FLH223 0711

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BIOMET®

One Surgeon. One Patient.

Oxford Revision System

Femoral Component
Surgical Technique

The Oxford Revision System is based upon the design of the Bi-Metric total hip system and has taken forward many of the design features which have contributed to its widespread clinical success.[1,2]

- Bi-planar taper
- Clinically Proven PPS Coating
- Forged titanium alloy
- 130° CCD angle

The Bi-Metric basic design has been modified in the following manner to create a highly functional and simple revision system.

- Clinically Proven PPS Coating [4,5]
- Fully HA coated
- Built in 12.5° anteversion
- Targeted distal locking
- Varying stem lengths 200, 250 and 300 mm

Disclaimer

Biomet does not practice medicine and is not responsible nor does it recommend for the selection of any particular orthopaedic implant or surgical technique for use on a specific patient. The surgeon who performs any implant procedure is responsible for determining and utilising the appropriate techniques for implanting prosthesis in each individual patient.

Biomet is not responsible for selection of the appropriate orthopaedic implant or surgical technique nor does it advocate a particular technique to be utilised on a individual patient.

We would like to offer thanks to Mr Peter Mclardy-Smith F.R.C.S and Senior Sister Victoria Flanagan of the Nuffield Orthopaedic Centre Oxford for their contribution to the design and attention to detail in the construction of the operative technique which follows.

Contents

Paprosky Femoral Deficiency Classification

Paprosky Type II:

A femur with a type-II defect has extensive loss of metaphyseal cancellous bone and an intact diaphysis. This type of defect often is encountered after the removal of a cemented femoral component.[3]

Paprosky Type IIIA:

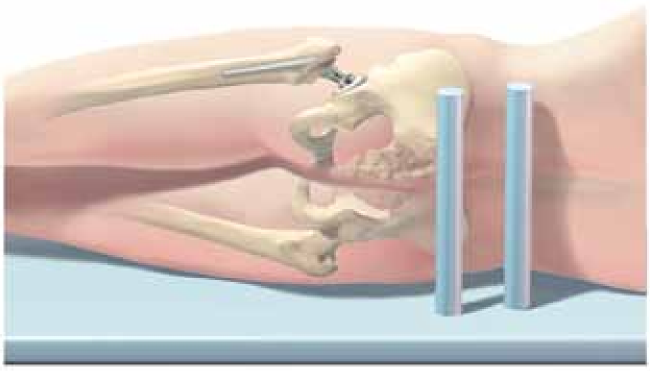
A femur with a type-IIIA defect is one in which the metaphysis is severely damaged and non-supportive and there is >4 cm of intact diaphyseal bone available for distal fixation. This type of defect is commonly seen after the removal of a grossly loose femoral component that was inserted with first-generation cementing techniques. [3]

Paprosky Type IIIB:

A femur with a type-IIIB defect is one in which the metaphysis is serverely damaged and non-supportive and there is <4 cm of diaphyseal bone available for distal fixation. This type of defect is often seen following the failure of a cemented femoral component that was inserted with a cement restrictor or a cementless femoral component that is associated with substantial distal osteolysis. [3]

Paprosky Type IV:

A femur with a type-IV defect has extensive metaphyseal and diaphyseal damage in conjunction with a widened femoral canal. The isthmus is non-supportive. [3]



Pre-operative Planning

Selection of an appropriate component is achieved by careful pre-operative planning. This can be visualized manually by means of x-ray templates, or digitally by means of a PAC system. In revision surgery it is recommended that full femoral AP and Lateral x-rays are utilized in order to accurately gauge the full extent of damage to the femur and or femoral canal.

Manual Pre-operative Planning

The Oxford Revision System femoral component provides a comprehensive selection of femoral x-ray templates in 100%, 110%, 115% and 120% magnification. These templates are positioned over the AP and Lateral x-rays in order to best determine the correct component size, length and appropriate modular head to restore the patient's natural anatomy and function.

Digital Pre-operative Planning

The Oxford Revision System femoral component digital templates are available through various digital template providers. When using digital templating for a revision THR, it is necessary to use a magnification marker with a known dimension. This is required in order for the PAC system to calculate the correct magnification from a known value.

As soon as the correct magnification has been determined, the PAC system can be used to best determine the correct component size, length and appropriate modular head required to restore the patient's natural anatomy and function.

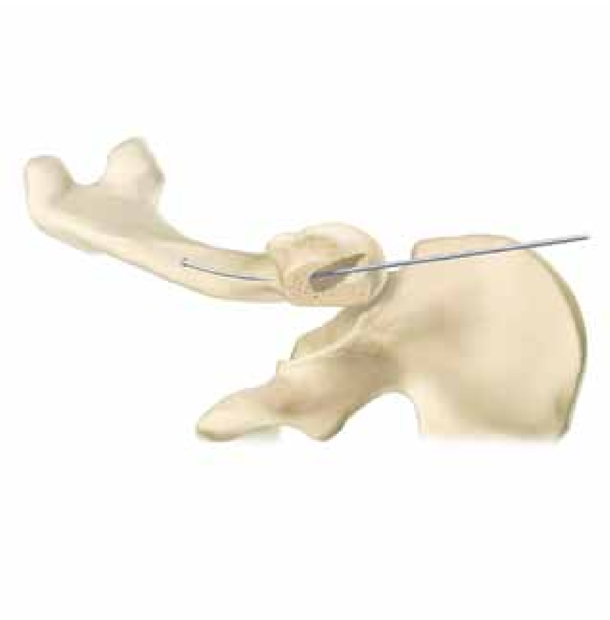
Surgical Exposure

The Oxford Revision System femoral component can be implanted using any of the standard approaches for total hip replacement. The approach selected is to provide adequate visualisation of the femur and any potential bone defects that may require additional surgical attention.

Removal of a Failed Implant

The technique or method of removal of the failed implant is best decided by the operating surgeon and will usually depend on the type of component originally implanted, the amount of bone loss viewed during the pre-operative planning and the type of indication being treated.

In surgical cases where cemented components are being revised, it is important to ensure all cement is removed from the intramedullary canal as any remaining cement may deflect the reamer during reaming process, or indeed impair the cementless fixation on which the Oxford Revision System depends.



Preparation of the Femur for Extensive Bone Loss Indications

After removal of the cement and or fibrous debris from the femoral canal, an olive tipped guide wire is placed inside the femoral canal so that flexible reaming can commence.

Commence reaming with reamers of diameter 2-3 mm below that of the estimated stem diameter ensuring that the reamers pass down the femoral canal in accordance with the length of stem templated. Trial stems can also be used to gauge if the planned diaphyseal diameter and length have been reached.

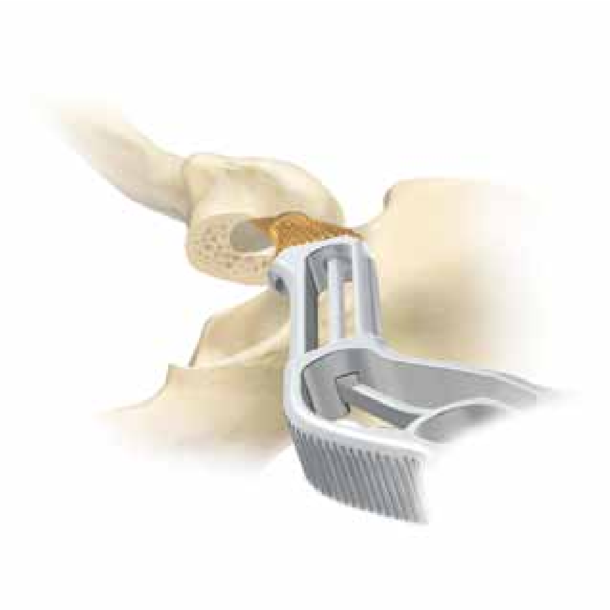
The 5^{+} revision reaming set provided with the Oxford Revision System has cannulated shafts for use with interchangable reaming tips in 0.5 mm increments from 10 mm to 24 mm and should be used over 3.2 mm olive tipped guide wire.

The femoral diaphysis is then reamed in 0.5 mm increments until cortical chatter is encountered. This is the first operative guide to the actual diameter of the definitive femoral component.

Reaming the Proximal Femur

Once the femur has been cleared of any debris, the flexible reamer and guide wire can be removed so that the proximal femur can be sized and prepared. Start reaming the metaphyseal/diaphyseal junction with taper reamers 2-3 mm smaller in diameter than the last flexible reamer. Increase the diameter until the last taper reamer matches the diameter of the last flexible reamer, ensuring the 'zero' indicator on the reamer shaft is at least 10 mm lower than the tip of the greater trochanter. This ensures that proximal jamming will not occur at the metaphyseal/diaphyseal junction before distal engagement occurs. Trial stems can be used to ensure jamming will not happen and to confirm the expected diameter.

Note: Tapered reaming should not be carried out using power tools.



Broaching the Proximal Femur

Select the broach two sizes smaller than the last tapered reamer used and sequentially broach the proximal femur until the last broach used corresponds to the last tapered reamer. Attach the broach to the broach handle as shown and begin preparing the proximal femur. These broaches are designed to follow the cavity prepared by the tapered reamers longitudinally, but rotation (anteversion) is set at this point. The broach will tend to fit into the shape of the metaphysis but this may not be the correct anteversion.

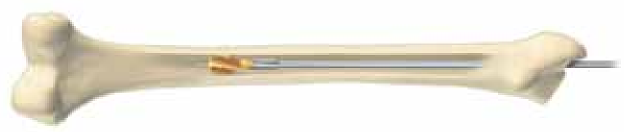
It is important to note that the Oxford Revision System femoral component has 12.5 degrees of anteversion built into the proximal body design. Therefore, over anterverting the broach is not necessary.

Broaching should be carried out until the broach is longitudinally stable within the metaphyseal portion of the femur. At this point in the procedure the broach may not be rotationally stable, but rotational stability may be achieved by the distal fixation.

When the broach is fully seated within the metaphysis a trial reduction can take place. First remove the rasp handle from the rasp and then attach the trial neck labeled LAT to the rasp. The trial modular head can then be attached to the trial neck.The diameter and neck length of the trial head should correspond to the articulation diameter of the acetabular bearing and the neck length with that chosen at the pre-operative analysis. However, it may be necessary to adjust the neck length to achieve optimum joint stability and leg length.

It is advisable when trialing not to plan for the shortest head option available.This is because the definitive component may sit proud at the trial rasp position, depending on where the component comes into the contact with bone and the level of interference fit achieved. If this does occur, you risk increasing the leg length. To avoid this ensure the rasp sits a few millimeters lower than the calcar. The final taper reamer may be used to remove some bone from the inner surface of the calcar allowing the rasp trial to seat a little more distally. Creating a calcar groove can also help confer rotational stability.

Note: The Oxford Revision System utilises Biomet's Type 1 taper.



Preparing the Distal Femur

Once the proximal femur has been fully prepared with tapered reamers and broaches, it is necessary to re-introduce the flexible reamers into the femoral canal to remove any mismatch between the metaphyseal and diaphyseal portion of the femoral canal and prepare the diaphysis for the femoral component.

It is advisory to over- ream the diaphysis by at least 1 mm to 1.5 mm larger than the proximal portion to allow for the anterior bow of the component and for the fact that the component is fully porous coated. See table 1.

If a short amount of cortical chatter is encountered during this reaming process then a 1mm over-ream is may be sufficient. If longer cortical chatter is encountered then a 1.5 mm over-ream is usually appropriate.

Note: Failure to over-ream the femur to allow for the anterior bow and porous coating may result in a femoral fracture

Oxford Revision System Sizing Rationale		
Stem Size	**Forging Plus Porous & HA Coating**	**Avaliable Lengths**
Ø11	~12.5 mm	200/250/300 mm
Ø13	~14.5 mm	200/250/300 mm
Ø15	~16.5 mm	200/250/300 mm
Ø17	~18.5 mm	200/250/300 mm
Ø19	~20.5 mm	200/250/300 mm

Note: A 1.5 mm over ream compared to stem size is effectively line to line reaming.

Table 1
Showing the actual diameter for each implant

Insertion of Trial Oxford Revision System Femoral Stems

Once the femoral preparation is completed, trial stems are available and must be used at this point. The trial stem is identical to the final implant minus the porous coating, but in some cases may not closely match the patient's actual femoral bow sufficiently closely. If it is possible to insert the trial by hand to within about 20 mm of the desired level and it is rotationally stable, or if it is rotationally stable at the desired level then proceed to the insertion of the final femoral component, particularly if the desired level of the trial is in the mid range of head/neck length options. If the trial will not seat to within 20 mm of the desired level, it is recommended to return to the flexible reamers and continue to over-ream in 0.5 mm increments until it will.

Note: Failure to over-ream the femur to allow for the anterior bow and porous coating may result in a femoral fracture.

If the trial is not rotationally stable at the desired level a trial of a longer stem of the same diameter (eg 13 mm x 200 mm to 13 mm x 250 mm) may be satisfactory. Alternatively, if a longer stem is not ideal, prepare for the next size up. This can be done very easily by returning to the reaming of the proximal femur with the taper reamers (e.g. 13 mm to 15 mm). Seat the larger broach (e.g. 13 mm to 15 mm) appropriately and ream up the distal femur with the flexible reamers by 2 mm (e.g. 14.5 mm to 16.5 mm). This should bring you back to the step where trial insertion is appropriate.

If cortical fixation on the trial seems to leave the metaphysis undersized, a clinical judgement can be made on the x-ray appearance of cortical thickness to use these steps to achieve a better metaphyseal match.

The trial femoral component is 1.5 mm smaller than the definitive implant, i.e. a 13 mm trial is 13 mm in diameter.

It is important to note that the distal tip of the stem should pass the most distal aspect of the defect by at least two and a half times the width of the canal.

In cases where substantial proximal bone loss is evident, it may be appropriate to augment the Oxford Revision System's fixation with distal screws.

However, do not expect the screws alone to confer reliable long term longitudinal and rotational stability. This must be achieved by appropriate preparation and stem selection. If screws are to be used, it is important to note they are most useful to aid rotational stability of the distal fragment in a peri-prostheic fracture.

The insertion of the trial component is carried out using the trial stem insertion/extraction instrument. A further trial reduction can then take place to assess the correct neck length of the selected femoral head.

Insertion of Oxford Revision System Femoral Component

When the femur has been fully prepared in accordance with instructions above, it will be possible to insert the final component. As these components are cementless and the component to be implanted is normally the same diameter as the last broach used, it is important to ensure the correct size, orientation and length of implant is selected.

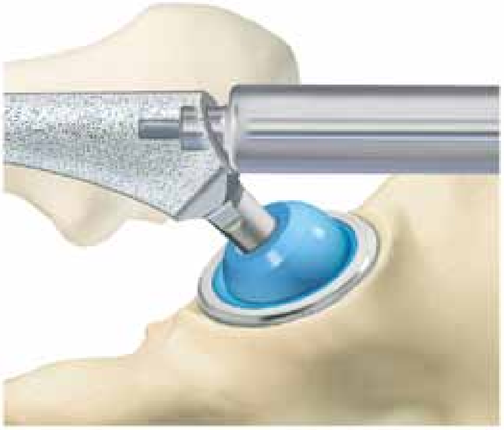
Note: Failure to follow this instruction may possibly result in a femoral fracture.

Attach the Oxford Revision System femoral component to the insertion device and insert the prosthesis into the canal until it reaches the desired position and full rotational and longitudinal stability is achieved. This should be possible with fairly gentle taps of the hammer.

If the component is not advancing with gentle taps at about 20 mm proud of the planned final level it is important to not hit it harder. At this stage it will still be possible to knock it back out and check preparation sizes, starting again with the taper reamer and broach preparation of the metaphysis and the trials. Usually one more distal over-ream by 0.5 mm with the flexible reamers is sufficient.

A final trial reduction can then take place to assess the appropriate modular femoral head neck length.

It is extremely important to take care when inserting the component into the femur, as an excess impaction force may possibly result in a femoral fracture.



Preparation of Distal Femur for Transverse Locking Screws

(Available in Ø13mm components and larger)

The ‘scratch fit’ between the plasma sprayed porous coating and the cortical bone should be usually sufficient to confirm primary stability. However, in cases where additional stability is required, the Oxford Revision System distal screws may be employed to further enhance distal fixation and stability. The need for distal screws is rare. However, in cases where proximal bone contact is compromised or in cases of fracture, screw fixation may be used to further enhance implant rotational stability.

Preparation of the distal femur for the transverse screws may be carried out by either percutaneous or open resection.

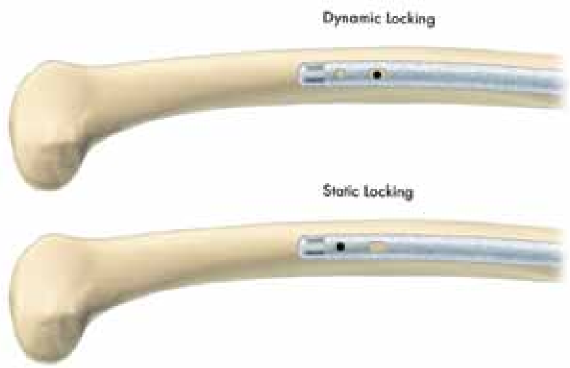
Should distal screw fixation be required, the distal targeting device may be used to insert the femoral component or may be attached to the femoral component after the component has been inserted into the femur. Before commencing preparation for locking screws it is essential that the component is stable and fully seated within the femur.

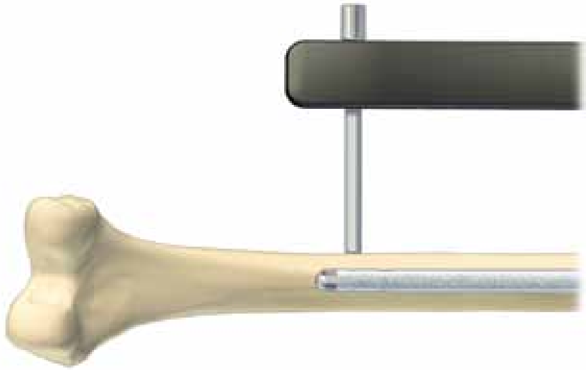
Assembly of Distal Targeting Device

Align the oval key that forms part of the distal targeting device with the ‘slotted’ impaction hole on the shoulder of the Oxford Revision femoral component.

Secure the distal targeting device in position with the locking bolt and hexagon t-wrench. The impaction handle may then be locked into the targeting arm implant assembly and used to implant the Oxford Revision femoral component. It is important not to over-tighten the locking bolt as over-tightening may prevent removal of the distal targeting device from the Oxford Revision femoral component when it’s fully seated within the femur.

Once the component is fully seated, commencement of distal locking can take place. There is a choice between static or dynamic fixation by selecting either the hole or the slot in the distal stem of the Oxford Revision femoral component. Once decided, the correct distal fixation drill hole can be prepared through the lateral cortex. In some cases, such as peri-prosthetic fractures, it may be advisable to utilize both distal holes in order to provide extra-rotational stability.

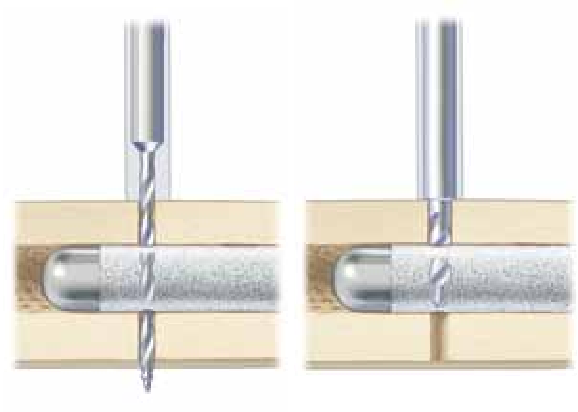




Drilling the Distal Femur

Before drilling can take place, it is advisable to ensure an 'image intensifier' is available so that drilling may take place under fluoroscopic control as the transverse screws for the Oxford Revision System Femoral Component are designed to lock into the medial cortex only.

Place the guide tube into the relevant hole in the distal targeting device ensuring the serrated tip of the guide tube is placed directly against the lateral cortex.



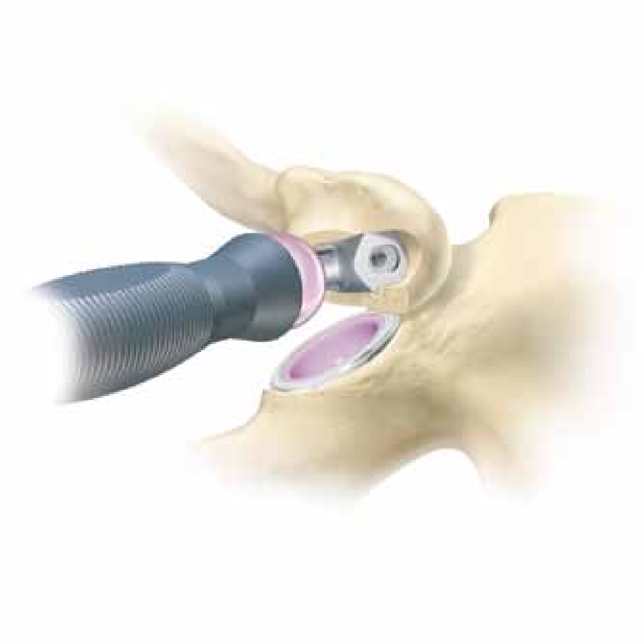
Take the 3.6 mm diameter drill (31-601511) and advance the drill through both cortices. Care should be taken when advancing the first drill as it is surgically sharp, and it may damage soft tissues on perforating the medial cortex. Remove the drill from the guide tube and advance the 5.1 mm diameter drill (31-601510) through the lateral cortex only. In practice, it is not possible to over advance the second drill.

Placement of Transverse Locking Screws

When both medial and lateral cortices have been prepared, a depth gauge can be used to measure the distance across both cortices. The measurement taken from the depth gauge is then used to select the appropriately sized transverse screw. Transverse screws are 5.0 mm in diameter and in available in lengths 25 mm to 60 mm in 5 mm increments. (See table on page 12)

The transverse screw can then be secured in position by means of the 3.5 mm hexagon T-handle. Both the transverse screw and T-handle can be placed inside the guide tube and advanced towards the medial cortex until resistance is achieved. At this point, care must be taken when securing the transverse screw as over-tightening of the transverse screw can have an adverse affect on the fixation.

Once screw fixation is complete, the distal targeting device can be removed from the Oxford Revision System femoral component and if required, a further trial reduction may take place to determine the appropriate neck length.



Modular Head Impaction

The selected modular head is positioned on the clean male taper of the femoral stem with hand pressure only. Alternatively, a combination of hand pressure and a twisting motion can be used.

The modular head is finally seated in position by means of a gentle tap utilising the femoral head impaction device and hammer.

Modular heads should never be heavily impacted onto the trunnion as this may cause damage to the highly polished surface of the modular head.

Once the correct modular femoral head has been attached to the femoral component, the hip joint may be reduced.

Modular Head Removal

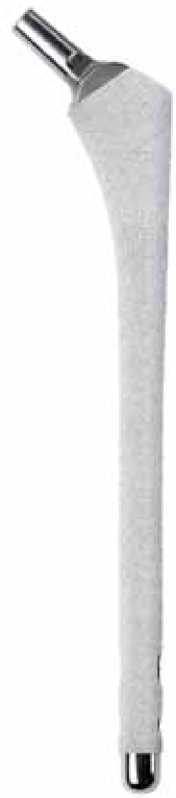
Should a modular head require replacing, included in the implant removal tray is a modular head removal instrument. This instrument locates either side of the taper and exerts a tensile force to eject the modular head.

Ordering Information

Implants

Femoral Components

Femoral Components Left-Biomet Type 1 Taper	Right	Left
Description	**Cat. No.**	**Cat. No.**
Oxford Rev System Fem Comp HA/PC Ø11 x 200 mm	650-0743	650-0723
Oxford Rev System Fem Comp HA/PC Ø11 x 250 mm	650-0744	650-0724
Oxford Rev System Fem Comp HA/PC Ø11 x 300 mm	650-0745	650-0725
Oxford Rev System Fem Comp HA/PC Ø13 x 200 mm	650-0746	650-0726
Oxford Rev System Fem Comp HA/PC Ø13 x 250 mm	650-0747	650-0727
Oxford Rev System Fem Comp HA/PC Ø13 x 300 mm	650-0748	650-0728
Oxford Rev System Fem Comp HA/PC Ø15 x 200 mm	650-0749	650-0729
Oxford Rev System Fem Comp HA/PC Ø15 x 250 mm	650-0750	650-0730
Oxford Rev System Fem Comp HA/PC Ø15 x 300 mm	650-0751	650-0731
Oxford Rev System Fem Comp HA/PC Ø17 x 200 mm	650-0752	650-0732
Oxford Rev System Fem Comp HA/PC Ø17 x 250 mm	650-0753	650-0733
Oxford Rev System Fem Comp HA/PC Ø17 x 300 mm	650-0754	650-0734
Oxford Rev System Fem Comp HA/PC Ø19 x 200 mm	650-0755	650-0735
Oxford Rev System Fem Comp HA/PC Ø19 x 250 mm	650-0756	650-0736
Oxford Rev System Fem Comp HA/PC Ø19 x 300 mm	650-0757	650-0737



*Components 13mm and larger include 2 distal fixation holes for transverse screw fixation

Modular Femoral Head Components - Type 1 Taper (T1)

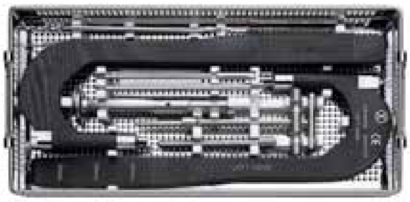
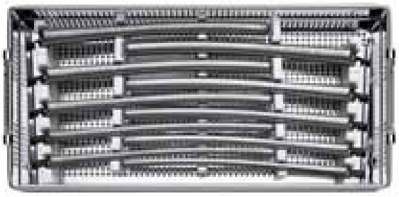
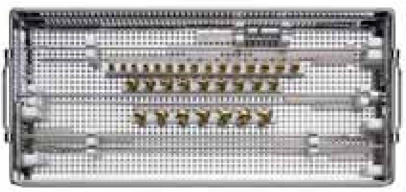
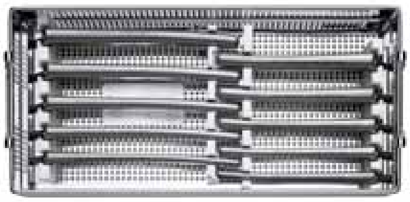
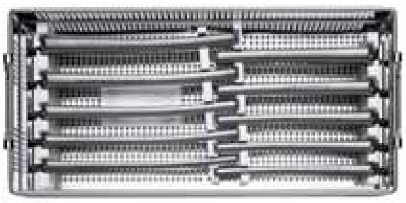
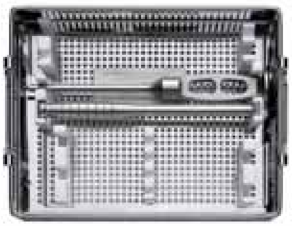
Neck Length	ABT CoCrMo M2A & UHMWPE			ABT Ceramic Biolox Delta Ceramic		
	28 mm	32 mm	36 mm	28 mm	32 mm	36 mm
-6 mm	650-0863	650-0870	650-0839	-	-	-
-3 mm	650-0864	650-0871	650-0840	164135	164185	650-0660
0 mm	650-0865	650-0872	650-0841	164136	164186	650-0661
+3 mm	650-0866	650-0873	650-0842	164137	164187	650-0662
+6 mm	650-0867	650-0874	650-0843	-	-	650-0663

Transverse Locking Screw

Transverse Locking Screw Ø5 mm	
Cat. No.	**Description**
CP250310	Kaessmann Transverse Screw Ø5 x 25 mm
CP250311	Kaessmann Transverse Screw Ø5 x 30 mm
CP250312	Kaessmann Transverse Screw Ø5 x 35 mm
CP250313	Kaessmann Transverse Screw Ø5 x 40 mm
CP250314	Kaessmann Transverse Screw Ø5 x 45 mm
CP250315	Kaessmann Transverse Screw Ø5 x 50 mm
CP250316	Kaessmann Transverse Screw Ø5 x 55 mm
CP250317	Kaessmann Transverse Screw Ø5 x 60 mm

Ordering Information

Instumentation

Instumentation

Femoral Component Instrumentation	
Cat. No.	**Description**
31-601011	Oxford Rev System Comp - Distal Targeting Instr Tray
31-601025	Oxford Rev System Comp - Trial 200 & 250 mm Left Stem Tray
31-601027	Oxford Rev System Comp - Trial 200 & 250 mm Right Stem Tray
31-601029	Oxford Rev System Comp - Trial 300 mm Left & Right Stems Tray
31-601071	Oxford Rev System Rev Comp - Insertion/Extraction Instr Tray
31-600185	+5 Revision Femoral Reaming System
31-601511	Stainless Steel Long Twist Drill Ø3.6 mm
31-601510	Stainless Steel Short Twist Drill Ø5.1 mm
31-600505	Oxford Rev System Comp - X-Ray Template Set

Additional Instumentation

Additional Instrumentation	
Cat. No.	**Description**
31-600002	Bi-Metric General Instrument Tray
31-600001A	Bi-Metric Rasp Tray
31-600000A	Bi-Metric I/M Tapered Reamer Tray
31-600003	Trial Modular Head Tray 22.2, 28 & 32 mm (T1)
31-600005	Modual Stem and Head Removal Instrument Tray

Notes

References

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