscopic Stone Therapy
and Soft Tissue Treatment, Recommended System Configuration

27 7502 01-1 CALCULASE II SCB, Holmium LASER system,
power supply 230 VAC, 50/60 Hz
including:
Mains Cord
One-Pedal Footswitch
Key Set, package of 2, for key-operated switch
Remote Interlock Connector
SCB Connecting Cable, length 100 cm
Safety Goggles Ho:YAG LASER 2080 µm
Ion Exchanger

27 7502 01U1 Same, power supply 115 VAC, 50/60 Hz

Please note:
Each lithotripsy system requires a separate basic fiber set: 27 7502 87 or 27 7502 86.

Parameters for 230 µm Fibers

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<td>0.5 J</td>
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<tr>
<td>0.8 J</td>
<td>3.2 W</td>
</tr>
<tr>
<td>1.2 J</td>
<td>4.8 W</td>
</tr>
<tr>
<td>1.7 J</td>
<td>–</td>
</tr>
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<td>2 J</td>
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Parameters for 365 µm and 600 µm Fibers

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<td>6.8 W</td>
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<tr>
<td>2 J</td>
<td>8 W</td>
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Parameter settings are selected via the LASER fiber code.
CALCULASE II SCB
System Components
CALCULASE II SCB
Accessories

Fiber Sets, reusable

- 27 7502 71-P6 CALCULASE II Fiber 230 µm, reusable, sterile, length 300 cm, package of 6
- 27 7502 72-P6 CALCULASE II Fiber 365 µm, reusable, sterile, length 300 cm, package of 6
- 27 7502 73-P6 CALCULASE II Fiber 600 µm, reusable, sterile, length 300 cm, package of 6

- 27 7502 87 CALCULASE II Fiber Kit
  including:
  - 3x CALCULASE II Fiber 230 µm, reusable
  - 3x CALCULASE II Fiber 365 µm, reusable
  - 3x CALCULASE II Fiber 600 µm, reusable

Fiber Sets, for single use

- 27 7502 77-P6 CALCULASE II Fiber 230 µm, for single use, sterile, length 300 cm, package of 6
- 27 7502 78-P6 CALCULASE II Fiber 365 µm, for single use, sterile, length 300 cm, package of 6
- 27 7502 79-P6 CALCULASE II Fiber 600 µm, for single use, sterile, length 300 cm, package of 6

- 27 7502 86 CALCULASE II Fiber Kit
  including:
  - 3x CALCULASE II Fiber 230 µm, for single use, sterile
  - 3x CALCULASE II Fiber 365 µm, for single use, sterile
  - 3x CALCULASE II Fiber 600 µm, for single use, sterile

Additional accessories

- 27 7500 82 Fiber Cutter
- 27 7500 81 Fiber Stripper
- 27 7502 80 Fiber Stripper Set, sterilizable, for use with CALCULASE II SCB fibers
  including:
  - Silicone Pad
  - Ceramic Knife
  - Fiber Strippers 230, 365 and 600 µm
- 27 7500 95 Safety Goggles Ho:YAG Laser, 2080 µm

The CALCULASE II fibers above are compatible with the previous model CALCULASE (27 7501 20-1).
CALCULASE II SCB Equipment Cart

Special Features:

- Flexible use of CALCULASE II SCB in various ORs
- Spacious storage room for accessories and expendable materials in two lockable drawers (LASER safety goggles or LASER fibers)
- Integrated cable winding and footswitch holder maintain an uncluttered OR
- Easy to transport due to large, smoothrunning and antistatic dual wheels
- Powder-coated panels and shelves meet the most stringent quality and hygiene standards

Equipment cart, wide, low, rides on 4 antistatic dual wheels equipped with locking brakes, mains switch on cover, double rear panel with integrated electrical subdistributors with 6 sockets, potential earth connectors,
Dimensions in mm (w x h x d):
Equipment cart: 830 x 1265 x 730,
shelf: 630 x 25 x 510,
caster diameter: 150 mm,
including:
Base module, equipment cart, wide
Cover, equipment cart, wide
Beam package, equipment cart, low
Shelf, wide
2x Drawer unit with lock, wide
2x Equipment rail, long
Flexible Ureteroscopy with the KARL STORZ FLEX-X® Ureteroscope

**IMAGE1 SPIES™ Camera System**

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

**Innovative Design**

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

**Dashboard**

**Live menu**

**Intelligent icons**

**SPIES™ VIEW: Parallel display of standard image and SPIES™ mode**
Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

IMAGE1 SPIES™ Camera System

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

Reflection is minimized
- Three SPIES™ technologies for homogeneous illumination, contrast enhancement and color shifting

FULL HD image

SPIES™ CLARA

FULL HD image

SPIES™ CHROMA

FULL HD image

SPIES™ SPECTRA A

FULL HD image

SPIES™ SPECTRA B
Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

**IMAGE1 SPIES™ Camera System**

TC 200EN

TC 200EN* **IMAGE1 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:**

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<th>Format signal outputs</th>
<th>USB interface</th>
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**For use with IMAGE1 SPIES™ IMAGE1 CONNECT™ Module TC 200EN**

TC 300

TC 300 **IMAGE1 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 CONNECT™ TC 200EN**

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

**Specifications:**

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Flexible Ureteroscopy with the KARL STORZ FLEX-X™ Ureteroscope

IMAGE1 SPIES™ Camera Heads

For use with IMAGE1 SPIES™ camera system
IMAGE1 CONNECT™ Module TC 200EN, IMAGE1 H3-LINK™ Module TC 300
and with all IMAGE1 HUB™ HD Camera Control Units

**TH 100**

**IMAGE1 H3-Z SPIES™ Three-Chip FULL HD Camera Head**, 50/60 Hz, SPIES™ 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 SPIES™ and IMAGE1 HUB™ HD/HD

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**TH 104**

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

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<td>F 1.4/1.17 Lux</td>
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<td>standard eyepiece adaptor</td>
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Monitors

19" HD Monitor, 9619 NB
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

26" FULL HD Monitor, 9826 NB
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

27" FULL HD Monitor, 9627 NB
wall-mounted with VESA 100 adaption, color systems PAL/NTSC, max. screen resolution 1920 x 1080, image format 16:9, power supply 85 – 265 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>
<th>27&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted with VESA 100 adaption</td>
<td>9619 NB</td>
<td>9626 NB</td>
<td>9627 NB</td>
</tr>
</tbody>
</table>

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

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

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

### Optional accessories:
- 9826 SF **Pedestal**, for monitor 9826 NB
- 9626 SF **Pedestal**, for 96xx monitor series

### Specifications:

<table>
<thead>
<tr>
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<th>19&quot;</th>
<th>26&quot;</th>
<th>27&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Desktop with pedestal</strong></td>
<td>optional</td>
<td>optional</td>
<td>optional</td>
</tr>
<tr>
<td><strong>Product no.</strong></td>
<td>9619 NB</td>
<td>9626 NB</td>
<td>9627 NB/NB-2</td>
</tr>
<tr>
<td><strong>Brightness</strong></td>
<td>200 cd/m² (type)</td>
<td>500 cd/m² (type)</td>
<td>240 cd/m² (type)</td>
</tr>
<tr>
<td><strong>Max. viewing angle</strong></td>
<td>178° vertical</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>
<td>0.3 mm</td>
</tr>
<tr>
<td><strong>Reaction time</strong></td>
<td>5 ms</td>
<td>8 ms</td>
<td>12 ms</td>
</tr>
<tr>
<td><strong>Contrast ratio</strong></td>
<td>700:1</td>
<td>1400:1</td>
<td>3000:1</td>
</tr>
<tr>
<td><strong>Mount</strong></td>
<td>100 mm VESA</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>
<td>9.8 kg</td>
</tr>
<tr>
<td><strong>Rated power</strong></td>
<td>28 W</td>
<td>72 W</td>
<td>45 W</td>
</tr>
<tr>
<td><strong>Operating conditions</strong></td>
<td>0–40°C</td>
<td>5–35°C</td>
<td>5–35°C</td>
</tr>
<tr>
<td><strong>Storage</strong></td>
<td>-20–60°C</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>
<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>
<td>776 x 443 x 114 mm</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>100–240 VAC</td>
<td>100–240 VAC</td>
<td>85–265 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>
<td>EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2</td>
</tr>
</tbody>
</table>

**Certified to**
- EN 60601-1, protection class IPX0
- EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2
- EN 60601-1, UL 60601-1, MDD93/42/EEC, protection class IPX2
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.
### Fiber Optic Light Cables

for Cold Light Fountains

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>495 NAC</td>
<td><strong>Fiber Optic Light Cable</strong>, with safety locking device, extremely heat-resistant, diameter 3.5 mm, length 230 cm</td>
</tr>
<tr>
<td>495 NL</td>
<td><strong>Fiber Optic Light Cable</strong>, with straight connector, diameter 3.5 mm, length 180 cm</td>
</tr>
</tbody>
</table>

### Cold Light Fountain XENON 300 SCB

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

### Cold Light Fountain Power LED 175

- **Cold Light Fountain Power LED 175**, with integrated SCB, high-performance LED and one KARL STORZ light outlet, power supply 100 - 240 VAC, 50/60 Hz
Notes:
Notes:
with the compliments of
KARL STORZ — ENDOSKOPE