



**CLS® Brevius™
Stem with
Kinectiv®
Technology**

Surgical Technique



Surgical Technique**CLS Brevius Stem with
Kinectiv Technology****Table of Contents**

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General Information

- Indications and contraindications for the use of these components must be carefully weighed against the patient's entire evaluation and the prognosis for possible alternative procedures
- Patient selection should be largely dependent on patient's age, general health, conditions of available bone stock, prior surgery and anticipated further surgeries. An implantation is generally only indicated for patients who have reached skeletal maturity.

Indications

The *CLS Brevius Stem with Kinectiv Technology* is for cementless use only and is indicated for total hip replacement for patients with:

- Noninflammatory degenerative joint disease (NIDJD), e.g., avascular necrosis, osteoarthritis, and inflammatory joint disease (IJD), e.g., rheumatoid arthritis.
- Femoral neck fractures.
- Failed previous surgery where pain, deformity, or dysfunction persists.
- Revision of previously failed hip arthroplasty.

Hemi-hip replacement for patients with:

- Femoral neck fractures.

Contraindications

- Acute, chronic local or systemic infections.
- Severe muscular, neural or vascular diseases that endanger the success of the procedure.
- Lack of bony structures proximal or distal to the joint, so that good anchorage of the implant is unlikely or impossible.
- Total or partial absence of the muscular or ligamentous apparatus.
- Any concomitant diseases that can jeopardize the functioning and the success of the implant.
- Allergy to the implanted material, above all to metal (e.g., Vanadium)
- Local bone tumors and/or cysts.
- Pregnancy.
- Skeletal immaturity.

Preoperative Planning

Primary Objectives of Preoperative Planning

An appropriate preoperative planning provides important information about:

- the correct size of the acetabular and femoral prostheses,
- the depth of the acetabulum preparation,
- the height of the neck resection,
- and the positioning and alignment of the pelvic and femoral components.

It allows fast and systematic execution of the operation and thus minimizes the risk of complications for the patient.

Besides the obvious advantages of planning all required neck and stem implant sizes to be available and anticipating intraoperative difficulties that might require special instrumentation during surgery, the preoperative planning serves to correct and avoid differences in leg length as well as to ensure appropriate abductor muscle tension (femoral offset).

Determining the preoperative leg length is essential for restoration of the appropriate leg length during surgery. If leg lengths are equal in both the recumbent and standing positions, the leg length determination is simplified; however, for most patients, leg lengths are not equal. The surgeon should determine the best treatment for various leg length discrepancies, and note how this impacts the process of implanting the *CLS Brevius* Hip Stem with *Kinectiv* Technology. *Kinectiv* Technology addresses leg length restoration by offering five leg length options in 4mm increments (–8mm, –4mm, +0mm, +4mm and +8mm).

Once the requirements for establishing the desired postoperative leg length have been decided, the next step is to consider the requirement for abductor muscle tension. When templating, center the femoral component in the canal. Choose the offset (Extra Reduced, Reduced, Standard, Extended and Extra Extended) that most closely approximates that of the patient when the new center of rotation is determined (after acetabular component templating). When the patient has a very large distance between the center of rotation of the femoral head and the line that is centered in the medullary canal, the insertion of a femoral component with a lesser offset will, in effect, medialize the femoral shaft. To the extent that this occurs, laxity in the abductors will result with a heightened dislocation risk. Conversely when the patient has a very small distance between the center of rotation of the femoral head and the line that is centered in the medullary canal, the insertion of a femoral

component with higher offset will, in effect, lateralize the femoral shaft. Excessive tension in the abductors will result in a heightened risk of trochanteric bursitis. *Kinectiv* Technology addresses offset restoration by offering five offsets in 4mm increments: Extra Reduced, Reduced, Standard, Extended and Extra Extended.

The leg length and offset options are accomplished by offering a scope of modular necks to be used in conjunction with a +0mm femoral head only. This allows for a change in leg length without affecting offset and vice-versa.

Whilst version can be difficult to assess from a radiograph, surgeons can intraoperatively identify it by looking at the version of the femur. The *CLS Brevius* Stem with *Kinectiv* Technology offers 60 different options to match head center, allowing for independent leg length (head heights), offset and version. This gives surgeons the ability to consider the combined anteversion of both cup and stem and therefore reduce the risk of impingement, provide for a better range of motion and a reduced risk of dislocation.

In the event that adverse bone conditions are present, it is recommended to have a C-arm ready in the operating room in order to assess the implant position intraoperatively.

Positioning for X-Rays

For the A/P X-ray of the pelvis, the femur should be internally rotated by 15° to show an accurate view of the femoral neck length, metaphysis and diaphysis. The *CLS Brevius Stem with Kinectiv Technology* templates enable the surgeon to also plan the version that best fits the patient's anatomy. Therefore, a direct lateral X-ray may also be beneficial in determining the version of the femur, in addition to implant sizing and femoral anteversion. The templates are available in different magnifications.

Templating the Acetabulum

The first step is to plan cup size, orientation and position to reconstruct the acetabulum and the correct center of rotation of the hip.

Templating the Femur

To determine any leg length discrepancy on the X-ray a line should be drawn across the bottom of the ischium (Fig. 1). The distance should then be measured from the lesser trochanter to the drawn reference line. The measured difference between the two measured sides is the radiographic leg length.

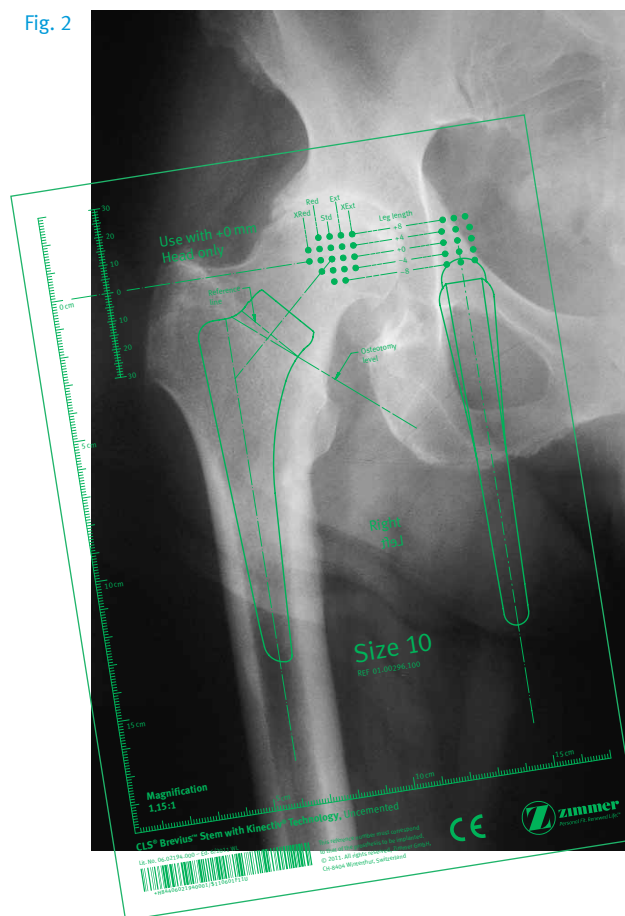
The femoral templates show the leg length and offset for each of the *Kinectiv Modular Femoral Necks* in combination with a +0mm femoral head. The *CLS Brevius Stem with Kinectiv Technology* has been designed for use with +0mm heads only.

Superimpose the template on the femur to be operated so that the stem fits into the medullary canal. The size of the stem must be selected so that at least 3/4 of the proximal ribbed structure is anchored in the cancellous bone. Ideally, the line of the chosen rotation center touches the tip of the greater trochanter (Fig. 2).



Fig. 1

Fig. 2



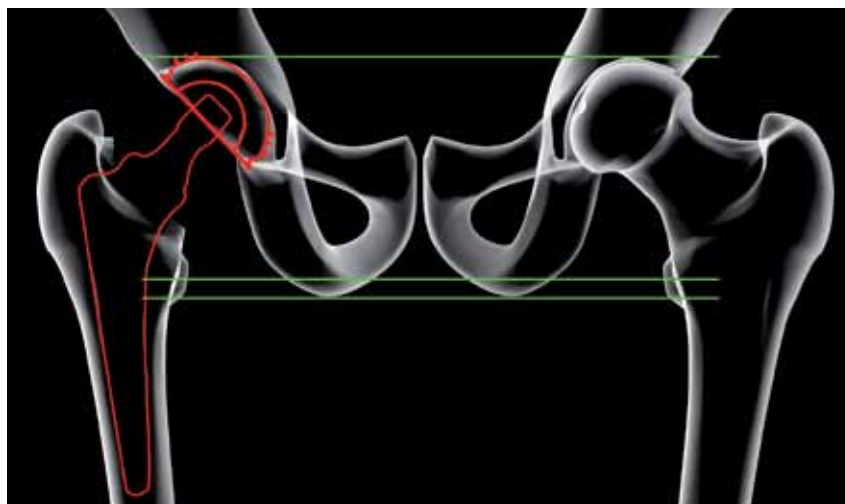
After establishing the proper size of the femoral component, determine the height of its position in the proximal femur and the amount of offset needed to provide adequate abductor muscle tension. To lengthen the limb, select a more proximal head center and/or raise the drawing of the pelvis on the X-ray picture proximally, by the total difference in the length to be corrected. To shorten the limb, select a more distal head center and/or shift the drawing of the pelvis on the X-ray picture distally, by the total difference in the length to be corrected.

Five leg length options offer vertical translation of the head center in 4mm increments (–8, –4, +0, +4 and +8mm). This allows for leg length increase or decrease of 4mm without changing the horizontal position or offset.

Five offset options offer medial-lateral translation of the head center in 4mm increments (Extra Reduced, Reduced, Standard, Extended and Extra Extended). This allows for an offset increase or decrease of 4mm without changing leg length.

Examples:

If the leg needs to be lengthened by 4mm, simply select a head center +4mm without moving the drawings. If the leg needs to be lengthened by 6mm, simply select a head center +4mm and move the drawings by 2mm upwards (head centers options available in 4mm increments).



Final result

The selected femoral implant and *Kinectiv* Neck as well as the osteotomy level are drawn on the X-ray. Once the stem size and the desired head center location have been determined, identify the level of the femoral neck osteotomy. Depending on the preferred surgical approach, the following anatomical landmarks on the A/P radiograph may be used to reference the femoral osteotomy: the lesser trochanter, the inferior margin of the femoral head, the tip of the greater trochanter, and the junction of the lateral femoral neck and the medial greater trochanter (saddle of neck). Using the millimeter scale on the template, measure from the planned osteotomy to the anatomic landmark(s). These measurements will be used during femoral preparation to ensure the proper resection level.

The distance between the proximal end of the stem taper and the lesser trochanter is measured and written down.

Other reference marks may be used depending on the individual technique and can be measured as well, for example:

- the distance between the proximal end of the stem taper and the osteotomy
- the distance between the tip of the greater trochanter and the shoulder of the prosthesis
- the distance between the tip of the greater trochanter and the center of rotation

Finally, all necessary information about the patient and the prosthetic components is written down.

Note: Digital templating is also available to plan surgery with the *CLS Brevius* Stem with *Kinectiv* Technology. For more information, please consult your Zimmer representative and contact your digital template software provider.

Surgical Technique

Exposure

The CLS Brevius Stem with Kinectiv Technology can be implanted with a variety of surgical approaches, including in MIS surgery. Kinectiv Technology facilitates surgical exposure in the minimally invasive approach as the neck is not inserted until the trial reduction*. The specific approach depends on the surgeon's preference.

Determination of Leg Length

Establish landmarks and obtain measurements before dislocation. This is essential to determine the correct leg length and offset after trial reduction and make the necessary adjustments to achieve the goals established during pre-op planning. There are several methods to measure leg length. Select the most appropriate based on the surgical approach.

Osteotomy of Femoral Neck

The lesser trochanter serves as the reference point for the osteotomy plane on the femoral neck, which was already included in the preoperative planning.

The osteotomy level is also influenced by the anteversion of the femoral neck: the greater the anteversion, the lower the osteotomy level. Normally, it proves an advantage to retain 1 to 1.5 cm of the femoral neck. This creates a sheath into which the proximal, ribbed part of the stem can fit.

The next step is the osteotomy with the reciprocating saw. Starting from the medial mark, the upper edge of the femoral neck is reached at the point where it rises from the mass of the trochanter.

It may be necessary to continue the osteotomy with a cut continued further upwards, parallel to the femoral axis (Fig. 3).

Surgeons should:

- ideally achieve an osteotomy angle of 40°
- avoid high osteotomy level (Fig. 4)

Preparation of the Medullary Cavity of the Femur

Depending on surgeon's preference, the preparation of the femoral canal can be performed before (femur-first technique) or after (standard procedure) the cup has been implanted. Kinectiv Technology featuring a modular neck, the femur-first technique can be performed more easily in order to potentially reduce blood loss and operative time, thereby reducing the risk of infection*.

In this case, surgeons must keep in mind that care must be taken to avoid any damage on the final stem when using the retractors necessary for the cup preparation.

Preparation of Femoral Canal

With the proximal femur exposed, remove soft tissue from the medial portion of the greater trochanter and lateral portion of the femoral neck. It is crucial to adequately visualize the proximal femur so the correct insertion site for the femoral instruments can be located.



Fig. 3

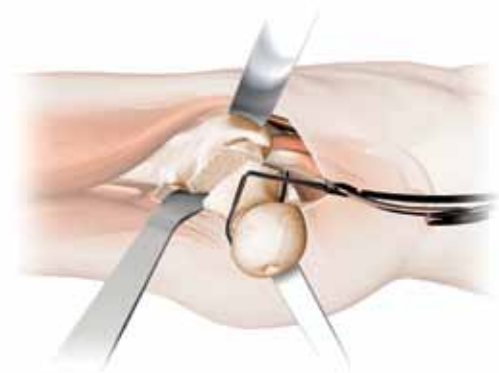


Fig. 4

*source: J. Duwelius, MD, Mark A. Hartzband, MD, Robert Burkhart, PA, Clay Carnahan, PA, Scott Blair, BS, YingXing Wu, MD, and Gary L. Grunkemeier, Ph. Clinical Results of a Modular Neck Hip System: Hitting the "Bull's-Eye" More Accurately. Am J Orthop. 2010;39(10 suppl):2-6.

Use of Box Chisel

Refer to the preoperative planning at this point. Identify the mid femoral shaft extension intraoperatively as viewed on the A/P and lateral radiographs. This is usually in the area of the piriformis tendon insertion in the junction between the medial trochanter and lateral femoral neck. Use the boxed chisel (Fig. 5) to remove the medial portion of the greater trochanter and lateral portion of the femoral neck. The orientation of the boxed chisel should follow the natural anteversion of the femur without the need to build-in additional anteversion as this can be achieved with *Kinectiv* Necks.

The space in this area should not be larger than the rasp or implant but should be large enough for the passage of each sequential rasp to ensure neutral rasp/implant alignment. Insufficient space may result in improper stem positioning. It is important to lateralize the starting envelope for rasping and implant insertion. Assessment of the amount of trochanteric overlap over the proximal femoral canal on the preoperative A/P radiograph can be useful in determining the degree of lateralization necessary to ensure neutral component positioning.

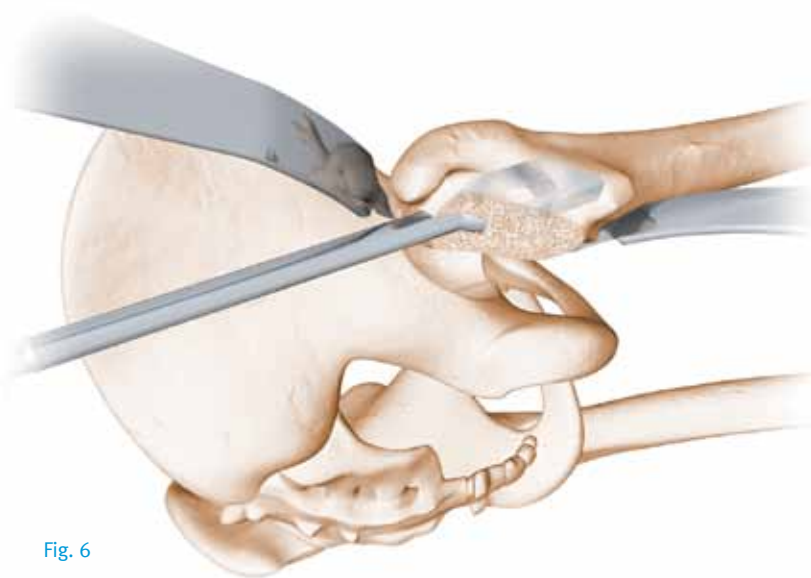
Use of Awl

The proximal notches on the awl mark the height of the implant shoulder for every size. Taking the attachment of the piriformis muscle as a reference for the entry point, the awl is inserted laterally and slightly dorsal into the medullary canal (Fig 6) until the appropriate stem size is identified at the tip of the greater trochanter using the proximal notches.

Fig. 5



Fig. 6



The attachment of the piriformis muscle usually corresponds to the point at which, in the preoperative planning, the tangent of the outer cortex's endosteal edge meets the greater trochanter. It provides an accurate, measurable conception of the obstacle to the prosthesis. Avoid reaming deeper than the size-specific marking on the awl in order to facilitate bone contact and preserve bone.

Care should be taken to ensure that the awl is pressed in the direction of the greater trochanter. The aim is to follow the predetermined line towards the lateral cortex, parallel to the femoral axis and to avoid a varus deformity.

Rasping Technique

The bed for the stem will now be prepared using rasps of increasing sizes. First, use the starter rasp (Fig. 7) regardless the final stem size that has been preoperatively planned. Since the final version will be achieved using the modular *Kinectiv* Necks, priority should be given to the proximal rasp (stem) fit during rasping sequence.

Then proceed with rasps of increasing sizes, starting with a rasp that is at least 3 to 4 sizes smaller than the predicted final rasp size. In this way, due to increasing dimensions, the cancellous bone is compressed.

A reference line is located on the proximal anterior and posterior surfaces of the rasp (Fig. 8). This line has to be located above the osteotomy level to ensure the minimal distance between *Kinectiv* Yoke and osteotomy level. If the reference line falls below the osteotomy level when seating the rasp, progress to the next rasp size. Contact between the yoke and calcar could indicate a false sense of rasp stability.



Fig. 7

Repeat until the predicted final rasp size has been seated. The final rasp size is defined when the highest possible degree of rotational and axial stability is obtained. Once rotational stability is achieved, it is recommended to wait few seconds with the rasp in-situ and to finally give few hammer blows to test the axial stability. If the rasp does not sink into the femur nor rotate any further, and if the reference line on the rasp is still visible above the resection level, the final size is achieved.

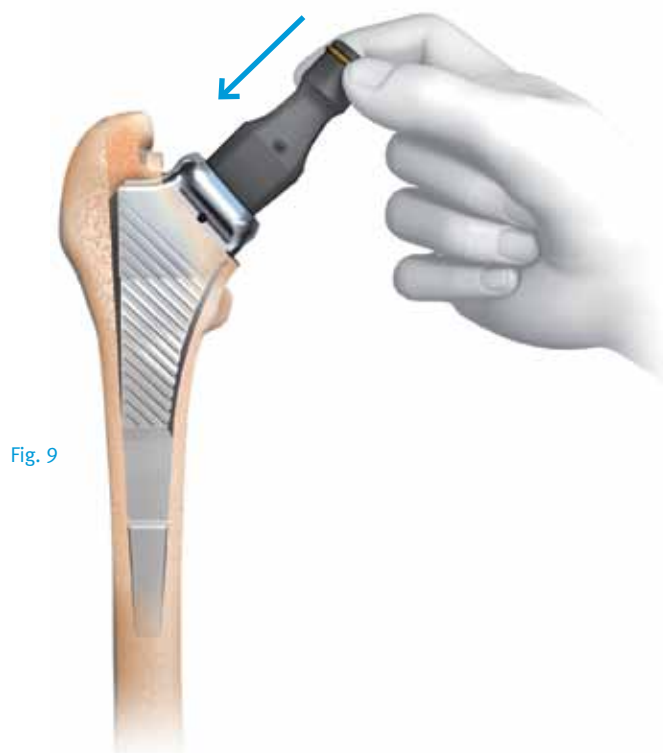
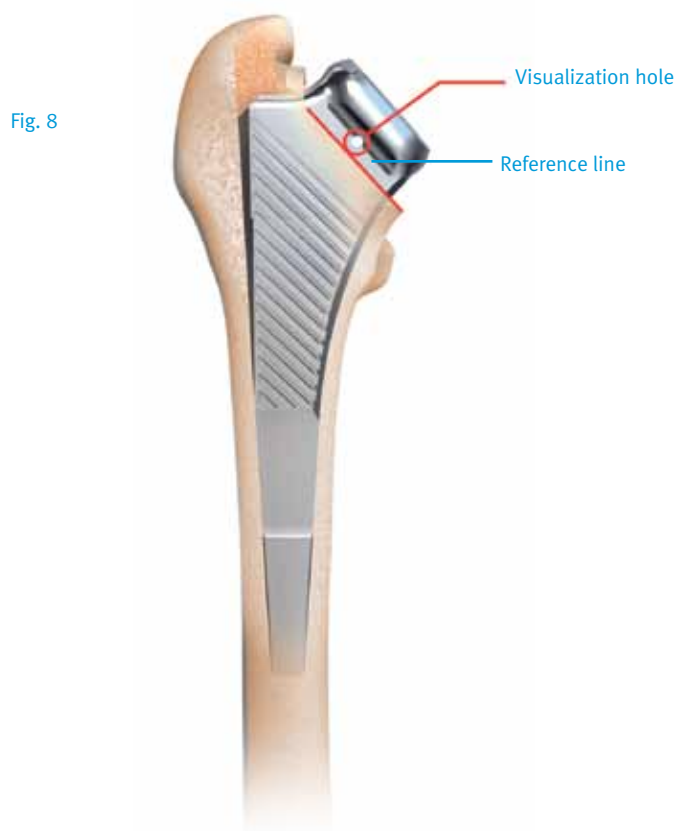
Note:

- The *CLS Brevius Stem with Kinectiv Technology* being a straight stem, the rasps should be introduced along a straight path only.
- Rasps should be operated manually only.
- Avoid rasping in varus. Subsequent varus stem placement results in higher stresses on the stem, increasing the risk of fatigue fracture.

Tip 1

The visualization hole can also be used to determine the appropriate rasp size (Fig. 8). If the hole is completely covered or sunk below the osteotomy level, progress to the next larger rasp. For some minimally invasive procedures direct visualization of the rasp may not be possible.

When using x-ray or fluoroscopy, the hole can be used to help orient the femur with respect to the imaging device and assess the level of rasp with respect to the osteotomy. The superior edge of the hole indicates the reference line level which shall be located above the resection level. The inferior edge of the hole indicates the ideal resection line position.



The rasp handle may need to be disengaged from the rasp to adequately visualize the hole.

Tip 2

Offset and straight rasp handles designed to mitigate soft tissue abrasion during minimally invasive hip procedures are available. Please consult your local sales associate for more information regarding Zimmer Institute educational opportunities and Zimmer minimally invasive hip instrumentation.

If desired, a trial reduction can be performed using the final rasp (Fig. 9) – optional only, as the trial reduction can and must be performed on the stem implant.

Disengage the rasp handle from the final rasp in preparation for trial reduction to determine the desired *Kinectiv* Neck Implant.

Final trial reduction using the neck provisionals has to be performed with the stem implant to confirm neck implant selection (please refer to page 23).

Kinectiv Modular Neck Implants

The *Kinectiv* Modular Neck Implants are offered in straight and anteverted/retroverted designs (Fig. 10).

The *Kinectiv* Necks are designed **for use with +0mm heads (size M) only** which offers distinctive advantages. The neck cross-sections are optimized for use with +0mm heads (size M) to facilitate maximum range of motion and eliminate the need for skirted heads. Head center adjustments are accomplished strictly by using the array of necks, to allow independent control of leg length, offset and version.

The thirty-two neck implants provide sixty head center options: twenty straight, twenty anteverted and twenty retroverted. Version is accomplished through an anterior or posterior translation of the head center of 5mm (4mm for the longest necks) (Fig. 11).

The version angle increases with decreasing offset and ranges from 4–10°.



Fig. 10

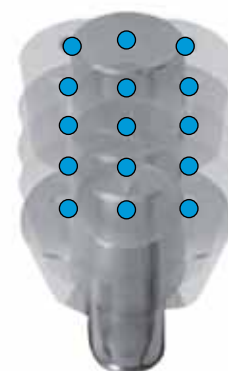


Fig. 11

Kinectiv Neck Provisional Trays

The *Kinectiv* Neck Provisional Trays have been designed to hold and orient the *Kinectiv* Neck Provisionals in locations which correspond to the head center locations found on the templates (Fig. 12).

There are three *Kinectiv* Neck Provisional Trays: straight, anteverted and retroverted. Each tray presents the *Kinectiv* Neck Provisionals in an identical manner. The multiple tray presentation, the tray layouts and their etch content are meant to ease selection of the desired neck component and intraoperative adjustments of leg length, offset and version.

Side-Specificity

The *Kinectiv* Neck Provisional Trays use side-specific etch content based on the operative limb (Fig. 13). For example, for a left hip, the tray should be oriented with the “Left” etching located towards the top. This will orient the *Kinectiv* Neck Provisionals to match the head-center locations for a left hip. Orientation of the case in this manner with respect to the operative side will simplify the steps of operation.

Head Centre Grids

The Head Centre Grids located in the tray corners represent the head centre options as shown in the templates (Fig. 14).

Leg Length and Offset Values

Numerical leg-length etching found adjacent to each *Kinectiv* Neck Provisional represents the leg-length options (Fig. 15).



Fig. 12



Fig. 13

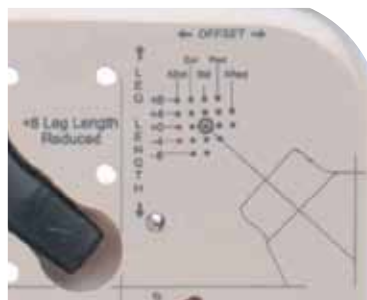


Fig. 14



Fig. 15

Kinectiv Neck Provisionals come in five leg length options: -8, -4, +0, +4, and +8mm. The offset etchings found immediately below the leg length etch content represent the offset option. The *Kinectiv* Neck Provisionals come in five offset options: Extra Reduced (XRed), Reduced (Red), Standard (Std), Extended (Ext) and Extra Extended (XExt). **The leg length and offset values for the provisional will be different for each operative side.** Therefore, the orientation of the leg length and offset etch content matches the operative side etch orientation.

Provisional/Implant Letter References

Letter characters are found:

- at the bottom of the tray beside and underneath each *Kinectiv* Neck Provisional (Fig. 15)
- and on both side of the *Kinectiv* Neck Provisional (molded letter) (Fig. 16).

These letters correspond to the final implant (Fig. 17).

The letter also facilitates relocation of the *Kinectiv* Neck Provisional within the tray.

The anteverted/retroverted *Kinectiv* Neck Provisionals have alpha-numeric characters which correspond to the *Kinectiv* Straight Neck Provisionals to ease intraoperative version adjustment. Always confirm that the letter on each *Kinectiv* Neck Provisional matches the letter in the bottom of the *Kinectiv* Neck Provisional Tray prior to the surgery.



Fig. 16



Fig. 17

Provisional/Implant Orientation

Reference

Since *Kinectiv* Neck Provisionals can represent two head-center locations – except neutral neck provisionals A, B, C and D in which the head center location is the same regardless of orientation – an orientation feature in the form of a small bump is located on one side of the *Kinectiv* Neck Provisionals. The location of the orientation bump on the *Kinectiv* Neck Provisional is replicated with an orientation bump on the *Kinectiv* Neck Implant (Fig. 18).

Fig. 18



To readily distinguish between them, the anteverted/retroverted *Kinectiv* Neck Provisionals have a silver locking ring and the straight *Kinectiv* Neck Provisionals have a golden locking ring (Fig. 19).

Fig. 19



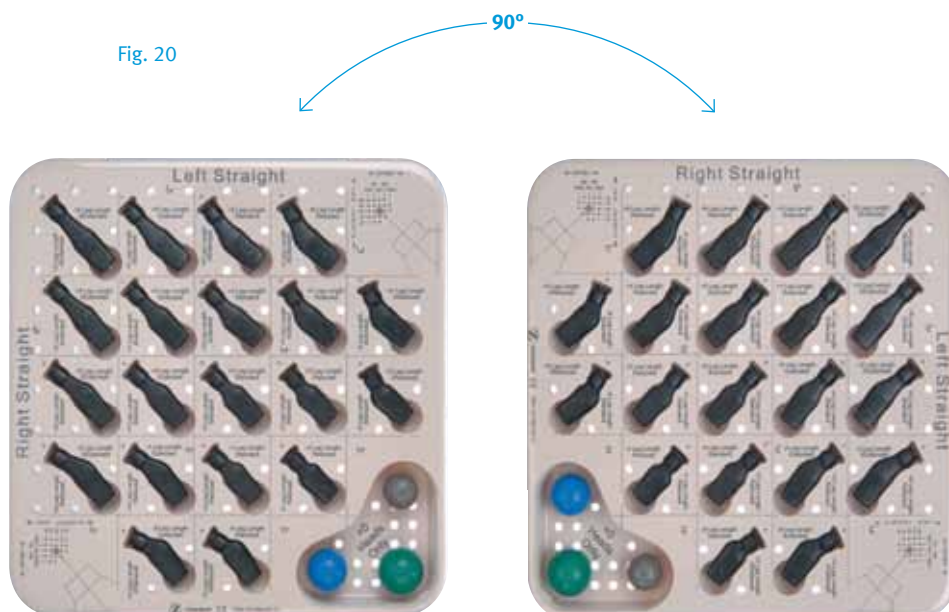
Trial Reduction

Tray Orientation

Orient the *Kinectiv* Neck Provisional Tray so that it corresponds to the operative hip side, left or right. If the left hip is being replaced, orient the *Kinectiv* Neck Provisional Tray so that “Left” can be read across the top of the tray (Fig. 20).

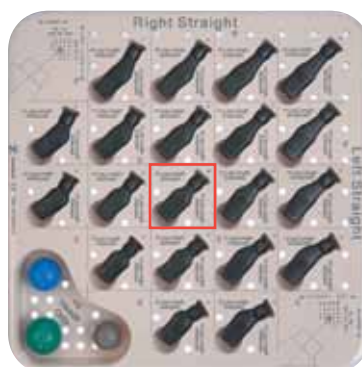
Simply rotate the tray 90° in a clockwise direction to orient the tray for a right hip procedure.

Fig. 20



Refer to preoperative templating at this point. The *Kinectiv* Neck Provisional Tray layout reflects the head centre options identified on the templates. As an orientation reference, the *Kinectiv* Neck Provisional in the middle of the tray is +0mm in leg length and standard offset (Fig. 21)

Fig. 21



Insertion of 1st Neck Provisional

Select the *Kinectiv* Neck Provisional which corresponds to the template head center location. Fully insert the selected *Kinectiv* Neck Provisional by hand into the taper of the rasp so that the etched line on the *Kinectiv* Neck Provisional is at the level of the proximal edge, or mouth, of the rasp (or stem if trial done with stem) taper (Fig. 22).

Fig. 22



The location of the orientation bump on the *Kinectiv* Neck Provisional is replicated with an orientation bump on the *Kinectiv* Neck Implant.

Alternatively, insert the *Kinectiv* Neck Provisional using the *Kinectiv* Neck Inserter (Fig. 23).

Fig. 23



Place a +0mm femoral head provisional onto the 12/14 taper of the *Kinectiv* Neck Provisional (Fig. 24).

WARNING: to enable independent adjustment of leg length, offset and version, the *CLS Brevius* Stem with *Kinectiv* Technology has been designed for use with +0mm femoral heads (size M) only. Use of other femoral head lengths results in higher stresses in the stem and neck, increasing the risk of fatigue failure of the device.

Fig. 24



1st Trial Reduction

Perform a trial reduction using a repositioning top of the same diameter as the chosen trial head to push it into the cup.

Check the leg length and offset of the femur, and compare them to the measurements made before the initial hip dislocation. Be sure to reposition the leg exactly where it was during the first measurement.

If necessary, intraoperative adjustments can be performed.

Intraoperative adjustments/

Further Trial Reductions

Please refer to “Fig. 26 and 28” to know how to locate the *Kinectiv* Neck Provisionals in the trays and to adjust leg length, offset and version.

Leg Length

To adjust leg length, change the *Kinectiv* Neck Provisional (Fig. 26).

- 5 leg length options: –8, –4, +0, +4, and +8mm
- Total range: 16mm.

Offset

To adjust offset, change the *Kinectiv* Neck Provisional (Fig. 26).

- 5 offset options: Extra Reduced, Reduced, Standard, Extended and Extra Extended
- 4mm increments
- Total range: 16mm.

Tip: during trial repositioning, it is recommended to first test leg length and offset **separately and with straight necks only**. Version adjustment should be made in a second step, as ante- and retroverted necks will typically be selected intraoperatively based on the patient’s anatomy or clinical impingement. Therefore these trial necks should typically be used after leg length and offset adjustments.

Straight Provisional trial reference

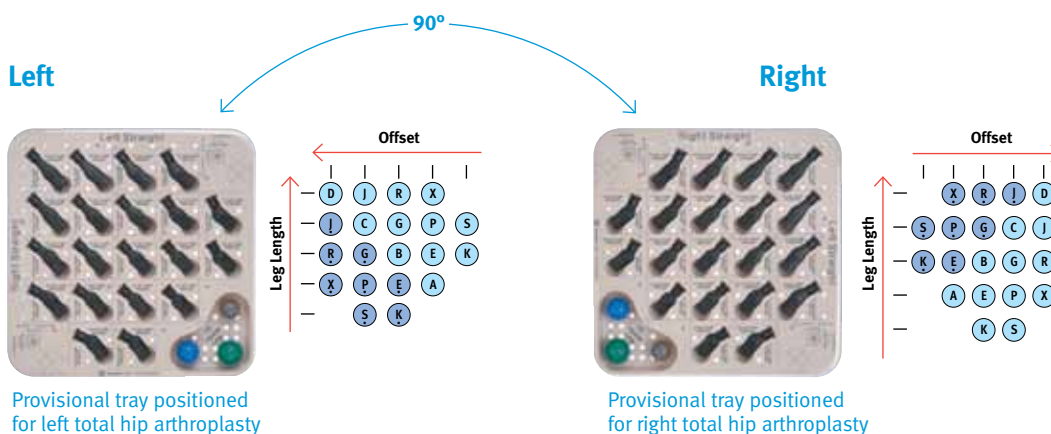


Fig. 26

● Indicates neck provisionals placed with the bump facing UP in the neck provisional tray.

- The orientation of the tray reproduces the A/P orientation of an X-ray. Always refer to the grid on the top right or left corner to double check the orientation of the neck.
- An orientation bump on the *Kinectiv* Neck Provisionals facilitates the correct placement of the neck provisional on the rasp/stem. When placing the neck provisional onto the rasp/stem, the orientation bump should face the same side (i.e. anterior or posterior) with respect to the femur as it did in the provisional tray.
- The necks A, B, C, D in the middle diagonal always have the same head center location regardless of orientation.

Version

The anteverted/retroverted *Kinectiv* Neck Provisionals have alpha-numeric characters (Fig. 27) which correspond to the *Kinectiv* Straight Neck Provisionals to ease intraoperative version adjustment.

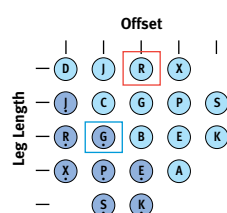
To adjust version, select the corresponding *Kinectiv* Neck Provisional from the anteverted or retroverted provisional tray (Fig. 28).

When optimal leg length, offset, range of motion and stability have been achieved, **again note whether the orientation bump is directed anteriorly or posteriorly, since this has a direct influence on the head-center location.**

Fig. 27

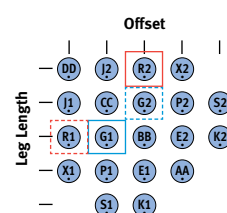


Left Straight



Provisional tray positioned for left total hip arthroplasty

Left Anteverted



Provisional tray positioned for left total hip arthroplasty

Fig. 28

How to switch from a provisional straight neck to a provisional anteverted neck without affecting leg length and offset?

Anteverted and retroverted Provisional Neck Trays have the exact same layout as the straight Provisional Necks Trays. For example, if the surgeon wants to add anteversion without affecting leg length and offset that she/he previously defined with a straight neck, she/he simply needs to orient the tray for the operative side and chose the anteverted neck that is at the exact same place in the anteverted tray.

Examples:

Straight neck R (red box): the corresponding anteverted neck will be the neck R2 (red box).

If the surgeon uses an R1 (dotted red box) by mistake instead of an R2 (red box), leg length will decrease by 8mm and offset will increase by 8mm as compared with the straight *Kinectiv* Provisional Neck R originally chosen to determine leg length and offset.

Straight neck G (blue box): the corresponding anteverted neck will be the neck G1 (blue box).

If the surgeon uses a G2 (dotted blue box) by mistake instead of a G1 neck, leg length will increase by 4mm and offset will decrease by 4mm as compared to the straight *Kinectiv* Neck Provisional G originally chosen to determine leg length and offset.

Identification of final *Kinectiv* Neck

Dislocate the hip and remove the provisional component. Note the location of the orientation bump as well as the molded letter identification of the *Kinectiv* Neck Provisional. The letter denotes the *Kinectiv* Neck Implant to be implanted (Fig. 29).

Fig. 29

*Kinectiv* Neck Provisional

Fig. 30

Note: The CLS Brevius Stem with *Kinectiv* Technology being a straight stem, it has to be introduced along a straight path only.

In this process, it is necessary to proceed with a light touch. This is learned with experience. It should be remembered that because of the wedge mechanism, an excessive load may be exerted on the trochanter and create bone fracture.

It is important to adjust the force of the hammer blows according to the bone quality and to stop hammering immediately if a change in the sound of the blows, from dull (cancellous bone) to sharp (cortex) is perceived.

Note: The surgeon should make sure that the yoke is above the resection plane to ensure full press-fit (Fig. 31b).

Fig. 31a



Fig. 31b

Label of *Kinectiv* Neck Implant

Due to bone elasticity, the final position of the actual stem and the final rasp might slightly be different. Therefore, final trial reduction needs to always be performed with the stem implant.

• **If a trial reduction was performed using the *Kinectiv* Rasps:**

Select the *Kinectiv* Neck Provisional that provided satisfactory leg length, offset, range of motion and stability during that trial reduction.

• **If a trial reduction off the rasp was NOT performed:**

Proceed as described in 'Trial Reduction' (page 18)

When optimal leg length, offset, range of motion and stability have been achieved, again, note if the orientation bump is directed anteriorly or posteriorly with respect to femur.

Dislocate the hip and remove the *Kinectiv* Neck Provisional.

Note the molded letter identification of the *Kinectiv* Neck Provisional. The letter corresponds to the letter on the label of the *Kinectiv* Neck Implant to be selected.

Attachment of the Femoral Neck and Head

When the appropriate *Kinectiv* Neck Implant is confirmed, **check to ensure that the stem female taper is clean and dry.**

Notes:

- Be careful not to scratch the taper.
- For the attachment of the *Metasul*® LDH® Large Diameter Head, refer to its specific surgical technique. Keep in mind that only the M-head adapter is allowed for use with the *Kinectiv* Neck Implant.

The letter on the bottom of the *Kinectiv* Neck Implant should correspond to the *Kinectiv* Neck Provisional.

1 – Insertion of *Kinectiv* Neck Implant

Place the selected *Kinectiv* Neck Implant into the taper by hand or using the *Kinectiv* Neck Inserter while taking care to replicate the desired direction of the orientation bump (Fig. 32).

Do not impact the *Kinectiv* Neck Implant into the prosthesis taper (Fig. 33).

2 – Head placement

Ensure that the *Kinectiv* Neck Implant 12/14 taper is clean and dry.

Place the selected +0mm femoral head (size M) on the taper and secure it firmly by twisting (Fig. 34).

2 – Impaction of head and *Kinectiv* Neck Implant

Secure both tapers by striking the femoral head at least once with the Head Impactor (Fig. 35).

Notes:

- In case a specific head surgical technique or design rational exists, it is essential to follow it.
- Do not impact the femoral head onto the *Kinectiv* Neck taper before driving in the prosthesis as the femoral head may loosen during subsequent impaction.



Fig. 32



Fig. 33



Fig. 34

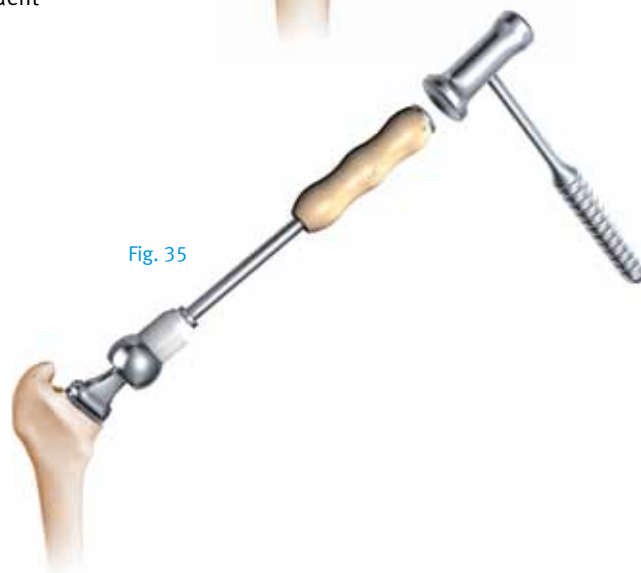


Fig. 35

3 – Fixation test

Test the security of the head and neck fixation by trying to remove the head by hand.

Reduce the hip and assess leg length, range of motion, stability, and abductor tension for the final time.

Wound Closure

With the placing of drains and suturing of the different layers according to the specific technique and approach used, the operation is now complete.

Femoral Neck Component Extraction (two methods)

Kinectiv Technology is designed to create a strong interface between the mating components where neck removal might be difficult, especially after extended implantation. Therefore, the surgeon should have an alternative surgical plan for neck/stem construct removal in the event that neck removal from the stem is not practical.

WARNING: Closely inspect the stem and neck mating interfaces for damages. Do not use or reuse any component if damage is observed or suspected. Such damages may increase the risk of fatigue failure, ion release and fretting corrosion of the devices.

Because the use of the Collet Neck Extractor or the Neck Extraction Hook might dislodge the stem from the bone, take steps to ensure stem stability prior to final neck selection and implantation.

Option 1

A Collet Neck Extractor is included in the instrument set. To attach the Collet Neck Extractor to the 12/14 neck taper, ensure that the Neck Extractor Chuck spins freely with respect to the collet.

Push the collet onto the taper (Fig. 36). There should be an audible “click” to indicate that the collet is fully seated onto the neck taper. Tighten the chuck onto the collet by hand or with the Ball Driver until secure (Fig. 37).

Dislodge the neck from the stem by impacting the stem impactor in one of the slots on the body (Fig. 38).

If no damage to the neck is observed during close inspection, the neck can be reused; otherwise discard the neck and implant a new femoral neck component.

If the stem is damaged or no longer well-fixed, remove it with the stem extractor and implant a new stem.

Because ceramic heads require a pristine 12/14 taper to preserve burst strength, use either a cobalt chromium femoral head or a *BIOLOX*® OPTION* Femoral Head after extracting the neck using the Collet Neck Extractor.

Option 2

A Neck Extraction Hook to remove the femoral neck components is also included in the revision instrument set.

Attach the Neck Extraction Hook to the Slap Hammer Adapter and screw the assembly to the Slap Hammer. Carefully place the hook under the neck avoiding contact with the stem component (Fig. 39). If the femoral neck component is removed with the Neck Extraction Hook, do not re-insert it.

If the stem is damaged or no longer well-fixed, remove the stem with the Stem Extractor and implant a new stem. Implant a new femoral neck component. If attempted neck removal from the stem using the Neck Extraction Hook is not successful, remove the entire neck/stem construct and implant new components.



Fig. 36

* *BIOLOX* OPTION is a trademark of CeramTec GmbH

Fig. 37



Fig. 38



Fig. 39



Intraoperative Femoral Stem Component Extraction

In case of intraoperative extraction of the stem, 2 removal instruments are available:

Intraoperative *Kinectiv* Stem Extractor (01.00295.101)

Since its polymer cap protects the female taper of the femoral component, the stem can be re-inserted following removal (Fig. 40). The Intraoperative *Kinectiv* Stem Extractor (01.00295.101) **can be used for intraoperative stem extraction only. It is not suitable for stem impaction.**

***Kinectiv* Stem Extractor (00-7805-063-00) (included in the revision instrument set)**

If necessary, it can be used as an alternative to remove the femoral stem component (Fig. 41). If the femoral stem component is removed with the *Kinectiv* Stem Extractor, do not re-insert it. Implant a new femoral stem component.

Important:

The *Kinectiv* Stem Extractor (00-7805-063-00) can be used **for stem extraction only**. It is not suitable for stem impaction.



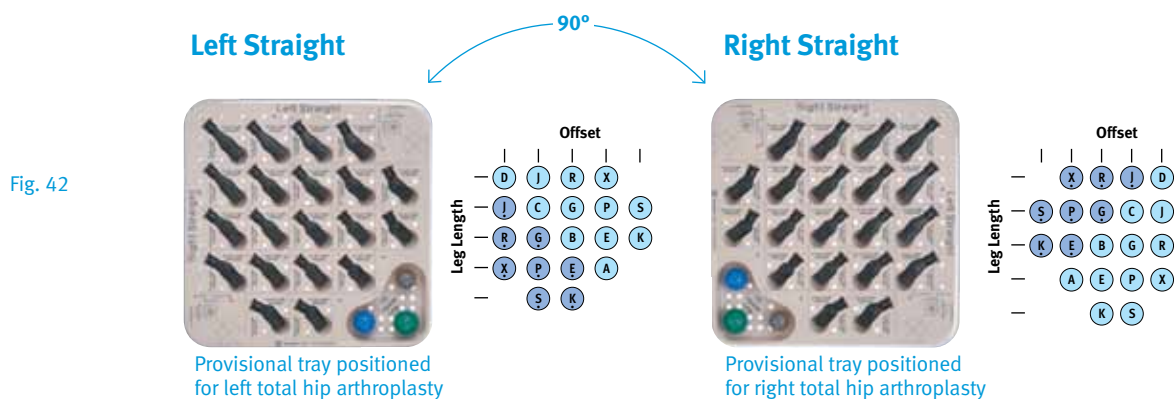
Fig. 40



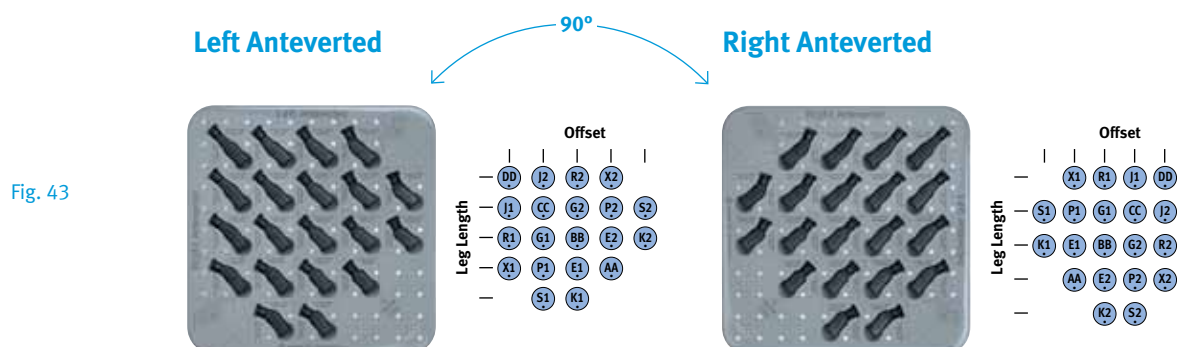
Fig. 41

How to correctly place the Kinectiv Neck Provisionals (back) in the Trays

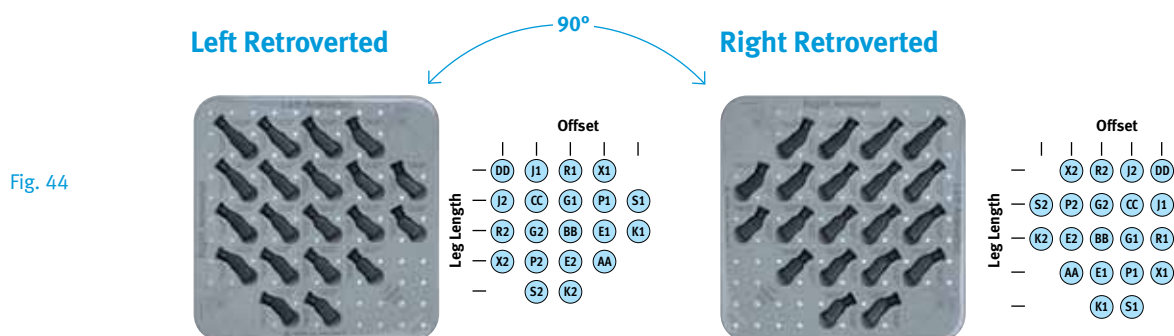
The following drawings describe the correct placement of *Kinectiv* Neck Provisionals in the trays (Fig. 42, 43, 44).



- Indicates neck provisionals placed with the bump facing UP in the neck provisional tray.



- Indicates neck provisionals placed with the bump facing **UP** in the neck provisional tray.
All *Kinectiv* Neck Provisionals should have the bump facing **UP** when placed in the anteverted neck provisional tray.



- All *Kinectiv* Neck Provisionals should have the bump facing **DOWN** when placed in the retroverted neck provisional tray.

Implants



CLS® Brevius™ Stem with
Kinectiv® Technology



Kinectiv® Technology
Straight Neck Implants



Kinectiv® Technology Ante/
Retroverted Neck Implants

Details

Protasul®-64 Alloy

Uncemented



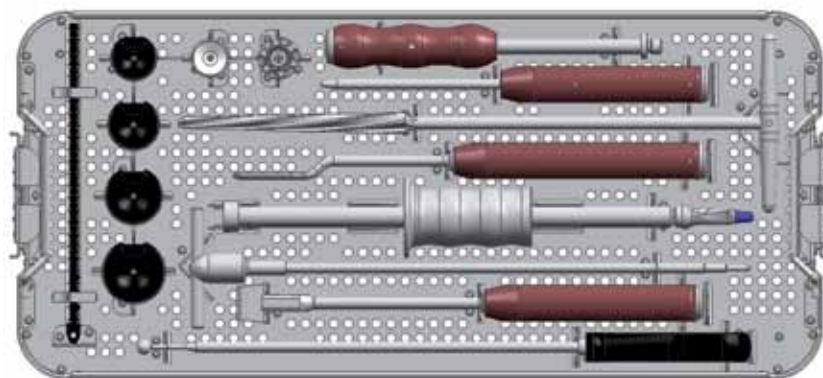
Size	REF
5	01.00296.050
6	01.00296.060
7	01.00296.070
8	01.00296.080
9	01.00296.090
10	01.00296.100
11.25	01.00296.112
12.5	01.00296.125
13.75	01.00296.137
15	01.00296.150
16.25	01.00296.162
17.5	01.00296.175
20	01.00296.200*

Size	REF
K	00-7848-002-00
S	00-7848-003-00
A	00-7848-011-00
E	00-7848-012-00
P	00-7848-013-00
X	00-7848-014-00
B	00-7848-022-00
G	00-7848-023-00
R	00-7848-024-00
C	00-7848-033-00
J	00-7848-034-00
D	00-7848-044-00

Size	REF
K1	00-7848-002-01
S1	00-7848-003-01
AA	00-7848-011-01
E1	00-7848-012-01
P1	00-7848-013-01
X1	00-7848-014-01
K2	00-7848-020-01
E2	00-7848-021-01
BB	00-7848-022-01
G1	00-7848-023-01
R1	00-7848-024-01
S2	00-7848-030-01
P2	00-7848-031-01
G2	00-7848-032-01
CC	00-7848-033-01
J1	00-7848-034-01
X2	00-7848-041-01
R2	00-7848-042-01
J2	00-7848-043-01
DD	00-7848-044-01

*Available upon request

Instruments



CLS Brevius with Kinectiv Technology
General Instruments set

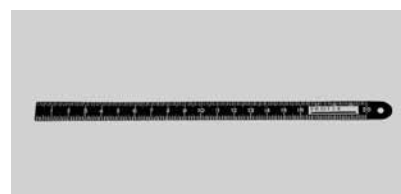
REF
KT-CLS-295-100

General Instruments case

REF
00-7805-005-00

Tray Lid

REF
00-5900-099-00



Ruler

Size in mm
20.0 REF
95-00-03



Repositioning lever

REF
75.11.00-02



Double-curved gauge

Size in mm
9.00 REF
75.09.15



Boxed chisel

REF
75.13.02-10



Repositioning Tops

Size in mm	REF
28	78.00.38-28
32	78.00.38-32
36	78.00.38-36
40	78.00.38-40



Head Impactor

REF
78.00.38



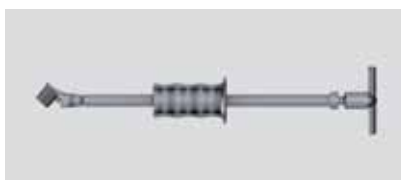
CLS Brevius Kinectiv Tapered Awl

REF
70.08.90



Stem impactor

REF
75.00.36



Intraoperative Kinectiv Stem Extraction Instrument

REF
01.00295.101



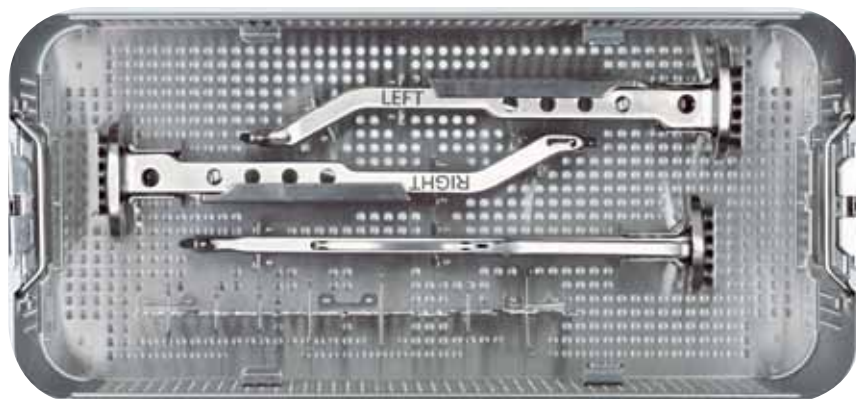
Ball Driver

REF
9375-00-032



Kinetiv Collect Neck Extractor Assembly

REF
00-7805-064-00



CLS Brevius with Kinectiv Technology
Rasp Instruments set

REF
KT-CLS-295-200

Rasp Base Case

REF
00-7805-006-00

Tray Lid

REF
00-5900-099-00

Rasp Case Inlay

REF
00-7805-007-00



Kinectiv Straight Rasp Handle

REF
00-7714-050-00



Kinectiv Offset Rasp Handle

REF
Left 00-7714-035-01
Right 00-7714-035-02



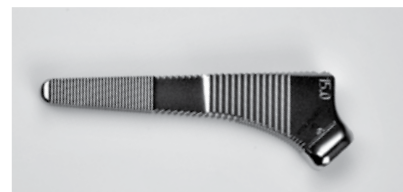
Long bar

REF
70.00.01



CLS Brevius Kinectiv Starter rasp

REF
01.00297.040

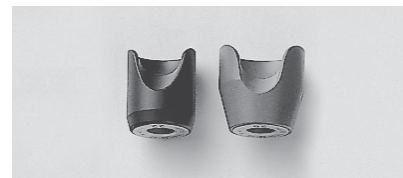


CLS Brevius Kinectiv Rasps

Size	REF
5	01.00297.050
6	01.00297.060
7	01.00297.070
8	01.00297.080
9	01.00297.090
10	01.00297.100
11.25	01.00297.112
12.5	01.00297.125
13.75	01.00297.137
15	01.00297.150
16.25	01.00297.162
17.5	01.00297.175
20	01.00297.200

Upon request – Space exists in the tray for additional +0mm Head Provisionals and repositioning tops which must be ordered individually

Size in mm	REF
22	00-7895-022-02
22 (CEP)	9666-22-000
26	00-7895-026-02
38 (CEP)	9666-38-000
44 (CEP)	9666-44-000



Repositioning Tops

Size in mm	REF
22	78.00.38-22
44	78.00.38-44



Kinectiv Technology Straight Neck Provisional and +0 Head Provisional Set (Includes one each of the following)
REF
00-7805-000-03

Kinectiv Technology Straight Neck Provisional Tray (includes lid)
REF
00-7805-001-20



Kinectiv Straight Neck Provisional

Size	REF
K (qty. 2)	00-7805-002-00
S (qty. 2)	00-7805-003-00
A	00-7805-011-00
E (qty. 2)	00-7805-012-00
P (qty. 2)	00-7805-013-00
X (qty. 2)	00-7805-014-00
B	00-7805-022-00
G (qty. 2)	00-7805-023-00
R (qty. 2)	00-7805-024-00
C	00-7805-033-00
J (qty. 2)	00-7805-034-00
D	00-7805-044-00



+0mm head Provisional Head

Size	REF
28mm +0	00-7895-028-02
32mm +0	00-7895-032-02
36mm +0	00-7895-036-02

Available upon request:
40mm +0 00-7895-040-02



Kinectiv Technology Anteverted Neck Provisional Set

(Includes one each of the following)

REF
00-7805-000-04

Kinectiv Technology Anteverted Neck Provisional Tray (includes lid)

REF
00-7805-001-30



Kinectiv Anteverted Neck Provisional

Size	REF
K1	00-7805-002-01
S1	00-7805-003-01
AA	00-7805-011-01
E1	00-7805-012-01
P1	00-7805-013-01
X1	00-7805-014-01
K2	00-7805-020-01
E2	00-7805-021-01
BB	00-7805-022-01
G1	00-7805-023-01
R1	00-7805-024-01
S2	00-7805-030-01
P2	00-7805-031-01
G2	00-7805-032-01
CC	00-7805-033-01
J1	00-7805-034-01
X2	00-7805-041-01
R2	00-7805-042-01
J2	00-7805-043-01
DD	00-7805-044-01



Kinectiv Technology Retroverted Neck Provisional Set

(Includes one each of the following)

REF
00-7805-000-05

Kinectiv Technology Retroverted Neck Provisional Tray (includes lid)

REF
00-7805-001-40



Kinectiv Retroverted Neck Provisional

Size	REF
K1	00-7805-002-01
S1	00-7805-003-01
AA	00-7805-011-01
E1	00-7805-012-01
P1	00-7805-013-01
X1	00-7805-014-01
K2	00-7805-020-01
E2	00-7805-021-01
BB	00-7805-022-01
G1	00-7805-023-01
R1	00-7805-024-01
S2	00-7805-030-01
P2	00-7805-031-01
G2	00-7805-032-01
CC	00-7805-033-01
J1	00-7805-034-01
X2	00-7805-041-01
R2	00-7805-042-01
J2	00-7805-043-01
DD	00-7805-044-01

Optional Instrumentation



22mm and 26mm Head Inserters Set
REF
00-7805-000-16

Head Inserter
Size REF
22mm 00-7804-053-22
26mm 00-7804-053-26

Kinectiv Technology Head and Neck
Inserter Set
REF
00-7805-000-06

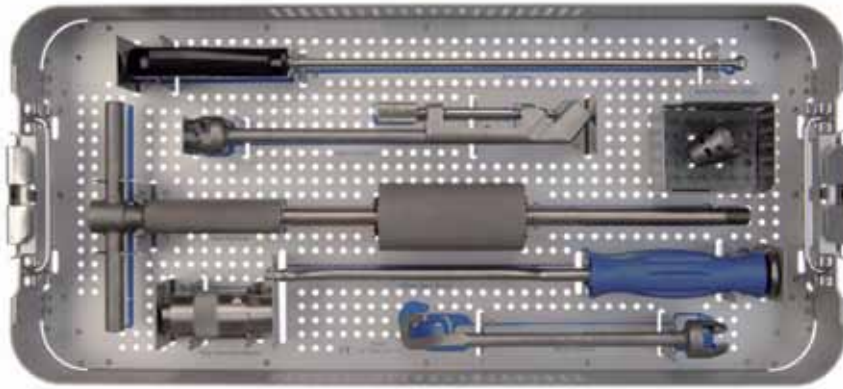
Head-Neck Inserter Handle
REF
00-7804-053-00

Kinectiv Neck Inserter
REF
00-7804-053-01

Head Inserter	
Size	REF
28mm	00-7804-053-28
32mm	00-7804-053-32
36mm	00-7804-053-36
38mm	00-7804-053-38
40mm	00-7804-053-40
44mm	00-7804-053-44

Head and Neck Inserter Case
(includes lid)
00-7805-001-60

Optional Instrumentation



Kinectiv Technology Revision Set

REF

00-7805-000-07

Kinectiv Revision Case (includes lid)

REF

00-7805-001-70

Kinectiv Neck Extractor Extractor Hook

REF

00-7805-062-00

Kinectiv Stem Extractor

REF

00-7805-063-00

Slap Hammer Adapter

REF

00-9986-030-15

Slap Hammer

REF

00-6551-006-00

Ball Driver

REF

9375-00-032

Kinectiv Collect Neck Extractor Assembly

REF

00-7805-064-00

Oval Tip Offset stem driver

REF

00-7806-011-10



Disclaimer

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