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# INTRODUCTION

The C-STEM AMT Triple Taper Stabilised Hip builds upon the clinical success of the original C-STEM Triple Taper Stabilised Hip and its highly polished design. The functional intra-medullary geometry has been preserved. The extra-medullary geometry has been enhanced with a raised lateral shoulder, for better visualisation, and the addition of the 12/14 ARTICUL/EZE<sup>®</sup> mini-taper. This taper provides the surgeon with increased versatility due to its compatibility with the extensive DePuy Synthes Joint Reconstruction femoral head and acetabular portfolio.

### 8 Standard Offset C-STEM AMT Implants



### 8 High Offset C-STEM AMT Implants



The C-STEM AMT Stem, combined with a sound modern cementing technique and proven bone cement,<sup>1</sup> is designed to restore function to today's patient population.

It is apparent however, that implant design alone is not sufficient to assure success. A surgical technique that leads to proper implant placement and alignment and a consistent, reliable cement mantle is also essential.

The following pages set out the steps that provide the surgeon with an established surgical technique for precise bone preparation, using correctly aligned instruments and appropriate use of fifth generation cementing techniques.

The C-STEM AMT Hip System can also be used to perform minimally invasive hip surgery using the DePuy Synthes MI System.

### 4 Small C-STEM AMT Implants - 1 CDH & 3 'A' sizes



### 6 Revision C-STEM AMT Implants



# OPTIMISE FUNCTION HIGH PERFORMANCE BEARINGS



The polished neck and no skirted ARTICUL/EZE heads are designed to reduce wear debris generation secondary to prosthetic impingement.

# MAXIMISE SURVIVORSHIP POSITIVE BONE REMODELLING

With the triple tapered stem design "...there is a potential to translate the promising early results of the C-STEM into the future and expect similar long-term success. The future potential for inward calcar loading and trabecular thickening may be realised as predicted by the stem design."<sup>2</sup> In a cohort of 500 C-STEMS, follow-up studies have shown clear evidence of positive bone remodelling in 20% of cases after seven years.<sup>3</sup> This has continued to improve to almost 22% after 10 years.<sup>4</sup> The mean age of patients was 55.5 years, (range 17 to 89 years) and the mean follow-up was 5.2 years (1 to 10 years). The radiographic evidence of denser cancellous bone has been observed to appear at different stages post-operatively, possibly influenced as much by the activity level of patients as by the time elapsed. At 5 years this improvement in cancellous bone quality is clearly evident.



Immediate Post-Op



5 year Post-Op

# MAXIMISE SURVIVORSHIP 5<sup>TH</sup> GENERATION CEMENTING TECHNIQUE

### Indicated by 2 year clinical RSA results



In a 2 year Radiostereometric Analysis (RSA) study, SMARTSET HV demonstrated its statistical equivalence to Palacos R.<sup>1</sup>

"Many factors influence the overall survivorship of a THR ....but progress has been made in the technique of cementing THR.

BIOMATERIALS SOLUTIONS BY DEPUY SYNTHES

These contemporary cement techniques include appropriate cement choice, careful bone preparation (broaching and cleaning), canal occlusion, appropriate cement preparation to limit voids, retrograde filling, cement pressurisation and the use of centralisers."<sup>5</sup>



The SMARTMIX™ CEMVAC<sup>®</sup> Vacuum Mixing System Prefilled with SmartSet (G) HV Bone Cement



The SMARTMIX CEMVAC Vacuum Mixing System



"Distal centralisers increase the likelihood of reproducibly achieving a complete cement mantle. Based on a study of these techniques, the Swedish Hip Register reported a 95% survivorship at 10 years."<sup>6,7</sup>

# C-STEM TRIPLE TAPERED POLISHED STEM: AN EVOLUTION OF OUR UNDERSTANDING

Cemented THA continues to evolve and improve as time and experience reveal which design features improve results. The original C-STEM implant established a taper slip stem that not only worked with the bone cement mantle, but was also the first stem to demonstrate positive bone remodelling through an even proximal load transfer.<sup>3,4</sup>

The C-STEM AMT stem builds upon the clinical success of the original C-STEM by maintaining the original intramedullary geometry and same triple taper stem geometry. The possible ROM is enhanced by introducing the AMT taper and narrower neck design. This provides more options to accurately address the anatomy of each patient.



### **Design Features**

Available in standard and high offset to accurately restore patient anatomy.

Optimised Mini ARTICUL/EZE taper to increase range of motion and reduce neck impingement when compared to the 9/10 taper.

Narrow neck geometry to increase



# PRE-OPERATIVE PLANNING X-RAY TEMPLATING

Make a thorough radiographic examination of the contralateral side, using both A/P and M/L projections, taking into consideration any anatomical anomalies, dysplasia or previous osteotomy. The radiographs should be at 20% magnification and the hips internally rotated to 15°. They should clearly demonstrate the acetabular configuration, the endosteal and the periosteal contours of the femoral head, neck and proximal femur.

### Templating Femoral Implant Size

The C-STEM AMT implant system offers a complete range of femoral templates. When the approximate size template is selected, overlay the outline above an A/P radiograph of the femur with the implant's centre line in line with the long axis of the femur. Position the template so that the centre of the central depth marking is level with the proposed neck resection and the cement mantle outline fills the proximal femoral canal. With the template positioned accurately, the centre of rotation of the head should overlay the centre of the femoral head (Figure 1).

If the patient has a higher than normal offset, consider the equivalent size high offset template. With C-STEM AMT this distance is increased by either 6 mm or 8 mm depending on size. The high offset option can also be used during revision surgery to optimise abductor tension.

### Limb Length Adjustment

Raise or lower the implant outline along the long axis of the femur to increase or decrease leg length, without adjusting the offset. Use the middle slot or hole in the template to mark the neck resection level.

### Sizing of the Cement Restrictor

Leave 20 mm space from the distal tip of the selected stem template when estimating the approximate diameter of the cement restrictor.

Void centraliser sizing: see page 20.



Figure 1. C-STEM AMT

# STEP 1 FEMORAL NECK RESECTION



#### Note 1.0

\*Please note that the CDH stem has a CCD angle of 125° (a resection angle of 55°). The rest of the C-STEM AMT size range have a CCD angle of 130° (a resection angle of 50°)

Figure 2

Once the femoral head is exposed, align the neck resection guide against the long axis of the femur.\* Determine the resection level by aligning the top of the guide with the tip of the greater trochanter (Figure 2) or by referencing a measured resection level above the lesser trochanter, or from the superomedial aspect of the femoral head along the axis of the femoral neck as determined during templating. Confirm the resection level with the preoperatively templated plan. Mark the resection line using diathermy. Resect the femoral head. The collarless stem enables proximal and distal adjustment regardless of neck resection level; however, orientation of the cut should be perpendicular to the neck axis in both planes in order to avoid impingement of the medial stem against the medial neck.

# STEP 2 OPENING THE FEMORAL CANAL

Note 2.0

Reamers are available for surgeons who prefer to ream the intramedullary canal (see page 24).





Figure 3

### Clearing the Anatomical Calcar

In order to achieve an optimal cement mantle, clear the anatomical calcar (the cortical condensation overlying the endosteal entry into the lesser trochanter) using an osteotome or curette. Avoid excavating the lesser trochanter (Figures 3 & 4).

# Figure 4

Figure 5

### Femoral Alignment

Attach the Canal Probe to the T-Handle. Introduce the probe into the femoral canal, maintaining neutral orientation (Figure 5).

The C-STEM AMT Hip System is designed as a broach-only system, to maximise the strength of the bone / cement interface.

# STEP 3 METAPHYSEAL PREPARATION



#### **Note 3.0**

The final broach should confirm the size templated pre-operatively and determine the final implant size. The C-STEM AMT broach system was designed to incorporate a circumferential 2 mm cement mantle. The 2 mm cement mantle does not include the additional cement mantle created by cement interdigitation into the cancellous bone structure.

**Note 3.1** 

The leg length adaptor is not to be assembled with the broach when broaching.

Note 3.2

There is no starter broach so with size 1 and CDH templated stems you should begin with that matching size.

### Femoral Broaching

Attach a broach – two sizes smaller than the size determined during pre-operative templating – to the broach handle. Carefully impact the broach down the long axis of the canal in neutral orientation. **Diamond tooth broaches should not be introduced aggressively.** When using the posterolateral approach, incorporate 5-15° of anteversion (Figure 6)

Figure 6

#### **Note 3.3**

### It is not possible to use the leg length adaptors with the CDH broach.



Ensure that any remaining superolateral femoral neck is cleared to avoid varus stem placement. If required, release a small portion of the gluteus medius to facilitate exposure and trim any overhanging trochanter. Sequentially increase the size of the broach until the final broach is fully seated in the femur with the upper surface of the broach level with the neck resection level, or at the level determined during pre-operative templating (Figure 7). If the final seating position does not match the pre-operatively templated position, the leg length adaptors can be used to set the broach at neutral or +5 mm positions for trial reduction (Figure 8).

# STEP 4 CALCAR PLANING (OPTIONAL)



**Note 4.0** 

Leg Length Adjuster must be removed before using the calcar mill

Figure 9

Since the C-STEM AMT Stem is a collarless stem, it can be positioned proximally or distally to the neck cut. Therefore, calcar planing is not mandatory; however, it is advisable in order to facilitate seating the actual prosthesis to the same level as the broach. Position the centre hole of the planer over the broach trunnion and plane the bone until it is level with the proximal surface of the broach (Figure 9).

Because the CDH stem has a CCD angle of 125° (rather than 130° like the rest of this range), calcar planing SHOULD NOT be used with the CDH broach.

# STEP 5 TRIAL REDUCTION

#### Note 5.0

When using the leg length adaptors, enusre that the trial neck is fully seated before performing a trial reduction Crotch Point Crotch Point (See table on page 26) Stem Length Distal Tip



### Femoral Neck Trial Assembly

Attach the appropriate neck segment to the broach. Multiple trial heads are available to help with proper restoration of hip biomechanics (22.225 mm, 26 mm, 28 mm, 32 mm, 36 mm heads). The C-STEM AMT Stem offers dual (i.e. standard and high) offsets in many of its sizes, the rule of thumb being that offsets in sizes 1-3 are 6 mm more in the HO option, and that offsets in sizes 4-8 are 8 mm more in the HO option. If the femoral neck resection level is correct for proper leg length restoration, but there is still inadequate soft tissue abductor muscle tension, consider a high offset neck segment.

Use a combination of neck segment and trial head sizes to restore joint stability with an adequate range of motion. To assess stability for each combination, check external rotation in extension to rule out anterior dislocation. Also perform a posterior dislocation test, bringing the hip up to 90° of flexion with internal rotation. Once adequate stability is achieved, note the neck segment (standard or high) and the trial head chosen (Figure 10).

If you need to increase leg length, neutral and +5 mm adjusters are available to raise and stabilise the proximal part of the broach on the resected neck surface.

### **Broach Removal**

Remove the broach using the broach handle. Clean the canal, to remove loose cancellous bone, using a curette.

# STEP 6 CEMENT RESTRICTION



### Inserting the Cement Restrictor

Use pulsatile lavage to clear the femoral canal of debris and open the interstices of the bone.

Use the stem restrictor trial based on the size determined from pre-operative templating to establish the correct size (Figure 11). Attach the correct size of trial cement restrictor to the cement restrictor inserter and insert the trial to the planned depth (see table on page 25). Check that it is firmly seated in the canal. Remove the trial and replace it with the corresponding restrictor implant. Insert the PE cement restrictor implant at the same level as the restrictor trial (Figures 11 & 12).

Irrigate the canal using pulsatile lavage with saline solution, ensuring that all debris is removed.

Pass a swab down the femoral canal to help dry and remove any remaining debris. The swab may also be pre-soaked in an epinephrine or hydrogen peroxide solution.

# STEP 7 DISTAL CENTRALISER

#### Note 7.0

Ensure that one of the fins is aligned with the lateral edge of the stem.

**Note 7.1** 

The void centraliser should not be used if the smallest diameter of the femoral canal is less than 10 mm at the level of the stem tip. An end cap should be used.



### Attaching the Void Centraliser

Using the centraliser trials, select the C-STEM void centraliser that corresponds to the diameter of the femoral canal (C-STEM Void Centralisers increase in 2 mm increments from 10 - 20 mm).

After selecting the right size of centraliser, slide it firmly over the distal tip of the stem and push the end over the tip of the stem, observing the correct orientation of one of the fins with the lateral edge. (Figure 13).

Figure 13

Select the void centraliser size that corresponds to the size of the PE cement restrictor:

### **PE Cement Restrictors**

### End Caps and Void Centralisers

Code	Description	Code	Description
546010000	PE Cement Restrictor Size 1	961221000	Resorbable End Cap
		961226000	PMMA End Cap
546012000	PE Cement Restrictor Size 2	961210500	PMMA Void Centraliser Size 10
546014000	PE Cement Restrictor Size 3	961212500	PMMA Void Centraliser Size 12
546016000	PE Cement Restrictor Size 4	961214500	PMMA Void Centraliser Size 14
546018000	PE Cement Restrictor Size 5	961216500	PMMA Void Centraliser Size 16
546020000	PE Cement Restrictor Size 6	961218500	PMMA Void Centraliser Size 18
546022000	PE Cement Restrictor Size 7	961220500	PMMA Void Centraliser Size 20

# STEP 8 CEMENTING TECHNIQUE



Figure 14

Figure 15

Mix DePuy Synthes CMW bone cement using the CEMVAC Vacuum Mixing System. Attach the syringe to the CEMVAC cement injection gun. Assess the viscosity of the cement. The cement is ready for insertion when it has taken on a dull, doughy appearance and does not adhere to the surgeon's glove. Start at the distal part of the femoral canal and inject the cement in a retrograde fashion, allowing the cement to push the nozzle gently back, until the canal is completely filled and the distal tip of the nozzle is clear of the canal (Figure 14).

Cut the nozzle and place a DePuy Synthes femoral pressuriser over the end. The DePuy Synthes CMW cement should be pressurised to allow good interdigitation of the cement into the trabecular bone. Continually inject cement during the period of pressurisation (Figure 15). Use the Femoral Prep Kit curettes to remove excess bone cement. Implant insertion can begin when the cement can be pressed together without sticking to itself.

# STEP 9 FEMORAL STEM IMPLANTATION

### Note 9.0 The inserter is not to be impacted **Note 9.1** Due to the larger cross sectional area of the alternative introducer (figure 16) there is an increased risk of soft tissue impingement. In cases where there is concern that the alternative introducer may impinge with soft tissue it is -5 mm Position recommended that the original stem Neutral Position introducer (2522-00-502) is used. +5 mm Position Note 9.2 The neutral seating level for the CDH stem aligns to the broach resection level at the medial crotch. Figure 17 Tip A straight, non-retaining introducer is also available: Catalogue number 252200502



To assemble the introducer to the stem, compress the lever and carefully locate the two forks behind the taper on the neck of the implant. Then insert the prong into the dimple on the lateral shoulder of the implant then gently release the lever. The stem should now be securely attached to the introducer. **DO NOT IMPACT THE INTRODUCER.** 

Introduce the implant in line with the long axis of the femur. Its entry point should be lateral, close to the greater trochanter. During stem insertion maintain thumb pressure on the cement at the medial femoral neck ensuring the stem is in the middle of the prepared cavity (Figure 16).

In terms of implantation depth, the stem is "neutrally" seated when the middle marking on the stem is level with the neck resection (Figure 17). The additonal lines allow the implant to be raised or lowered; to increase or decrease leg length, without adjusting the offset.

Raising or lowering the stem with respect to the neck resection will increase or decrease the proximo-medial cement mantle thickness respectively. Remove excess cement with a curette. Maintain pressure until the cement is completely polymerised.

To remove the introducer from the stem, compress the lever slightly whilst gently pulling the instrument away from the implant taking care not to disturb the cement whilst it is curing.

# STEP 10 FEMORAL HEAD IMPACTION



Figure 18

Once the cement has completely set, place the trial head on the implant and perform a final trial reduction (Figure 18). Remove the trial head then irrigate, thoroughly clean and dry the taper; to remove any fluid or particulate debris.

Twist and push the definitive head onto the taper using the head taper, then impact firmly with head impactor. Reduce the hip to carry out a final assessment of joint mechanics and stability (Figure 19).

#### Closure

Closure is based on the surgeon's preference and the individual case. The repair should be tested throughout the hip range of motion.

# **TECHNICAL SPECIFICATIONS**





Cement Plug Ideally, the cement restrictor should be positioned 20 mm distal to stem tip (see column A below).

\* CDH stem 125 degree

Size	A = Stem Length (mm)	B = Offset with head (mm)				C = Leg Adjustment Length with head (mm)				D = Neck Length with head (mm)									
		-2	+1.5	+5	+8.5	+12	+15.5	-2	+1.5	+5	+8.5	+12	+15.5	-2	+1.5	+5	+8.5	+12	+15.5
CDH	103	20.5	23	26	29	31.5	-	17	19	21	23	25	-	18.5	22	25.5	29	32.5	-
1A	103.5	24.5	27.5	30	32.5	35.5	-	18.5	21	23	25.5	27.5	-	19.5	23	26.5	30	33.5	-
2A	106.5	26.5	29.5	32	34.5	37.5	-	21	23.5	25.5	28	30	-	23	26.5	30	33.5	37	-
3A	110.5	29.5	32.5	35	37.5	40.5	-	22.5	24.5	27	29	31.5	-	24.5	28	31.5	35	38.5	-
1 Standard	106	30.5	33	35.5	38.5	41	43.5	22	24	26.5	28.5	31	33	23.5	27	30.5	34	37.5	40.5
1 HO	106	36.5	39	41.5	44.5	47	49.5	22	24	26.5	28.5	31	33	27.5	31	34.5	38	41.5	44.5
2 Standard	110.5	32.5	35	37.5	40.5	43	45.5	23.5	26	28	30.5	32.5	34.5	25	28.5	32	35.5	39	42
2 Long Std	144.5	32.5	35	37.5	40.5	43	-	23.5	26	28	30.5	32.5	-	25	28.5	32	35.5	39	-
2 HO	110.5	38.5	41	43.5	46.5	49	51.5	23.5	26	28	30.5	32.5	34.5	29	32.5	36	39.5	43	46
2 Long HO	144.5	38.5	41	43.5	46.5	49	-	23.5	26	28	30.5	32.5	-	29	32.5	36	39.5	43	-
3 Standard	115	32.5	35	37.5	40.5	43	45.5	25	27.5	29.5	32	34	36	25	28.5	32	35.5	39	42
3 Long Std	148.5	32.5	35	37.5	40.5	43	-	25	27.5	29.5	32	34	-	25	28.5	32	35.5	39	-
3 HO	115	38.5	41	43.5	46.5	49	51.5	25	27.5	29.5	32	34	36	29	32.5	36	39.5	43	46
3 Long HO	148.5	38.5	41	43.5	46.5	49	-	25	27.5	29.5	32	34	-	29	32.5	36	39.5	43	-
3 XL205	175.5	32.5	35	37.5	40.5	43	-	25	27.5	29.5	32	34	-	25	28.5	32	35.5	39	-
3 XL240	210.5	32.5	35	37.5	40.5	43	-	25	27.5	29.5	32	34	-	25	28.5	32	35.5	39	-
4 Standard	119.5	34.5	37	39.5	42.5	45	47.5	27.5	29.5	32	34	36.5	38	27	30.5	34	37.5	41	44
4 HO	119.5	42.5	45	47.5	50.5	53	55.5	27.5	29.5	32	34	36.5	38	32.5	36	39.5	43	46.5	49.5
5 Standard	124	34.5	37	39.5	42.5	45	47.5	28.5	31	33	35.5	37.5	39.5	27	30.5	34	37.5	41	44
5 HO	124	42.5	45	47.5	50.5	53	55.5	28.5	31	33	35.5	37.5	39.5	32.5	36	39.5	43	46.5	49.5
6 Standard	128.5	36.5	39	41.5	44.5	47	49.5	30.5	33	35	37.5	39.5	41.5	29	32.5	36	39.5	43	46
6 HO	128.5	44.5	47	49.5	52.5	55	57.5	30.5	33	35	37.5	39.5	41.5	34	37.5	41	44.5	48	51
7 Standard	133	36.5	39	41.5	44.5	47	49.5	31.5	34	36	38.5	40.5	42.5	29	32.5	36	39.5	43	46
7 HO	133	44.5	47	49.5	52.5	55	57.5	31.5	34	36	38.5	40.5	42.5	34	37.5	41	44.5	48	51
8 Standard	137.5	38.5	41	43.5	46.5	49	51.5	33.5	35.5	38	40	42.5	44.5	31	34.5	38	41.5	45	48
8 HO	137.5	46.5	49	51.5	54.5	57	59.5	33.5	35.5	38	40	42.5	44.5	36	39.5	43	46.5	50	53

# C-STEM AMT LONG SURGICAL TECHNIQUE



The C-STEM AMT Triple Taper Stabilised Hip builds on the proven clinical success of the original C-STEM Triple Taper and its highly polished design. The C-STEM AMT Long stems provide an extension to this range to allow the surgeon to utilize this system for more complex primary and revision cases.

The functional intrameduallary geometry has been preserved. The 12-14 ATRICUL/EZE mini taper is maintained across the range allowing complete compatibility with DePuy Synthes Reconstruction femoral heads.

#### Indications

The C-STEM AMT Long stem should be used as indicated in the instructions for use. The extra length provided allows the surgeon to gain better fixation and also to bypass areas of lytic bone which could potentially lead to stress risers and peri prosthetic fractures. The C-STEM AMT Long is used in cases where the femoral component has been removed using an endo -femoral technique. It does not lend itself to cases where an extended trochanteric osteotomy has been performed because of the increased risk of migration or lack of adequate bone to support implants. In these cases a modular Wagner stem such as the RECLAIM<sup>™</sup> should be used.

### **Pre-Operative Planning**

Pre operative planning is imperative for any revision hip surgery. Good quality radiographs in both AP and lateral film should be obtained. The X-Ray should include the complete cement mantle including any tail beyond the tip of the stem. The use of a radiograph marker ball is recommended as it allows the use of digitized templating software.

Careful analysis of the femoral anatomy must be made, looking specifically for areas of lysis, mal-positioning of the original stem and varus remodeling.

### C-STEM AMT LONG SURGICAL APPROACH

It is important that the surgeon uses an extensile approach that he or she is familiar with. Typically this is anterolateral or posterior.

#### Anterolateral

For the anterolateral approach, place the patient in the lateral decubitus position and execute a skin incision that extends from distal to proximal, centered over the anterior aspect of the femur, continuing over the greater trochanter tip.

The iliotibial band is split under the skin incision, extending proximally into the gluteus maximus or in between the maximus and the tensor fascia lata muscles.

Palpate the anterior and posterior borders of the gluteus medius. The gluteus medius is split from the trochanter, parallel to its fibers, releasing the anterior 1/2 to 1/3 of the muscle.

The gluteus medius should not be split more than 4 cm from the tip of the greater trochanter. Care must be taken to ensure the inferior branch of the superior gluteal nerve is not damaged. The gluteus minimus is exposed and released either with or separate from the gluteus medius. Flexion and external rotation of the leg facilitates exposure of the hip capsule, which is incised or excised depending on surgeon preference.



Anterolateral approach

#### Posterior

The incision should ideally be made to incorporate the old scar, extending it both superiorly and distally. The fascia lata is incised. If it is difficult to identify planes the incision should be developed distally, dissecting through virgin tissues to find the fasica. The plane can then be developed from distal to proximal, splitting through the fibers of gluteus maximus. The tendon of gluteus maximus can be partially or fully released to allow better exposure.

At this point the sciatic nerve is identified and protected.

The hip should be aspirated and joint fluid sent for culture and sensitivity analysis. The capsule and the short external rotators are reflected either separately or en bloc, keeping close to the trochanteric ridge. This soft tissue flap can be secured with ties and used to further protect and cushion the sciatic nerve.

The capsule should be released superiorly underneath gluteus medius and minimus before dislocation is considered.

Once the head and neck of the prosthesis are exposed a blunt hook is passed around the neck of the prosthesis. The leg is gently rotated internally with some gentle traction to allow the hip to be dislocated. There is a risk of peri prosthetic fracture if dealing with a case that involves significant femoral bone loss.

Tip

Before considering removing the femoral component it is important to complete a 360° capsulotomy to allow complete exposure to the femoral component.



Posterolateral approach

### C-STEM AMT LONG REMOVING THE STEM

It is imperative that the soft tissue and cement from around the shoulder of the prosthesis are removed before attempting to remove the stem.

Suitable osteotomes such as the Moreland or Symmetry system should be used.

Once adequate clearance has been achieved the stem can be removed, taking care to remove the stem in line with the long axis of the femur.





Once the stem has been removed the metaphyseal and diaphyseal cement can be removed. This can often be the most taxing part of the operation. It is important that good exposure and good lighting is available. Using appropriate gouges and chisels the residual cement mantle is removed. It is important to refer back to the pre operative X-ay periodically to identify potential areas of weakness where cortical perforations can occur.

Mal-positioning of the old stem and varus remodeling can often lead the surgeon off the correct track and it is important to avoid this. Once the metaphyseal and diaphyseal cement is removed the surgeon can concentrate on the distal plug. This can be removed using a variety of methods including a distal cement extractor, cement drills and ultrasound.





# C-STEM AMT LONG FEMORAL PREPERATION

Once the canal is clear of cement, currettes and lavage should be used to remove any membrane and residual granuloma.

The lesser trochanter should be penetrated and excavated to allow further cement purchase at the time of implantation.

The use of cement restrictors is governed by the position of the isthmus relative to the template implant distal tip. As a general rule restrictors can be used with the size 2 and 3 Long stems and XL205 stems; this may not be possible with the XL240 stem.

Using the reamers (figure 20) and T-handle provided, the femoral canal should be sequentially reamed to ensure a minimum 2 mm cement mantle is present along the entire length of the stems. The 16 mm reamer is the minimum diameter that will achieve this target. Refer to figures, 21, 22 & 23 for target depths and clearance.





Tip

It may be beneficial to have a triple mix of cement available.

Following femoral canal preparation for the long stems, the stems should be implanted using the standard protocol as described on pages 19 - 23.

**Figure 21.** When preparing the intrameduallary canal for the size 2 Long and size 3 Long implants, plan to ream to a position 40 mm past the distal tip of the implant to provide sufficient space for the cement restrictor (page 33) and centraliser (page 33). To achieve this depth, the "6" mark on the reamer should approximately align to the top of the Greater Trochanter



**Figure 22.** When preparing the intrameduallary canal for the size 3 XL 205 implant, plan to ream to a position 20 mm past the distal tip of the implant to provide sufficient space for the centraliser (page 33). To achieve this depth, the "7" mark on the reamer should approximately align to the top of the Greater Trochanter. If use of a cement centraliser is planned, the reamer should be progressed a further 20 mm.

**Figure 23.** When preparing the intrameduallary canal for the size 3 XL 240 implant, plan to ream to a position 20 mm past the distal tip of the implant to provide sufficient space for the centraliser (page 33). To achieve this depth, the reamer should be progressed until the middle of the widest part of the reamer shaft is aligned to the top of the greater trochanter

# ORDERING INFORMATION

C-STEM AMT	Trav 1 - Base	C-STEM AMT 1	Frav 2
Cat. No.	Description	Cat. No.	Description
2580-00-094	C-STEM AMT Inst Tray 1	2580-00-096	C-STEM AMT Tray 2
2570-20-000	Canal Sizers Size 8-9	2570-04-100	SUMMIT Calcar Planer – Small
2570-21-000	Canal Sizers Size 10 -11	2570-04-200	SUMMIT Calcar Planer – Large
2570-22-000	Canal Sizers Size 12-13	2570-03-001	C-STEM AMT Size CDH Neck Segment
2570-23-000	Canal Sizers Size 14-15	2570-03-002	C-STEM AMT Size 1A Neck Segment
2570-24-000	Canal Sizers Size 16-17	2570-03-003	C-STEM AMT Size 2A Neck Segment
9611-83-000	IM Reamer 16 mm	2570-03-004	C-STEM AMT Size 3A Neck Segment
9611-84-000	IM Reamer 17 mm	2570-03-000	SUMMIT Size 0/1 Std Neck Segment
9611-85-000	IM Reamer 18 mm	2570-03-050	SUMMIT Size 0/1 Hi Neck Segment
		2570-03-100	SUMMIT Size 2/3 Std Neck Segment
C-STEM AMT	Tray 1 - Insert	2570-03-150	SUMMIT Size 2/3 Hi Neck Segment
Cat. No.	Description	2570-03-200	SUMMIT Size 4/5 Std Neck Segment
2570-01-600	SUMMIT <sup>®</sup> Univ Neck Res Guide	2570-03-250	SUMMIT Size 4/5 Hi Neck Segment
854673	Box Osteotome	2570-03-300	SUMMIT Size 6/7 Std Neck Segment
2001-42-000	EXCEL <sup>™</sup> T-Handle	2570-03-350	SUMMIT Size 6/7 Hi Neck Segment
2354-10-000	Muller Awl Reamer W/Hudson End	2570-03-400	SUMMIT Size 8/9 Std Neck Segment
2570-00-000	SUMMIT Universal Broach Handle	2570-03-450	SUMMIT Size 8/9 Hi Neck Segment
853928	P.F.C. <sup>®</sup> Broach Hand Align Rod	2580-00-097	Leg Length Adjuster 0 mm
2580-00-001	C-STEM AMT Broach CDH	2580-00-098	Leg Length Adjuster +5 mm
2580-00-070	C-STEM AMT Broach Size 1A	2530-69-000	ARTICUL/EZE Trial Grooved Head 22.225 +4
2580-00-033	C-STEM AMT Broach Size 2A	2530-70-000	ARTICUL/EZE Trial Grooved Head 22.225 +7
2580-00-043	C-STEM AMT Broach Size 3A	2530-71-000	ARTICUL/EZE Trial Grooved Head 26 +4
2580-00-085	C-STEM AMT Broach Size 1	2530-72-000	ARTICUL/EZE Trial Grooved Head 26 +7
2580-00-086	C-STEM AMT Broach Size 2	2530-73-000	ARTICUL/EZE Trial Grooved Head 26 +10
2580-00-087	C-STEM AMT Broach Size 3	2530-81-000	ARTICUL/EZE Trial Grooved Head 28 +1.5
2580-00-088	C-STEM AMT Broach Size 4	2530-82-000	ARTICUL/EZE Trial Grooved Head 28 + 5
2580-00-089	C-STEM AMT Broach Size 5	2530-83-000	ARTICUL/EZE Trial Grooved Head 28 + 8.5
2580-00-090	C-STEM AMT Broach Size 6	2530-84-000	ARTICUL/EZE Trial Grooved Head 28 + 12
2580-00-091	C-STEM AMT Broach Size 7	2531-50-000	ARTICUL/EZE Trial Grooved Head 36 - 2
2580-00-092	C-STEM AMT Broach Size 8	2531-51-000	ARTICUL/EZE 36 mm Trial Head +1.5
		2531-52-000	ARTICUL/EZE 36 mm Trial Head +5
X-Ray Templat	tes	2531-53-000	ARTICUL/EZE 36 mm Trial Head +8.5
Cat. No.	Description	2531-54-000	ARTICUL/EZE 36 mm Trial Head +12
2580-00-000	C-STEM AMT X-Ray Templates	2530-91-000	ARTICUL/EZE Trial Grooved Head 32 +1
		2530-92-000	ARTICUL/EZE Trial Grooved Head 32 +5
		2530-93-000	ARTICUL/EZE Trial Grooved Head 32 +9
		2530-94-000	ARTICUL/EZE Trial Grooved Head 32 +13
		2522-00-502	Original Stem Introducer

2522-00-503	Alternative Stem Introducer
200-165-000	Femoral Head Impactor

C-STEM AMT	Cement Restrictor Kit	C-STEM to C-S	TEM AMT Conversion Kit
Cat. No.	Description	Cat. No.	Description
5460-02-000	Cement Restrictor Inserter	2580-00-045	C-STEM to AMT Hi Neck Segment 1
		2580-00-046	C-STEM to AMT Hi Neck Segment 2
5460-30-000	SS Cement Restrictor Trial 1	2580-00-047	C-STEM to AMT Hi Neck Segment 3
5460-32-000	SS Cement Restrictor Trial 2	2580-00-048	C-STEM to AMT Hi Neck Segment 4
5460-34-000	SS Cement Restrictor Trial 3	2580-00-049	C-STEM to AMT Hi Neck Segment 5
5460-36-000	SS Cement Restrictor Trial 4	2580-00-050	C-STEM to AMT Hi Neck Segment 6
5460-38-000	SS Cement Restrictor Trial 5	2580-00-051	C-STEM to AMT Hi Neck Segment 7
5460-40-000	SS Cement Restrictor Trial 6	2580-00-052	C-STEM to AMT Hi Neck Segment 8
5460-42-000	SS Cement Restrictor Trial 7	2580-00-034	C-STEM to AMT Standard Neck Segment 1
		2580-00-035	C-STEM to AMT Standard Neck Segment 2
End Caps and	Centralisers	2580-00-036	C-STEM to AMT Standard Neck Segment 3
Cat. No.	Description	2580-00-037	C-STEM to AMT Standard Neck Segment 4
9612-21-000	C-STEM End Cap (Resorbable)	2580-00-038	C-STEM to AMT Standard Neck Segment 5
9612-26-000	C-STEM End Cap (PMMA)	2580-00-039	C-STEM to AMT Standard Neck Segment 6
		2580-00-040	C-STEM to AMT Standard Neck Segment 7
Void Centralis	ers	2580-00-041	C-STEM to AMT Standard Neck Segment 8
Cat. No.	Description		
9612-10-500	C-STEM Void Centraliser Size 10	2580-00-056	C-STEM AMT X-ray Templates
9612-12-500	C-STEM Void Centraliser Size 12		
9612-14-500	C-STEM Void Centraliser Size 14	2580-00-059	C-STEM to AMT Conversion Kit
9612-16-500	C-STEM Void Centraliser Size 16		
9612-18-500	C-STEM Void Centraliser Size 18	2570-20-000	Canal Sizers Size 8-9
9612-20-500	C-STEM Void Centraliser Size 20	2570-21-000	Canal Sizers Size 10 -11
5012 20 500		2570-22-000	Canal Sizers Size 12-13
SUMMIT to C-	STEM AMT Conversion Kit	2570-23-000	Canal Sizers Size 14-15
Cat No	Description	2570-24-000	Canal Sizers Size 16-17
2580-00-085	C-STEM AMT Broach Size 1	2570 24 000	
2580-00-086	C-STEM AMT Broach Size 7	2570-00-005	SUMMIT Lateraliser
2580-00-080	C-STEM AMT Broach Size 3	2370-00-003	Solvinin Lateraliser
2580-00-087	C-STEM AMT Broach Size J	2570-01-600	SUMMIT Universal Neck Resection Guide
2580-00-080	C-STEM AMT Broach Size 4	2370-01-000	Solvinin oniversal neck nesection duite
2580-00-089	C STEM AMT Broach Size 5		
2580-00-090	C STEM AMT Broach Size 7		
	C STEM AMT Broach Size 7		
2560-00-092	C-STEIN AINT DIOACH SIZE 6		
2580-00-058	C-STEM AMT Broach Instrument Tray		
2580-00-056	C-STEM AMT X-ray Templates		
2522-00-502	Original Stem Introducer		
2522-00-503	Alternative Stem Introducer		

### ORDERING INFORMATION

C-STEM AMTFemoral ImplantsCat. No.Description1570-24-095C-STEM AMT CDH Standard Offset1570-24-091C-STEM AMT Size 1A Standard Offset1570-24-092C-STEM AMT Size 2A Standard Offset1570-24-093C-STEM AMT Size 3A Standard Offset

1570-04-070C-STEM AMT Size 1 Standard Offset1570-04-085C-STEM AMT Size 2 Standard Offset1570-04-090C-STEM AMT Size 3 Standard Offset1570-04-100C-STEM AMT Size 4 Standard Offset1570-04-110C-STEM AMT Size 5 Standard Offset1570-04-120C-STEM AMT Size 6 Standard Offset1570-04-135C-STEM AMT Size 7 Standard Offset1570-04-150C-STEM AMT Size 8 Standard Offset

 1570-14-070
 C-STEM AMT Size 1 High Offset

 1570-14-085
 C-STEM AMT Size 2 High Offset

 1570-14-090
 C-STEM AMT Size 3 High Offset

 1570-14-100
 C-STEM AMT Size 4 High Offset

 1570-14-100
 C-STEM AMT Size 5 High Offset

 1570-14-110
 C-STEM AMT Size 6 High Offset

 1570-14-120
 C-STEM AMT Size 6 High Offset

 1570-14-135
 C-STEM AMT Size 7 High Offset

 1570-14-150
 C-STEM AMT Size 8 High Offset

 1570-24-087
 C-STEM AMT Long 2 Standard Offset

 1570-24-088
 C-STEM AMT Long 3 Standard Offset

 1570-24-089
 C-STEM AMT XL205 3 Standard Offset

 1570-24-094
 C-STEM AMT XL240 3 Standard Offset

 1570-24-085
 C-STEM AMT Long 2 High Offset

 1570-24-086
 C-STEM AMT Long 3 High Offset

#### ARTICUL/EZE 12/14 BIOLOX DELTA Head 28 mm Cat. No. Description

1365-28-31028 mm 12/14 ARTICUL/EZE BIOLOX delta Head Neck Length +1.51365-28-32028 mm 12/14 ARTICUL/EZE BIOLOX delta Head Neck Length +51365-28-33028 mm 12/14 ARTICUL/EZE BIOLOX delta Head Neck Length +8.5

#### ARTICUL/EZE 12/14 BIOLOX DELTA Head 32 mm

#### Cat. No. Description

 1365-32-310
 32 mm 12/14 ARTICUL/EZE BIOLOX *delta* Head Neck Length +1

 1365-32-320
 32 mm 12/14 ARTICUL/EZE BIOLOX *delta* Head Neck Length +5

 1365-32-330
 32 mm 12/14 ARTICUL/EZE BIOLOX *delta* Head Neck Length +9







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#### ARTICUL/EZE 12/14 BIOLOX DELTA Head 36 mm

#### Cat. No. Description

1365-36-310	36 mm 12/14 ARTICUL/EZE BIOLOX delta Head Neck Length +1.5
1365-36-320	36 mm 12/14 ARTICUL/EZE BIOLOX <i>delta</i> Head Neck Length +5
1365-36-330	36 mm 12/14 ARTICUL/EZE BIOLOX delta Head Neck Length +8.5
1365-36-340	36 mm 12/14 ARTICUL/EZE BIOLOX <i>delta</i> Head Neck Length +12

#### DELTAMOTION® DELTA Heads

Description
S -3.0 mm Modular 12/14 sleeve Small
M +0 mm Modular 12/14 sleeve Medium
L +4.0 mm Modular 12/14 sleeve Large
XL+7.0 mm Modular 12/14 sleeve Extra Large

167132F	32 Head
167136F	36 Head
167140F	40 Head
167144F	44 Head
167148F	48 Head

#### ARTICUL/EZE12/14 Cobalt Chrome Head 22.225 mm

Cat. No.	Description
136529000	ARTICUL/EZE Cobalt Chrome 22.225 mm Modular Head +4
136530000	ARTICUL/EZE Cobalt Chrome 22.225 mm Modular Head +7

#### ARTICUL/EZE 12/14 ULTAMET Head 28 mm

Cat. No.	Description
1365-11-500	28 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +1.5
1365-12-500	28 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +5
1365-13-500	28 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +8.5

#### ARTICUL/EZE 12/14 ULTAMET Head 36 mm

Cat. No.	Description
1365-50-000	36 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length -2
1365-51-000	36 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +1.5
1365-52-000	36 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +5
1365-53-000	36 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +8.5
1365-54-000	36 mm 12/14 ARTICUL/EZE ULTAMET Head Neck Length +12

For Complete Code Listings for PINNACLE please use 9080-10-000 PINNACLE Reference Guide

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# ORDERING INFORMATION

Femoral Revis	ion	Kit
Cat No.		Description
2709-01-001	1	Crochet Hook
2709-01-002	2	Flag Splitter
2709-01-003	3	V Splitter
2709-01-004	4	Straight Gouge
2709-01-005	(5)	Modified Angled Gouge
2709-01-006	6	Reverse Curette 6 mm x 432 mm
2709-01-007		Reverse Curette 7 mm x 432 mm
2709-01-008	7	Chisel 8 mm x 432 mm
2709-01-010	8	7 mm "X" Osteotome
2709-01-011	6	Reverse Curette 11 mm x 432 mm
2709-01-012	9	Conical Tap 9 mm
2709-01-013		Conical Tap 11 mm
2709-01-014		Twist Drill 6.4 mm
2709-01-015		Twist Drill 8 mm
2709-01-016	10	Rongeur with Serrated Teeth 300 mm
2709-01-100		Femoral Delivery System

#### Acetabular Revision Kit Cat No. Description

cut No.		Description
2709-02-001	(11)	Acetabular Gouge 48 mm x 13 mm
2709-02-002		Acetabular Gouge 52 mm x 13 mm
2709-02-003		Acetabular Gouge 56 mm x 13 mm
2709-02-004	(12)	Curved Acetabular Chisel
2709-02-005	(13)	Round Acetabular Cement Splitter
2709-02-006	(14)	Slotted Mallet with Delrin Cap
2709-02-007	(15)	Acetabular Component Gripper
2709-02-008	(16)	Acetabular Component Forceps
2709-02-100		Acetabular Delivery System

#### Hip Revision Extractor Kit

Cat No.		Description
2709-03-001	(17)	Femoral Extractor Slap Hammer
2709-03-002	(18)	Universal Mod Stem Extractor
2709-03-003	(19)	One-Piece Stem Adapter
2709-03-004	20	Closed Looped Extractor
2709-03-005	21	Hook Stem Extractor
2709-03-006	22	Locking Pliers
2709-03-007		Locking Pliers Slap Hammer Adapter



Flexible Osteotome Kit		Trephine set			
Cat No.		Description	Cat No.		Description
2709-04-001	23	Handle with Quick-Couple End	2709-05-001	27	Slap Hammer Shaft
2709-04-002		Small Slap Hammer	2709-05-002	28)	Quick Connect T-Handle
2709-04-004	24)	Thin Osteotome 8 mm x 76 mm	2709-05-003		T-Bar Stem Extractor
2709-04-005		Thin Osteotome 10 mm x 76 mm	2709-05-004	29	Wrench
2709-04-006		Thin Osteotome 12 mm x 76 mm	2709-05-100		Trephine Delivery System
2709-04-007		Thin Osteotome 20 mm x 76 mm	2709-05-110	30	Trephine 11 mm ID x 203 mm
2709-04-008	25	Thin Osteotome Curved 12 mm	2709-05-115		Trephine 11.5 mm ID x 203 mm
2709-04-009		Thin Osteotome Curved 20 mm	2709-05-120		Trephine 12 mm ID x 203 mm
2709-04-010		Thin Osteotome 8 mm x 127 mm	2709-05-125		Trephine 12.5 mm ID x 203 mm
2709-04-011		Thin Osteotome 10 mm x 127 mm	2709-05-130		Trephine 13 mm ID x 203 mm
2709-04-012		Radial Osteotome 10 mm x 127 mm	2709-05-135		Trephine 13.5 mm ID x 203 mm
2709-04-013		Radial Osteotome 12 mm x 127 mm	2709-05-140		Trephine 14 mm ID x 203 mm
2709-04-014		Radial Osteotome 14 mm x 127 mm	2709-05-145		Trephine 14.5 mm ID x 203 mm
2709-04-015		Radial Osteotome 16 mm x 127 mm	2709-05-150		Trephine 15 mm ID x 203 mm
2709-04-016		Radial Osteotome 20 mm x 127 mm	2709-05-155		Trephine 15.5 mm ID x 203 mm
2709-04-017		Extra Long Osteotome 8 mm x 229 mm	2709-05-160		Trephine 16 mm ID x 203 mm
2709-04-018	26	Flex Chisel Blade 8 mm x 64 mm	2709-05-165		Trephine 16.5 mm ID x 203 mm
2709-04-019		Flex Chisel Blade 10 mm x 64 mm	2709-05-170		Trephine 17 mm ID x 203 mm
2709-04-020		Flex Chisel Blade 12 mm x 64 mm	2709-05-175		Trephine 17.5 mm ID x 203 mm
2709-04-021		Flex Chisel Blade 20 mm x 64 mm	2709-05-180		Trephine 18 mm ID x 203 mm
2709-04-022		Flex Chisel Blade 8 mm x 127 mm	2709-05-185		Trephine 18.5 mm ID x 203 mm
2709-04-023		Flex Chisel Blade 10 mm x 127 mm	2709-05-190		Trephine 19 mm ID x 203 mm
2709-04-024		Flex Chisel Blade 12 mm x 127 mm	2709-05-195		Trephine 19.5 mm ID x 203 mm
2709-04-025		Flex Chisel Blade 20 mm x 127 mm	2709-05-200		Trephine 20 mm ID x 203 mm
2709-04-100		Flex Osteotome Delivery System	2709-05-205		Trephine 20.5 mm ID x 203 mm
			2709-05-210		Trephine 21 mm ID x 203 mm
JUL 1			2709-05-215		Trephine 21.5 mm ID x 203 mm
			2709-05-220		Trephine 22 mm ID x 203 mm
11			2709-05-225		Trephine 22.5 mm ID x 203 mm

2709-05-230

2709-05-235

2709-05-240

23)

22)

Trephine 23.5 mm ID x 203 mm Trephine 24 mm ID x 203 mm

30

29

Trephine 23 mm ID x 203 mm

(21)

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(19)

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(17)

(18)

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(16)

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