



## Surgical Technique

Amplitude is an internationally renowned orthopaedic company that has built a reputation for exceptional engineering, reliable clinical results, and cohesive collaboration with the world's leading surgeons.



# Table of Contents

<b>evok® Hip System</b>	4
Surgical Technique Overview	8
Pre-Operative Planning	10
Surgical Approach	12
Step 1 - Femoral Neck Resection	13
Step 2 - Femoral Canal Preparation	14
Step 3 - Metaphyseal Preparation	14
Step 4 - Cancellous Bone Compaction	15
Step 5 - Broaching	16
Step 6 - Calcar Reaming	17
Step 7 - Trial on Broach	18
Step 8 - Final Stem Impaction	19
Step 9 - Head Impaction & Final Reduction	20
Stem Extraction	21
Implant Information	22
Instrumentation	24

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# evok<sup>®</sup> Hip System

The evok<sup>®</sup> femoral hip system combines a comprehensive range of cementless stems based on proven designs with more than 30 years' clinical use. The system was developed by Amplitude's team of internationally renowned engineers in collaboration with leading surgeons from around the globe.

evok<sup>®</sup> was launched utilising the 'Stepwise Introduction' recommended by Henrik Malchau.<sup>1</sup>

- Clinical Pretesting - extensively tested by Amplitude for CE marking.
- Multicentre study performed in Australia with excellent clinical outcomes.<sup>2</sup>
- AOANJRR data since 2010.<sup>3</sup>
- First implanted in Australia in 2010, the evok<sup>®</sup> continues to set benchmarks for adaptability, safety, ergonomics, and simplicity with a range of unique design features that make it the system of choice for surgeons throughout the world.
- evok<sup>®</sup> includes simple instrumentation suitable for all anatomies and surgical techniques. It can easily be used for Posterior, Lateral, Anterolateral or Direct Anterior approaches.

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## Safe

- Proven design<sup>3</sup>, material and fixation - cementless tapered rectangular design, titanium, Hydroxyapatite (HA) coated.
- Forged from high quality titanium by the manufacturer that has been producing this type of stem for over 30 years.<sup>4</sup>
- Coated with 155 microns of HA.
- Extensive mechanical testing with a focus on fatigue, fretting and corrosion resistance.
- Fully validated in-house quality control on 100% of stems.

## Simple

- Ergonomic instrumentation.
- Efficient tray design and layout.
- Modular Instruments decrease tray weight and improve work flow.

## Adaptable

- Three offset options (Standard, Lateralised and High).
- Collared or Collarless versions provide surgical flexibility.
- Evolutive CCD angle from 126.2 to 129.3 with increasing neck length for lateralised offset.
- Optimised neck geometry for range of motion and 12/14 taper.
- Suitable for different anatomies and varying bone quality.

1. Malchau et al., *The Stepwise Introduction of Innovation into Orthopaedic Surgery The Next Level of Dilemmas*, Journal of Arthroplasty Vol. 26 No. 6, (Elsevier Inc.), 2011

2. Data on file at Amplitude

3. Australian Orthopaedic Association National Joint Registry (data on file at Amplitude)

4. Khanuja et al., *Cementless Femoral Fixation in Total Hip Arthroplasty*, The Journal of Bone and Joint Surgery Inc.(Am), 2011





## Femoral Heads 12/14

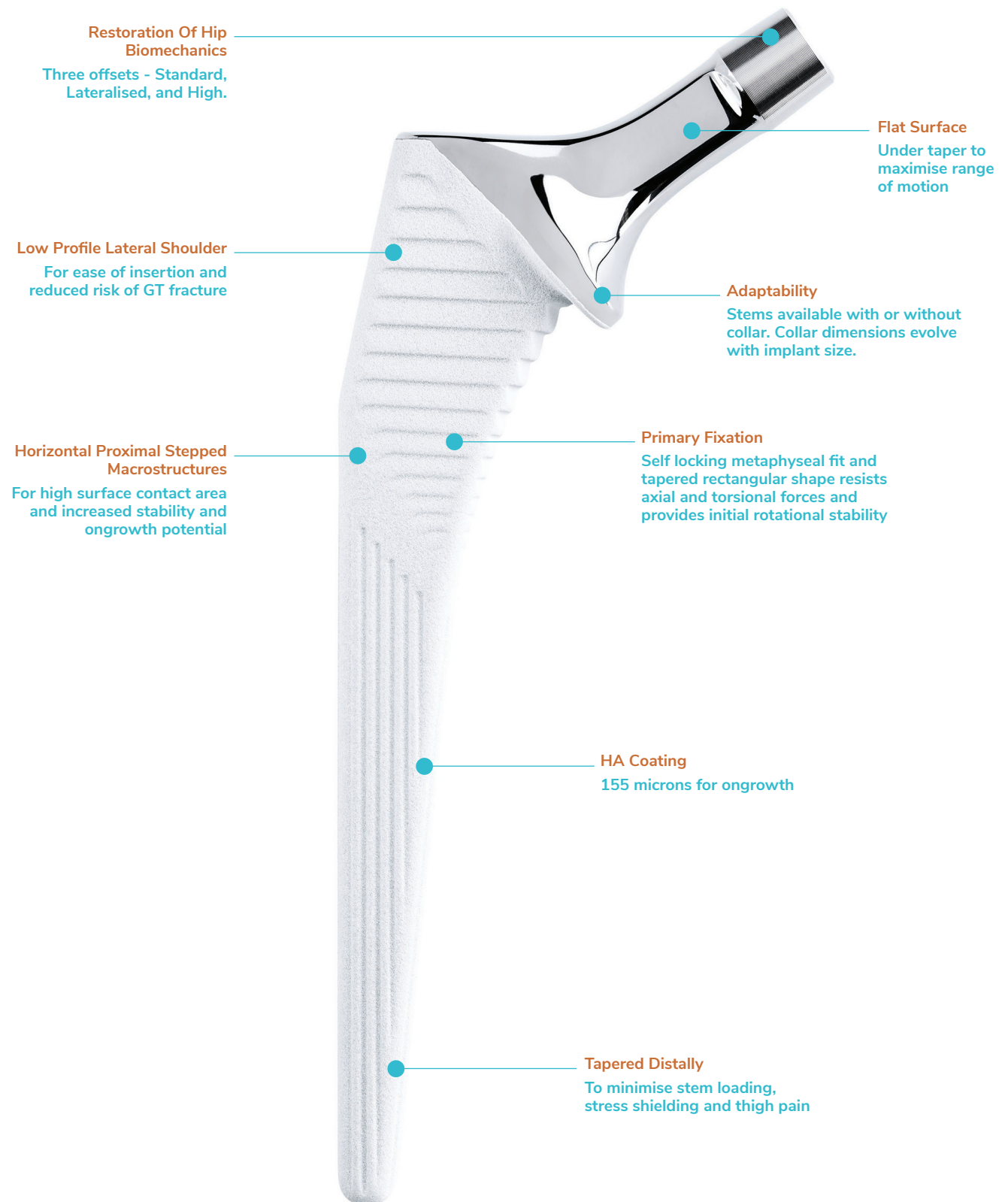


Size	Neck length
Ø 28mm	SN -3.5mm
	MN 0mm
	LN +3.5mm
Ø 32mm	SN -4mm
	MN 0mm
	LN +4mm
	XLN +7mm
Ø 36mm	SN -4mm
	MN 0mm
	LN +4mm
	XLN +8mm

Size	Neck length
Ø 22.2mm	SN -2mm
	MN 0mm
	LN +2mm
Ø 28mm	SN -3.5mm
	MN 0mm
	LN +3.5mm
	XLN +7mm
Ø 32mm	SN -4mm
	MN 0mm
	LN +4mm
	XLN +7mm
Ø 36mm	SN -4mm
	MN 0mm
	LN +4mm
	XLN +8mm

Size	Neck length
Ø 28mm	SN -3mm
	MN 0mm
	LN +4mm
	XLN +7mm
Ø 32mm	SN -3mm
	MN 0mm
	LN +4mm
	XLN +7mm
Ø 36mm	SN -3mm
	MN 0mm
	LN +4mm
	XLN +7mm

## evok® Features

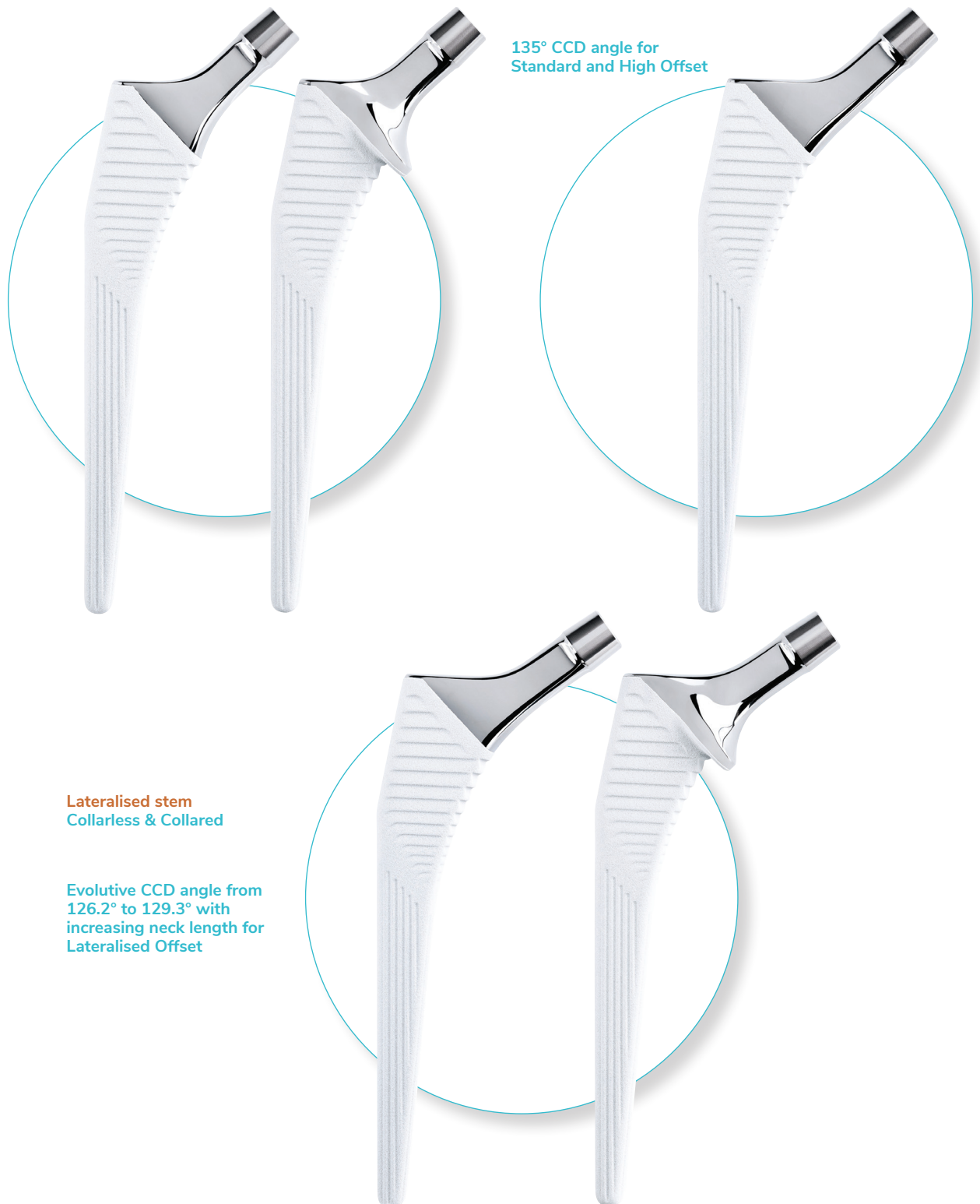


## Adaptability

Stems available with or without collar in 8 to 11 sizes depending on versions.

**Standard stem**  
Collarless & Collared

**High Offset stem**  
Collarless only



# Surgical Technique Overview

1

## Femoral Neck Resection

- Identify anatomical landmarks (LT, PF, GT).
- Determine the neck cut level during pre-operative planning.
- Mark the cutting plane level onto the bone with reference to the anatomical landmarks.
- Take care to protect the soft tissues and greater trochanter during the neck cut - in some cases, where the cut is lower, a second vertical cut is made at the base of the neck and GT.

2

## Femoral Canal Preparation

- Insert smallest T-handle reamer into centre of the femoral canal.
- Remove hard bone along the medial side of the greater trochanter with the box chisel.
- Leave cut bone within the proximal canal for compaction.



3

## Metaphyseal Preparation

- Prepare the metaphyseal area by removing hard bone, passing the box chisel close to the medial side of the greater trochanter at its junction with the neck.



4

## Cancellous Bone Compaction

- Create a rectangular cross-section cavity in line with femoral axis, compacting cancellous bone using the most appropriate method for the patient's bone quality - Dorr A, Dorr B or Dorr C.





5



### Broaching

- Compact bone gently to create a rectangular cross sectional cavity with axial and rotational stability.
- Starting at size 7, increase broach size until axial stability is obtained.
- Check rotational stability and leave the last broach in the femur.

6



### Calcar Reaming

- With the broach in place, position the appropriate calcar reamer in line with the broach spigot.
- Ream gently until you reach the broach and achieve a flat surface, taking care to protect any soft tissue.

7



### Trial on Broach

- With the final broach still in place, attach the trial neck and head to restore the planned offset and leg length.
- Test range of motion, joint stability, leg length, and offset, then remove the head, trial neck and broach from the femur.

8



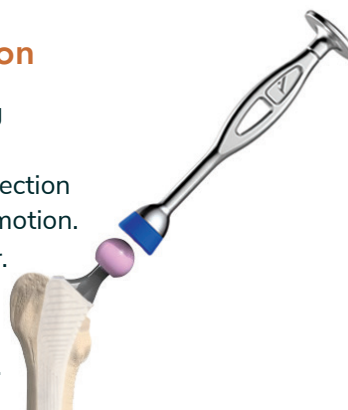
### Final Stem Impaction

- Gently impact the appropriate **evok**<sup>®</sup> stem until the HA border marking the appropriate depth is reached and the stem is stable.
- Remove the stem impactor.
- Place a trial head on the stem and reduce the joint to help confirm the head neck length.

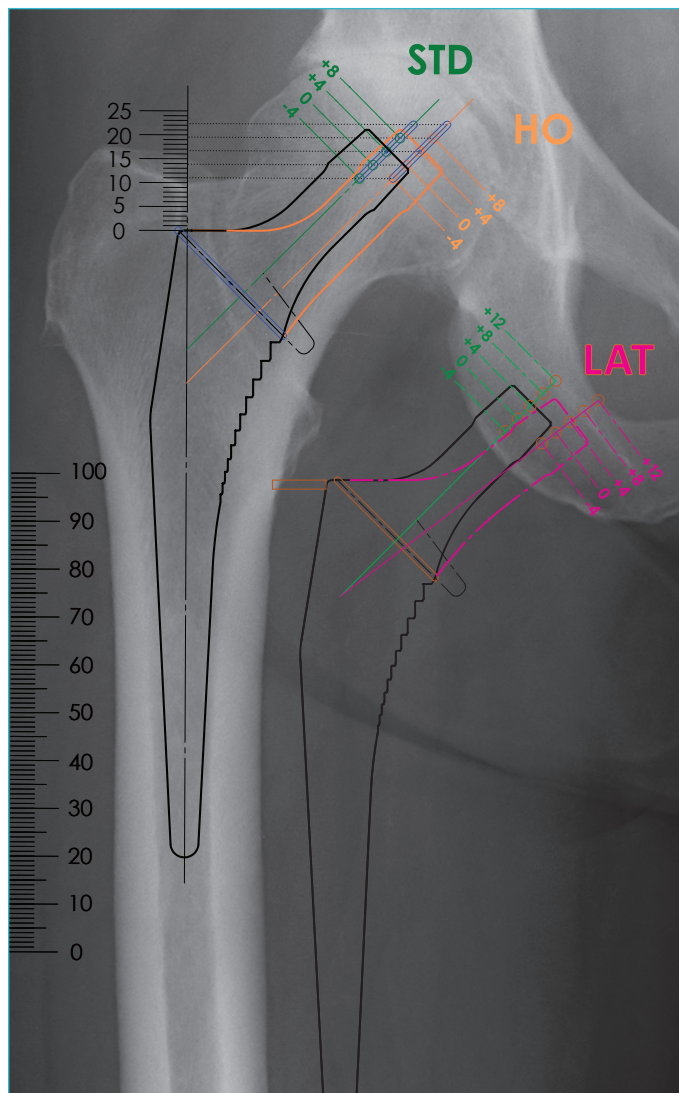
9

### Head Impaction & Final Reduction

- Clean and dry the stem taper, inspecting for damage or contamination.
- Position the femoral head in the axial direction of the stem taper using a slight turning motion.
- Lock the femoral head on the stem taper.
- Tap the impactor with hammer in the axial direction of the stem taper to ensure the femoral head is seated firmly.



# Pre-Operative Planning



## NOTE

- Two colour coded templates are available - Standard/High Offset or Standard/Lateralised Offset.
- Templates are provided at 115% scale. Other magnifications are available upon request.

## 1: Assess Quality of Radiograph

Obtain an adequate AP pelvis X-ray centred on the pubis with attention to the following:

- Pelvic rotation – The symphysis should project centrally through the middle of the sacrum. You should be able to see both of the obturator foramen equally sized and shaped.
- Pelvic flexion – Sacrococcygeal joint to upper symphysis should be approximately 30-50mm. It will be increased if the pelvis was tilted forwards, or decreased if the pelvis was tilted back at the time of X-ray.
- Femoral rotation – Both femora should be internally rotated by 15-20 degrees. You should be able to see more than 2mm but less than 3mm of the lower trochanter.
- Quality of the image is acceptable, and is at the expected magnification~115%.

## 2: Identify Anatomical Landmarks

You should be able to identify the following landmarks on the radiograph:

- Femoral head centres for both femora – centre of rotation.
- Femoral shaft axis.
- Teardrops.

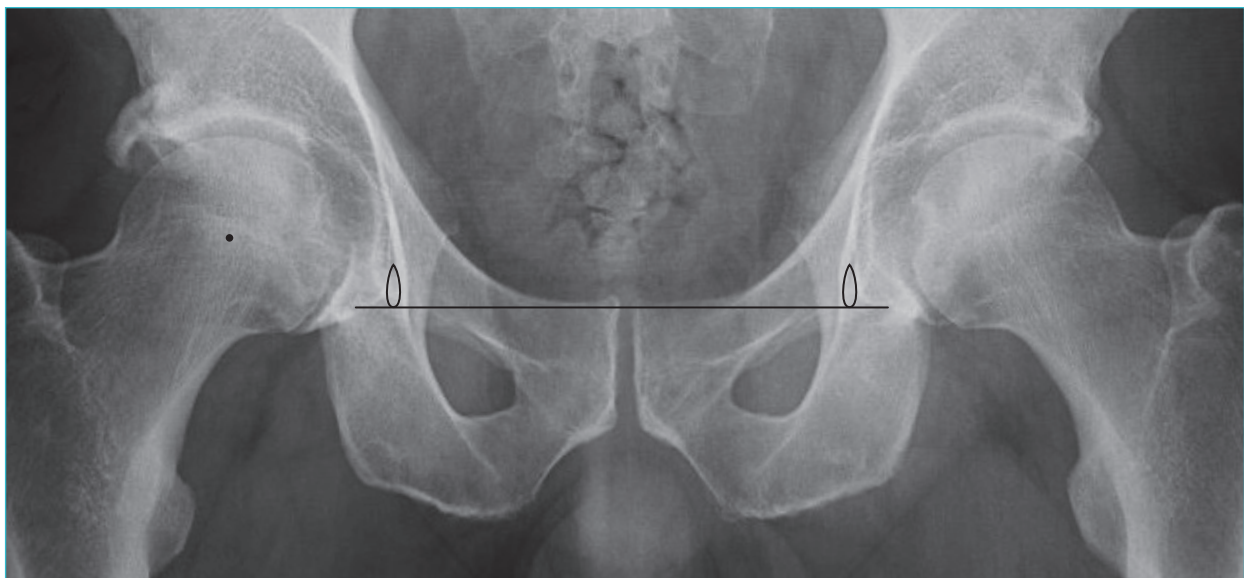
### 3: Identify Acetabular and Femoral Biomechanical Points and Optimise Implant Positioning<sup>1</sup>

#### Acetabulum

1. Mark the teardrops and draw a straight line between them.
2. Measure the distance from the inter teardrop line to the lesser trochanter or other fixed landmark on each side. Note the difference between the indicated and contra-indicated side in order to assess leg length inequality.
3. Rest dome line of the acetabular template on the medial wall. The inferior cup should sit just below the tear drop at the inferior acetabulum. Mark the new acetabular centre. Make the inclination 40 degrees and note the component size.

#### Femur

- Compare the normal and abnormal sides.
- Template the normal side first. This is of particular importance if the femoral head is deformed.
- Template the indicated side and note the neck osteotomy level, stem size and new femoral head centre.
- The implant size should allow adequate femoral shaft filling while leaving 1 to 2mm space between the implant and cortical walls.
- The offset of the stem and neck cut level should allow a proper restoration of lower limb length and abductor's lever arm (femoral offset).
- Mark and measure neck resection level to use as a reference intra-operatively.
- Check and adjust neck length to restore leg length.



1. Scheerlinck T., Primary hip arthroplasty templating on standard radiographs - A stepwise approach, Acta Orthop. Belg., 2010

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# Surgical Approach

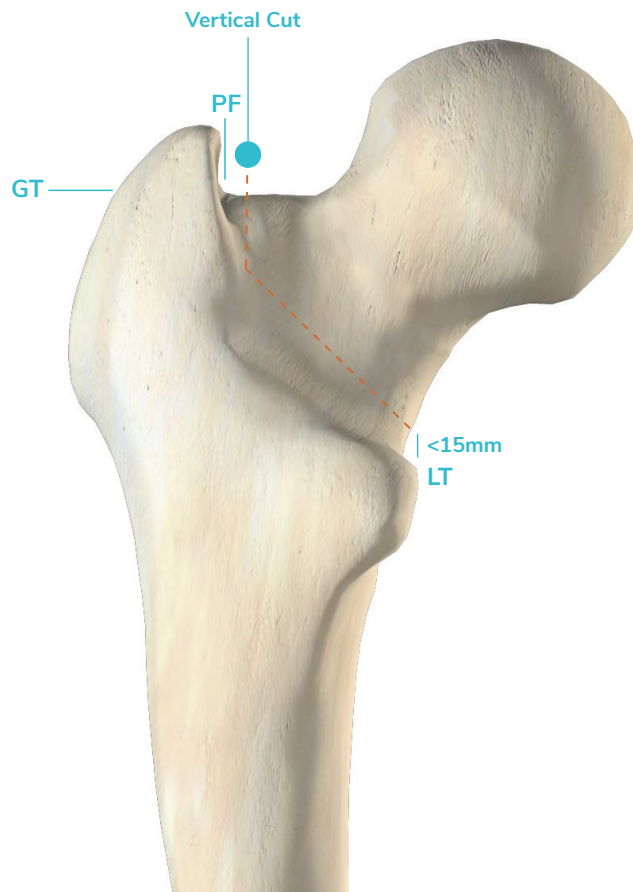
The evok<sup>®</sup> stem may be implanted using any of the traditional surgical approaches and any of the contemporary, less-invasive approaches including direct anterior (on or off table).

The requirement of any approach is adequate visualisation of the acetabulum and proximal femur.

- 360 (degree) view of the rim, floor, transverse acetabular ligament and other landmarks for correct cup positioning.
- Direct view down the femoral canal and the calcar in order to prepare the canal correctly and minimise/ identify intra-operative fractures.
- Clear view of the greater and lesser trochanters to reduce the incidence of fracture and measure leg length.



# 1 Femoral Neck Resection



1. Identify anatomical landmarks: Lesser Trochanter (LT), Piriformis Fossa (PF), Greater Trochanter (GT).
2. Determine the neck cut level during pre-operative planning. In most cases the distance from the neck cut to the LT is less than 15mm (see diagram).
3. Mark the cutting plane level onto the bone with reference to the anatomical landmarks.
4. Take care to protect the soft tissues and greater trochanter during neck cut - in some cases, where the cut is lower, a second vertical cut is made at the base of the neck and GT (see diagram).

## NOTE

- The neck can be cut before or after dislocation and its level can be slightly above what was planned as final adjustments can be made later with the calcar reamer.
- A broach aligned with the femoral diaphysis can enable you to confirm the proper orientation of cut.
- The neck cut should be 45 degrees to the axis of the stem.

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## 2 Femoral Canal Preparation



### Canal Identification

1. Identify the femoral entry point which is normally found in the piriformis fossa on the posterior and lateral quadrant of the cut neck surface. You may need to remove a small part of the posterior cortex at the neck junction.
2. Use the smallest T-handle reamer to find the centre of the canal.
3. Push into the femoral canal to prepare it for broaching, making sure to stay in the femoral shaft axis.

## 3 Metaphyseal Preparation



### Canal Opening

1. Prepare the metaphyseal area by removing hard bone, passing close to the medial side of the greater trochanter at its junction with the neck.
2. Keep the box chisel in line with the centre of the canal and the planned anteversion of the stem.
3. Avoid removing any additional bone and leave cut bone within the proximal canal for compaction.

\*Canal Identification and Canal Opening are interchangeable steps.



## 4 Cancellous Bone Compaction

1. Create a strong compacted bone envelope of cancellous bone, avoiding direct stem contact with the cortical bone if possible.
2. Create a regular rectangular cross-section cavity in line with femoral axis. Bone quality will determine how this is achieved.
  - **Dorr A** - Consider reaming diaphysis to 11 or 12mm to prevent distal stem fixation and to allow proper proximal bone compaction.
  - **Dorr B** - Utilise tamp to create the correct proximal shape prior to broaching.
  - **Dorr C** - The proximal cancellous bone may be soft or deficient. A tapered rectangular straight stem may be used if adequate 3-point fixation can be achieved. Be careful not to remove any bone from the proximal envelope and compact gently to avoid fracture. If this 3-point fixation is not possible, use of a cemented stem is advisable. There is a higher risk of intraoperative fracture in this group of patients.

### NOTE

- Proximal metaphyseal bone compaction is extremely important to preserve as much bone stock as possible.
- Bone compactor is the same size as a size 7 broach.



## 5 Broaching



### IMPORTANT

- If a broach does not insert easily, check that the broach is not held up laterally or distally. Removing some lateral bone with the box chisel may help.
- If rotational and axial stability cannot be obtained, consider using a cemented stem.
- If calcar fracture occurs, remove broach and wire calcar, then use the broach one size smaller. If this is not rotationally or axially stable, consider using a cemented stem.

**evok® broaches are designed to compact bone only, rather than remove bone. They are not sharp cutting broaches.**

- The aim of this step is to compact bone gently to create a rectangular cross sectional cavity with axial and rotational stability.
- Broach orientation should remain in line with the femoral mechanical axis and planned anteversion, staying lateral and taking care not to fracture the calcar.
- Aggressive broaching increases the risk of femoral fracture.
- Broaches should be introduced in the desired anteversion. Typically, the femoral morphology will dictate this, however anatomic variation may make it desirable to alter the anteversion.
- To prevent any varus position, be sure to introduce broaches in the anatomical axis with a lateral bias.
- The resection plane of the broach corresponds to the HA coating border of the stem and should serve as a landmark to reproduce insertion level.

1. Start at size 7 broach and increase progressively until axial stability is obtained.
2. If the broach can be inserted 4mm below the planned resection level, it is usually possible to go to the next size.
3. Once good axial stability is achieved, check rotational stability.
4. Leave the last broach in the femur and remove the broach handle.

### NOTE

Care should be taken not to rotate the broaches.





## 6 Calcar Reaming

Calcar reaming is performed for several reasons:

- To define the correct insertion level.
  - To remove prominent proximal bone at the neck that may reduce range of motion or create impingement.
  - For collared stems in order to allow calcar loading.
1. Ensure final broach is stable and is at the correct insertion level.
  2. Choose the small calcar reamer and assemble with the surgical hand-piece.
  3. Apply gently in line with the broach spigot then ream slowly with minimal force.
  4. Ream until you reach the broach and achieve a flat surface, taking care to protect the soft tissues in this area.
  5. Use larger reamer if peripheral bone remains.



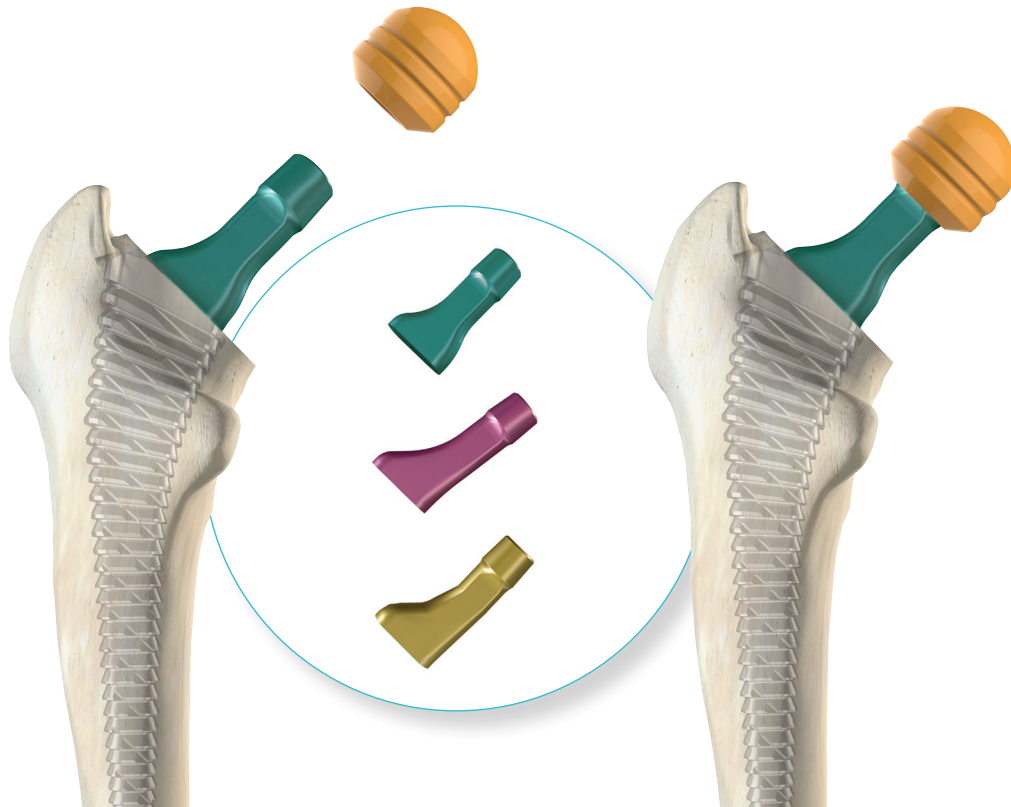
### NOTE

This step is only necessary when using a collared stem. It ensures that the underside of the collar rests on a flat surface.

### NOTE

- Use the Ø35mm reamer for stem sizes 7 to 12-13.
- Use the Ø40mm reamer for stem sizes 12-13 to 18.

## 7 Trial On Broach

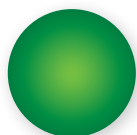


1. Place the trial neck of the desired offset on the broach:

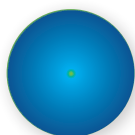
- **Standard** - green
- **Lateralised** - pink
- **High** - yellow

If using a lateralised neck, the size of the neck must match the size of the stem.

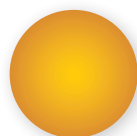
2. Place the trial head onto the neck.
3. Reduce the hip using the head impactor or by hand under control.
4. If required, change the trial head until desired results are achieved.
5. Test the range of motion and joint stability as well as leg length, offset and impingement to confirm adjustments. Remove the trial head and extract the broach from the femoral canal using the broach handle.



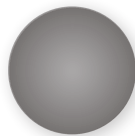
Ø22.2mm



Ø28mm



Ø32mm



Ø36mm



short neck



medium neck



long neck



extra-long neck

## 8 Final Stem Impaction

1. Select the **evok**<sup>®</sup> stem that matches the size and offset chosen during the trials.
2. The stem is 0.31mm larger than the broach trial.
3. Manually position the stem in the prepared femoral canal, leaving 1-2cm of exposed HA coating.
4. Place the stem impactor in the impaction hole on top of the stem with the handle positioned away from the GT to avoid impingement.
5. Gently impact in line with the axis of the stem until the HA border marking the appropriate depth is reached and the stem is stable. **Do not attempt to change or direct the stem anteversion.**
6. Once the stem is stable, remove the stem impactor.



### NOTE

- If the stem is unable to be fully seated with gentle impaction, consider a shorter neck length or consider removing the stem if it is too proud. Do not continue to impact as this may result in fracture.
- If the stem inserts below the planned level, check for stability and check for fracture.
- If stable and no fracture, consider a longer neck length if possible or remove the stem and use the next size.
- If a fracture is evident, remove the stem, wire the fracture and reinsert the same stem to the correct level. Refer to Page 21 for Stem Extraction Technique if required.

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## 9 Head Impaction & Final Reduction



1. It is essential to thoroughly clean and dry the stem taper.
2. Inspect the taper for possible damage and contamination with foreign material.
3. Position the femoral head in the axial direction of the stem taper using a slight turning motion on the clean and dry stem taper.
4. After correctly positioning the femoral head, it is essential that the femoral head is locked on the stem taper.
5. Tap the impactor with hammer in the axial direction of the stem taper to ensure the femoral head is seated firmly. A single hammer blow is sufficient, although several blows are permitted if necessary.

### IMPORTANT

- Never strike the femoral head directly with the hammer so as to avoid damage.
- During the final reduction of the femoral head into the acetabular liner, contact between the femoral head and any metal (cup or instruments) must be avoided.

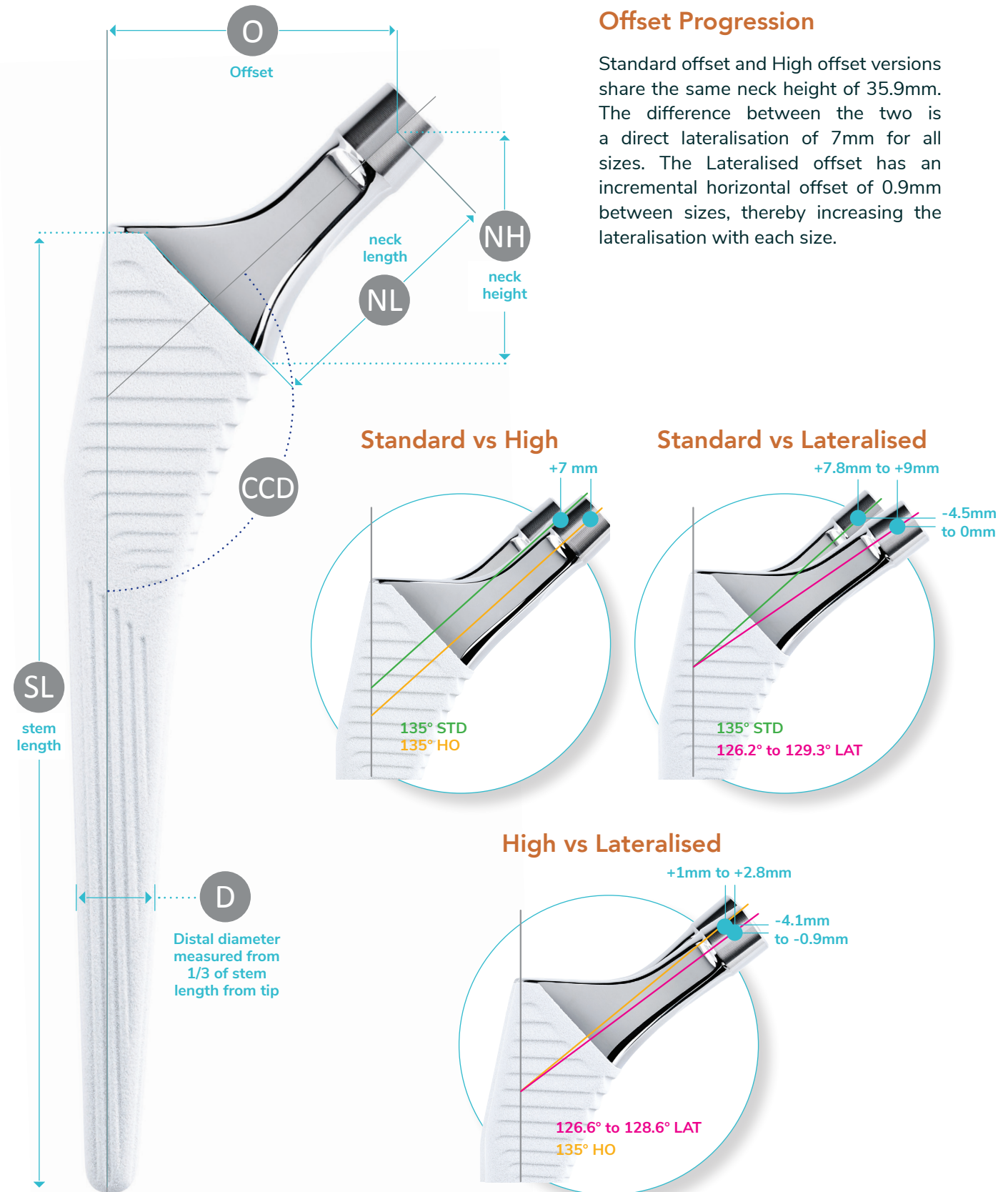
## Stem Extraction

**A peri-operative extraction instrument is available.**

1. Assemble the slap hammer weight onto the slap hammer shaft and screw both components into the slap hammer tip.
2. Tightly screw the slap hammer tip into the upper portion of the stem and then extract it by impacting the weight upwards onto the strike plate. Keep the slap hammer aligned with the stem axis during extraction.



# Implant Information



## Offset Progression

Standard offset and High offset versions share the same neck height of 35.9mm. The difference between the two is a direct lateralisation of 7mm for all sizes. The Lateralised offset has an incremental horizontal offset of 0.9mm between sizes, thereby increasing the lateralisation with each size.



## Standard Offset

REF - Collarless	REF - Collared	Size	O	SL	D	NH	NL	CCD
1-0192007	1-0192107	7*	37.5	111	8.9	35.9	38.5	135°
1-0192008	1-0192108	8*	38.1	116	9.5	35.9	38.5	135°
1-0192009	1-0192109	9	38.8	131	9.9	35.9	38.5	135°
1-0192010	1-019110	10	39.4	141	10.6	35.9	38.5	135°
1-0192011	1-0192111	11	40.1	146	11.6	35.9	38.5	135°
1-0192012	1-0192112	12	40.7	151	12.6	35.9	38.5	135°
1-0192013	1-0192113	13	41.4	156	13.6	35.9	38.5	135°
1-0192014	1-0192114	14	42.0	161	14.6	35.9	38.5	135°
1-0192015	1-0192115	15	42.7	166	15.6	35.9	38.5	135°
1-0192016	1-0192116	16	43.3	171	16.6	35.9	38.5	135°
1-0192018	1-0192118	18	44.6	181	18.6	35.9	38.5	135°

## Lateralised Offset

REF - Collarless	REF - Collared	Size	O	SL	D	NH	NL	CCD
1-0192208	1-0192308	8*	45.9	116	9.5	31.4	41.3	126.2°
1-0192209	1-0192309	9*	46.8	131	9.9	31.8	41.8	126.6°
1-0192210	1-0192310	10	47.7	141	10.6	32.3	42.3	126.9°
1-0192211	1-0192311	11	48.6	146	11.6	32.7	42.7	127.2°
1-0192212	1-0192312	12	49.5	151	12.6	33.2	43.2	127.5°
1-0192213	1-0192313	13	50.4	156	13.6	33.6	43.7	127.8°
1-0192214	1-0192314	14	51.3	161	14.6	34.1	44.1	128.1°
1-0192215	1-0192315	15	52.2	166	15.6	34.5	44.6	128.4°
1-0192216	1-0192316	16	53.1	171	16.6	35.0	45.1	128.6°
1-0192218	1-0192318	18	54.0	181	18.6	35.4	45.1	129.3°

## High Offset

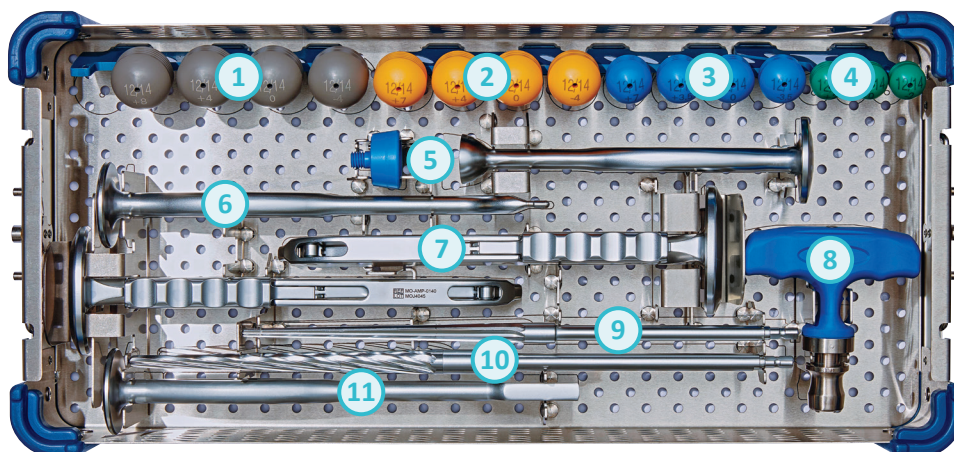
REF - Collarless	Size	O	SL	D	NH	NL	CCD
1-0194709	9	45.8	131	9.9	35.9	43.2	135°
1-0194710	10	46.4	141	10.6	35.9	43.2	135°
1-0194711	11	47.1	146	11.6	35.9	43.2	135°
1-0194712	12	47.7	151	12.6	35.9	43.2	135°
1-0194713	13	48.4	156	13.6	35.9	43.2	135°
1-0194714	14	49.0	161	14.6	35.9	43.2	135°
1-0194715	15	49.7	166	15.6	35.9	43.2	135°
1-0194716	16	50.3	171	16.6	35.9	43.2	135°

### \* Weight Limitations:

Standard Stem Size 7 is not recommended for patients over 68kg. Standard Stem Size 8 is not recommended for patients over 85kg. Lateralised Stem Size 8 is not recommended for patients over 64kg. Lateralised Stem Size 9 is not recommended for patients over 89kg.

# Instrumentation

## Universal Set

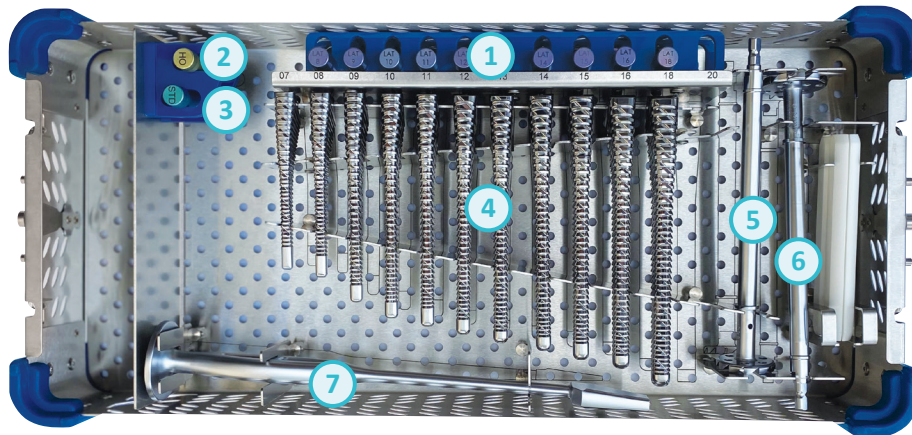


KEY	DESCRIPTION	REFERENCE	QTY
1	Trial Femoral Head 12/14 on stem Ø36 Extra-Long neck +8	2-0196115	1
1	Trial Femoral Head 12/14 on stem Ø36 Long neck +4	2-0196112	1
1	Trial Femoral Head 12/14 on stem Ø36 Medium neck	2-0196111	1
1	Trial Femoral Head 12/14 on stem Ø36 Short neck -4	2-0196110	1
2	Trial Femoral Head 12/14 on stem Ø32 Extra-Long neck	2-0196114	1
2	Trial Femoral Head 12/14 on stem Ø32 Long neck +4	2-0196109	1
2	Trial Femoral Head 12/14 on stem Ø32 Medium neck	2-0196108	1
2	Trial Femoral Head 12/14 on stem Ø32 Short neck -4	2-0196107	1
3	Trial Femoral Head 12/14 on stem Ø28 Extra-Long neck	2-0196113	1
3	Trial Femoral Head 12/14 on stem Ø28 Long neck +3.5	2-0196103	1
3	Trial Femoral Head 12/14 on stem Ø28 Medium neck	2-0196102	1
3	Trial Femoral Head 12/14 on stem Ø28 Short neck	2-0196101	1
4	Trial Femoral Head 12/14 on stem Ø22.2 Long neck	2-0196106	1
4	Trial Femoral Head 12/14 on stem Ø22.2 Medium neck	2-0196105	1
4	Trial Femoral Head 12/14 on stem Ø22.2 Short neck	2-0196104	1
5	Head Impactor Ø22.2, Ø28, Ø32, Ø36	112-042-045	1
6	Offset Stem Impactor	2-0194200	1
7	Straight Male Broach Handle Conventional	2-0194500	2
8	T handle - Zimmer-Hall Connection	2-0192300	1
9	Tapered Pin Reamer 4/11mm - Zimmer/Hall	2-0193200	1
10	Tapered Pin Reamer 7/14mm - Zimmer/Hall	2-0193300	1
11	Box Chisel Medium	112-042-038	1



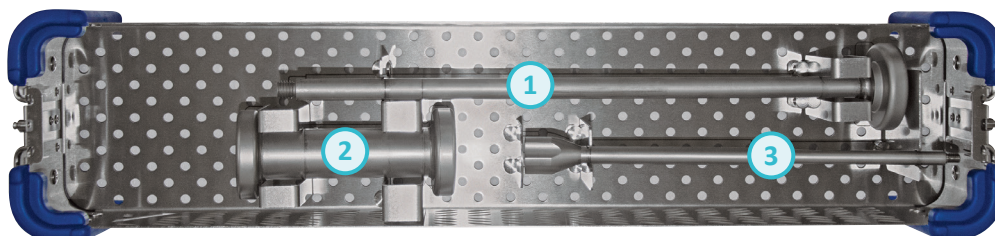


## evok® Broach Tray



KEY	DESCRIPTION	REFERENCE	QTY
1	Trial Neck on Male Broach for <b>evok</b> ® Lateralised Femoral Stem sizes 8 to 18	2-0129008 to 2-0129018	10
2	Trial Neck on Male Broach for <b>evok</b> ® High Offset Femoral Stem compatible with sizes 9 to 16	2-0129001	1
3	Trial Neck on Male Broach for <b>evok</b> ® Standard Femoral Stem compatible with all sizes	2-0129000	1
4	Male Broach for <b>evok</b> ® Femoral Stem – Sizes 7 to 18	112-042-000 to 112-042-011	11
5	Calcar Reamer for Ø35mm Femoral Stem - Male Broach - Zimmer/Hall connection	2-0193135	1
6	Calcar Reamer for Ø40mm Femoral Stem - Male Broach - Zimmer/Hall connection	2-0193140	1
7	<b>evok</b> ® Femoral Stem Cancellous Bone Compactor	112-042-037	1

## Mini Tray For Extraction



KEY	DESCRIPTION	REFERENCE	QTY
1	Slap Hammer Shaft	2-0102900	1
2	Slap Hammer Weight	2-0103300	1
3	Slap Hammer Tip	2-0103200	1







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