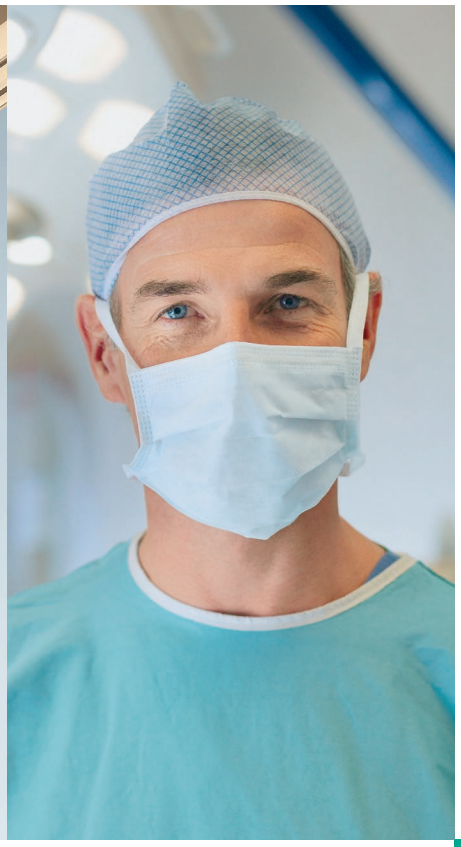
B BRAUN
SHARING EXPERTISE



ORTHOPAEDIC
SURGERY

AESCULAP® Columbus® Revision

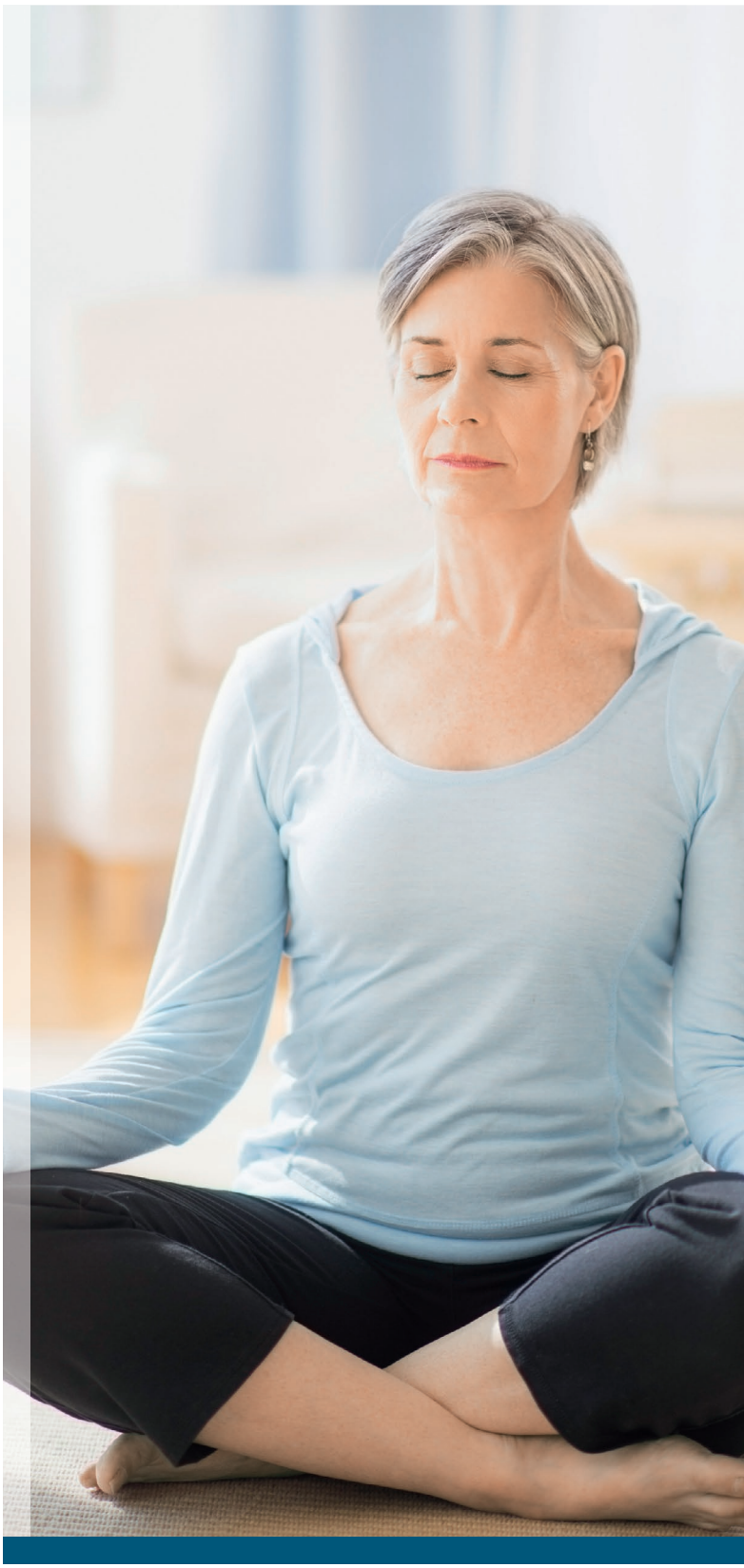
MANUAL SURGICAL TECHNIQUE

AESCULAP® Columbus® Revision

1 | CONTENTS

Columbus® Revision – WELL EQUIPPED FOR THE FUTURE

Due to today's growing demographic situation, revision operations will continue to play a significant role in the future.
The special challenges of these implant procedures require surgeons to pay maximum attention. The Columbus® Revision system has been designed to optimally support surgeons in providing proper treatment for their patients.
As a part of the Columbus® group of implants, the Columbus® Revision system offers manifold options. With two different levels of stability of the polyethylen gliding surfaces for the revision, the patients' specific ligament needs can be addressed. The cemented and cementless extension stems of different lengths and diameters allow for a stable anchorage of the implant; the offset is initiated close to the joint line. This way the implant can be positioned as desired without involuntary cortical impingement inside the diaphysis.
An extensive product portfolio including various implant sizes, augments, stem extensions and gliding surfaces gives the surgeon the flexibility to adapt the treatment to the patient. In addition, the optional AS Advanced Surface version can reduce the release of metal ions and improve wear properties, which was demonstrated during in-vitro experiments (1).
Precise implementation of the planning in the operating room is essential for the success of the procedure. The Columbus® Revision instruments are intended to achieve just that, serving as the surgeon's extension within the surgery theatre.



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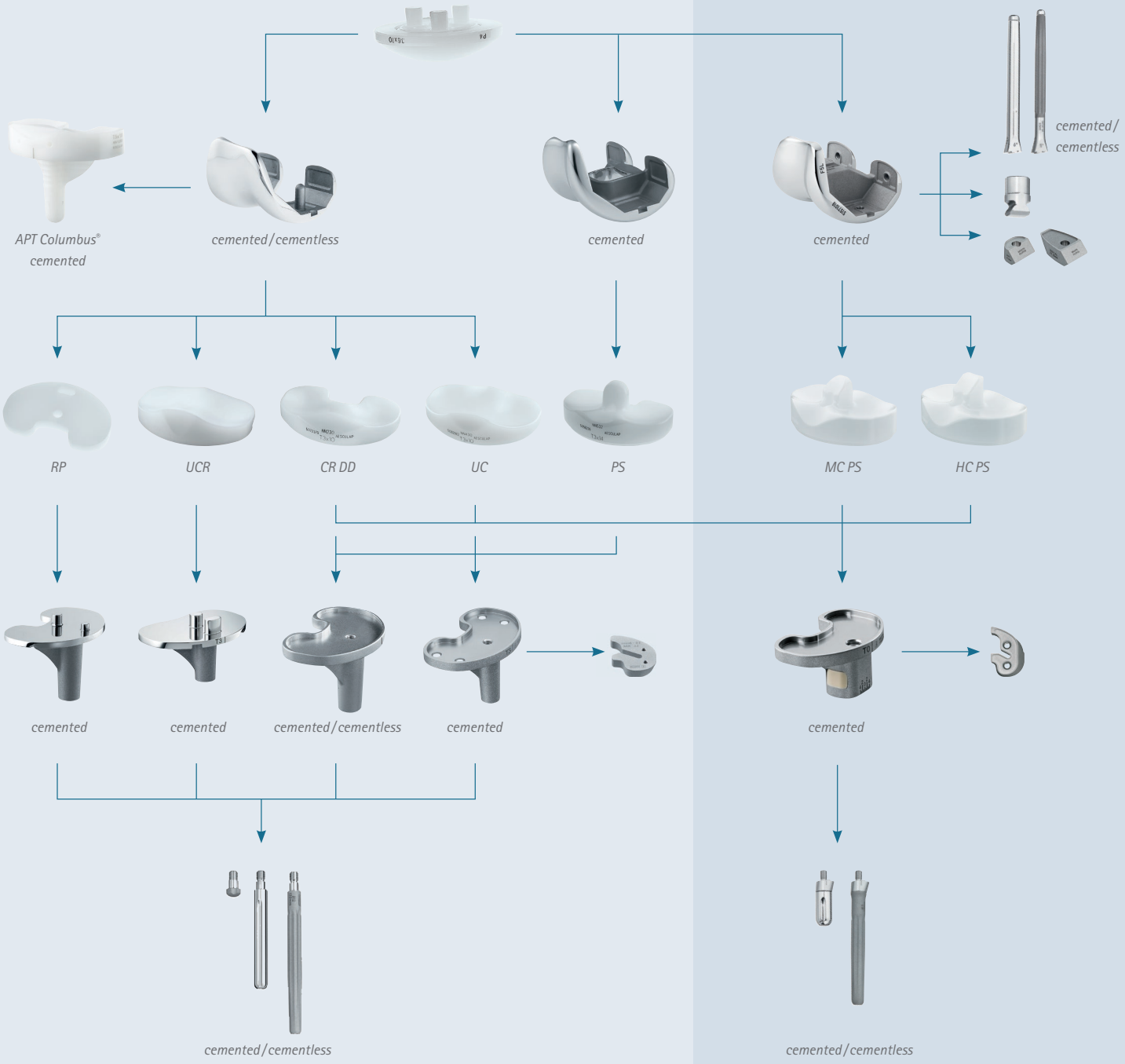
2 | Columbus® SYSTEM OVERVIEW

Columbus® Primary – Options

Columbus® Revision – Options



3 | PREOPERATIVE PLANNING

In order to achieve a successful treatment with the Columbus® Revision knee system, an in-depth analysis of any bone defects and if applicable, existing soft tissue dysfunctions, must be performed. If the primary endoprosthesis failed, it is mandatory to identify the causes of the failure in order to avoid repeat errors. For this purpose, it is recommended to consult the pre- and postoperative X-ray images. Further parameters to ensure optimal results include:

- Restoration of the joint line
- Proper axis alignment
- Functionality of the extensor mechanism
- Bone-sparing removal of the primary endoprosthesis
- Functional stability
- Evaluation of the soft tissue condition.

For the purposes of preoperative planning, Columbus® Revision X-ray templates are available for X-ray image analysis to help determine the following:

- The angle between the anatomical and mechanical
- Femoral axis;
- Resection heights;
- The size of the implants;
- The entry points of the intramedullary alignment;
- The necessity and dimensions of augments and extension stems.

Indications

Severe knee problems that cannot be alleviated through other therapies:

- Degenerative arthrosis
- Rheumatoid arthritis
- Post-traumatic arthrosis
- Symptomatic knee joint instability
- Knee-joint ankylosis
- Severe knee-joint deformities
- Revision and replacement surgeries

The Columbus® Revision knee system can be used in cases of insufficient collateral ligaments thanks to its varus/valgus stabilizing high constraint (HC) gliding surface. With the use of the medium constraint (MC) gliding surface, no varus/valgus stabilization takes place.

With both versions, the box-peg design transfers forces from one implant component to the other. To distribute this force also into the intramedullary canal, AESCULAP® strongly recommends using the Columbus® Revision Knee System exclusively with tibial and femoral extension stems.

Experience with the system has shown that a defect reconstruction with the available femoral and tibial augments up to and including defect sizes of the AORI* classification type IIB is recommendable.

Further information on indications and contraindications can be found in the instruction manual TA012000.

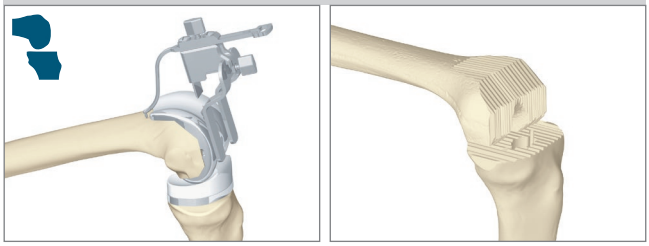
* Anderson Orthopaedic Research Institute

AESCULAP® Columbus® Revision

4 | OVERVIEW OF SURGICAL STEPS

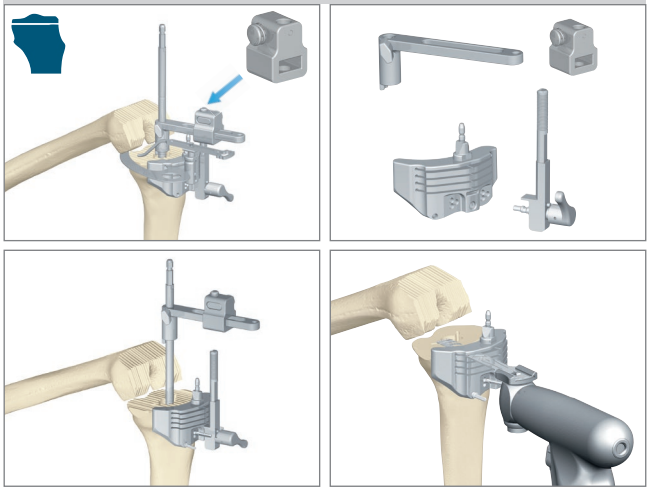
1

Set ant. reference mark and remove implants



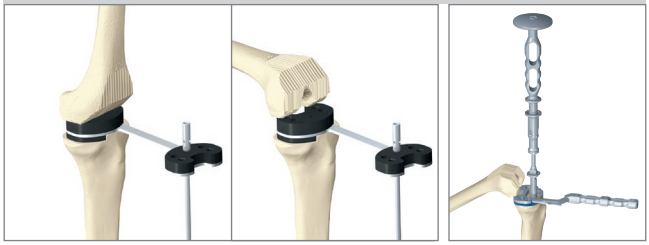
2

Resection of proximal tibia



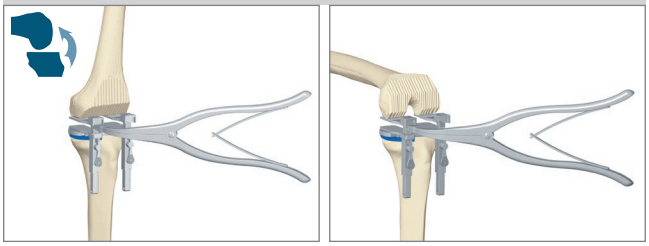
3

Gap balancing by spacer. Tibia and trial stem selection



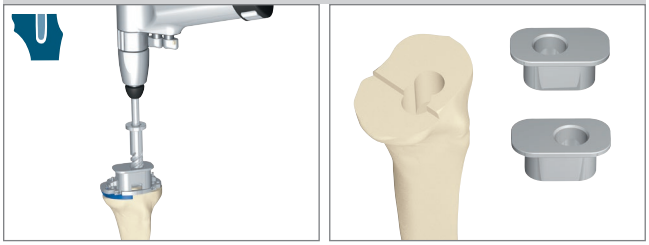
4

Option: Gap balancing by distractor

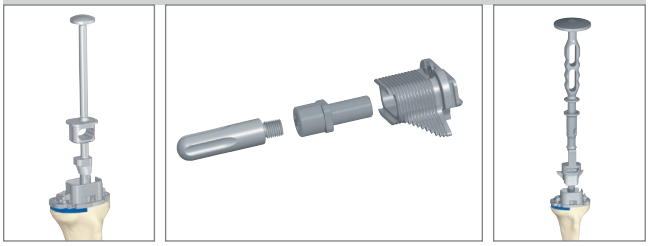


5

Tibia box preparation by drill

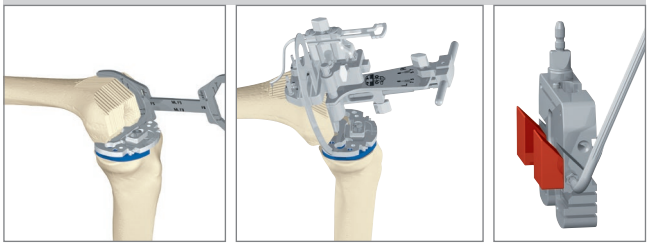


Tibia box broach preparation



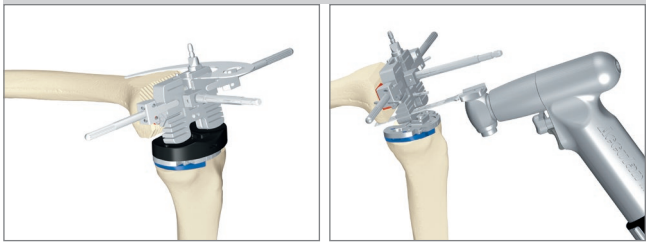
6

Define femur size. Resection of distal femur



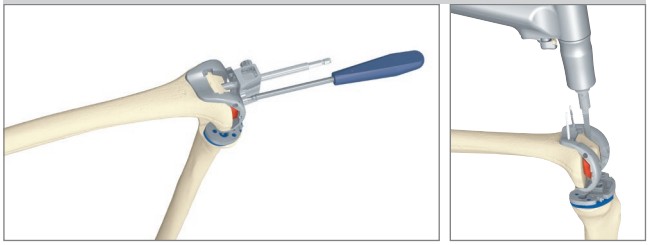
7

Resection of femoral 4-in-1 geometry



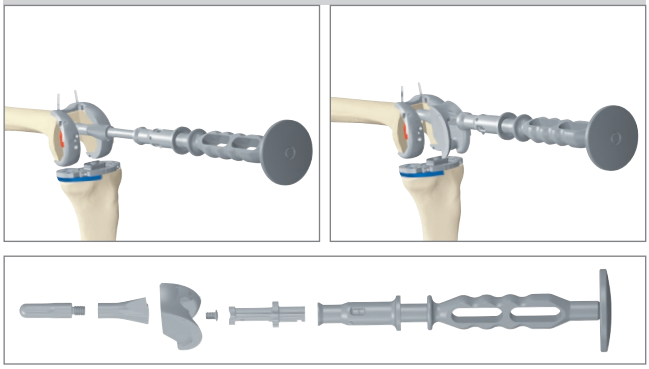
8

Resection of femoral box geometry



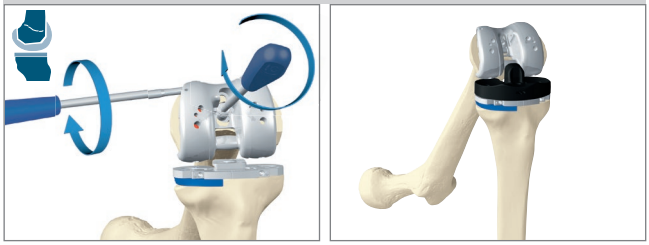
9

Femoral box preparation by rasp. Trial box impaction



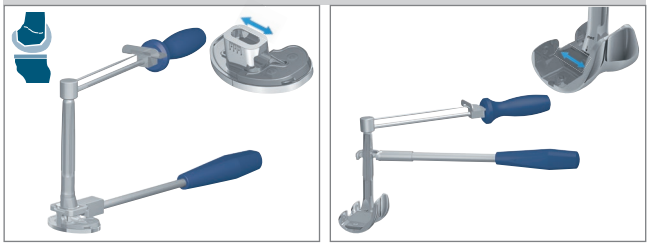
10

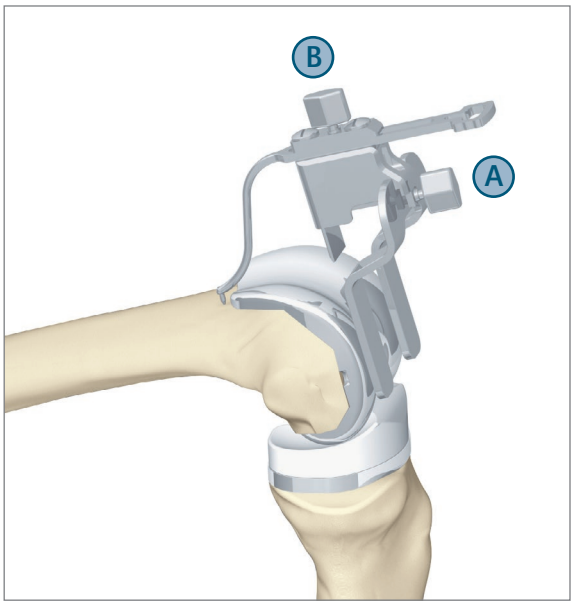
Fix femoral box and stem



11

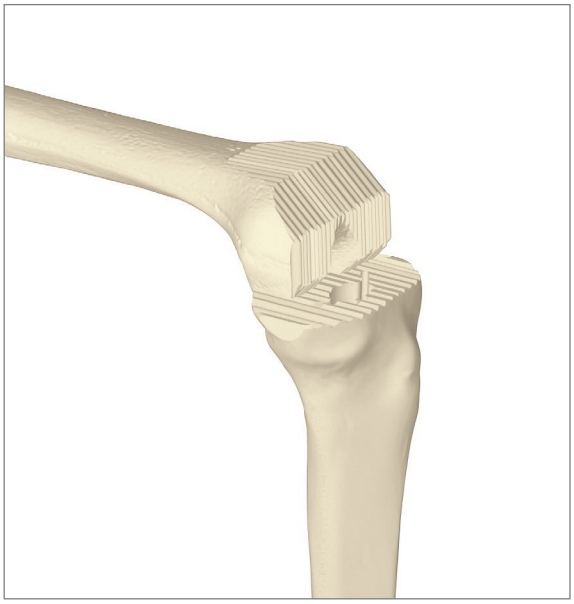
Adapt trial values to definitive implan





Set joint line reference

The joint line positioner is placed on the distal contact plate and screwed down with screw A. On the anterior side of the femur, a reference marking is made, for example, at the level where the primary femoral shield ends proximally. In this position, the joint line positioner is fixed using screw B. This will remain tightend during the remaining course of the surgery.



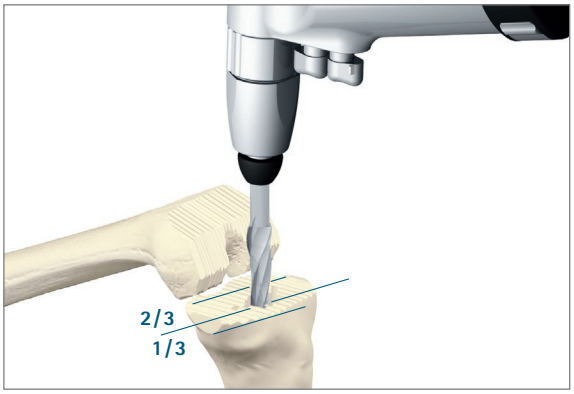
Remove all primary implants.

NOTE
The availability of the implants required according to preoperative planning is ensured using the implant matrix (see annex).

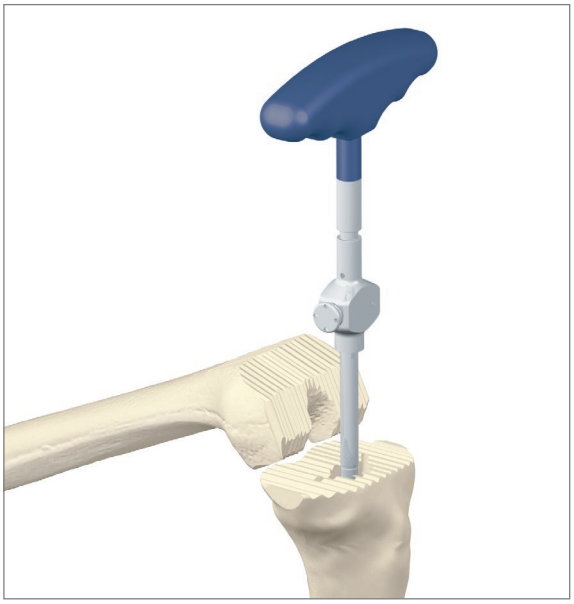
6 | TIBIA PREPARATION

This surgical guide describes the Tibia First technique. However, if the Femur First technique is used, the step "Femur Preparation" on page 19 will be performed first.

The entry point for the step drill and the IM alignment rod or the reamers is determined by means of X-ray images (AP distance 1/3 to 2/3 or via a tibial trial plateau).



With the reamers or the IM alignment rod, the intramedullary canal is reamed as deeply as possible with the long reamer until a stable anchorage for precise alignment of the axis is achieved. Following the tibial resection, it is reamed again to the required depth with the desired diameter in order to achieve pressfit in the case of a cementless stem fixation or, in the case of a cemented variant, to make room for the cement mantle. The reamers have markings for the different stem lengths. The depth reference is always the back side of the implant without augments. Since bone is removed during proximal resection, it may be necessary to increase the depth so that the stem can be inserted correctly. For cemented stems, a cement mantle of at least 1 mm is required.



NOTE

Cementless tibial stem implants have an excess size of 1 mm compared to the reamer. Reamers and implants are conically shaped up to 5.2 cm from the reamer tip. Therefore, the depth of the preparation is crucial.

WARNING

Too aggressive pressfit could lead to pain at the tip of the stem. Therefore, achieving a less aggressive glide fit is recommended.

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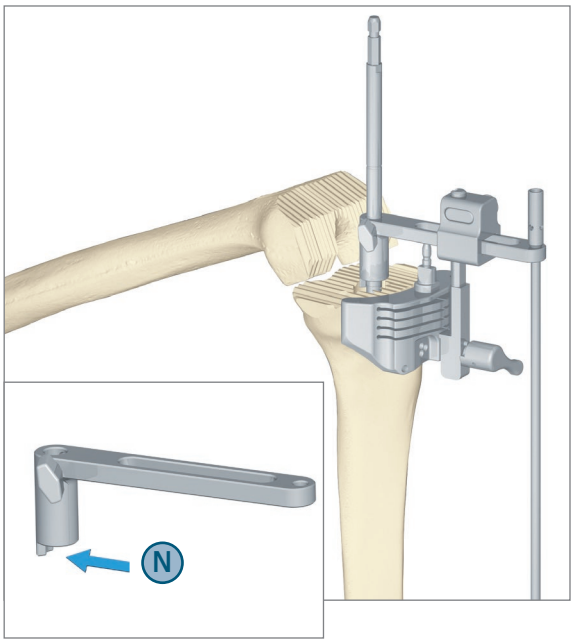
6 | TIBIA PREPARATION

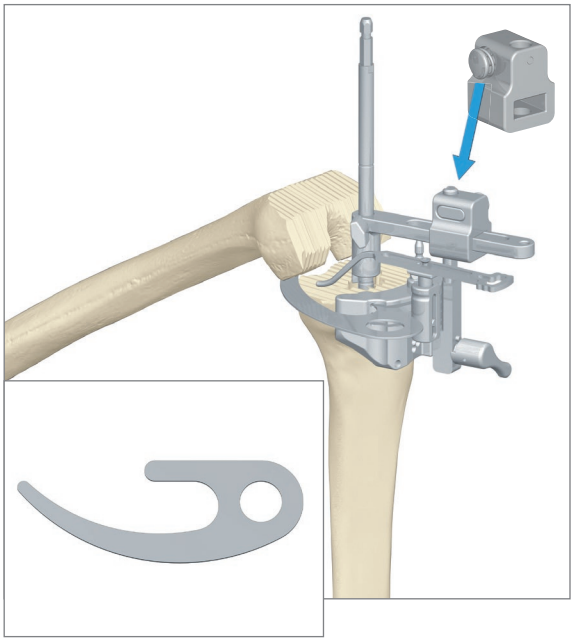


Intramedullary Alignment

The IM alignment system, including the tibial cutting block, is completely assembled and attached to the reamer. The posterior lug (N) should be at the same level here as the reamer marking.

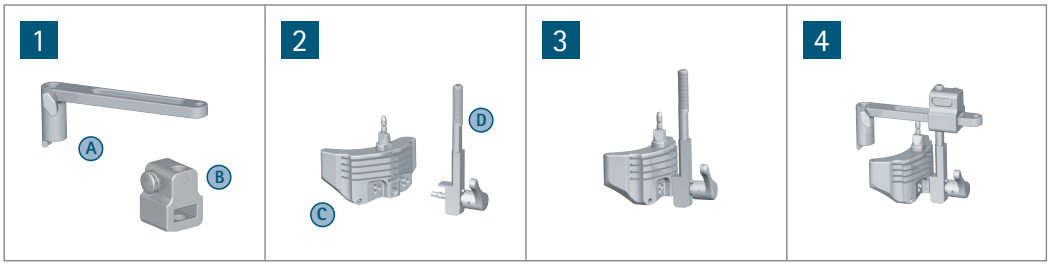
Option:
Using the alignment control rods, which are placed inside the bore of the slide rail, the position of the leg axis can be controlled.

1. Version:
The resection height is determined by means of the stylus in the cutting slot adjusted to the desired resection height. Fix this position by tightening the lateral fixation screw at the IM slide rail. The position of the saw incision can be controlled with the incision control plate.



2. Version:
The posterior lug of the IM slide rail should be at the same level as the marking in the reamer stem (resection = 0 mm). The incision level can be selected via the scale of the IM vertical connecting rod by pushing the button on the back of the IM socket (see arrow).

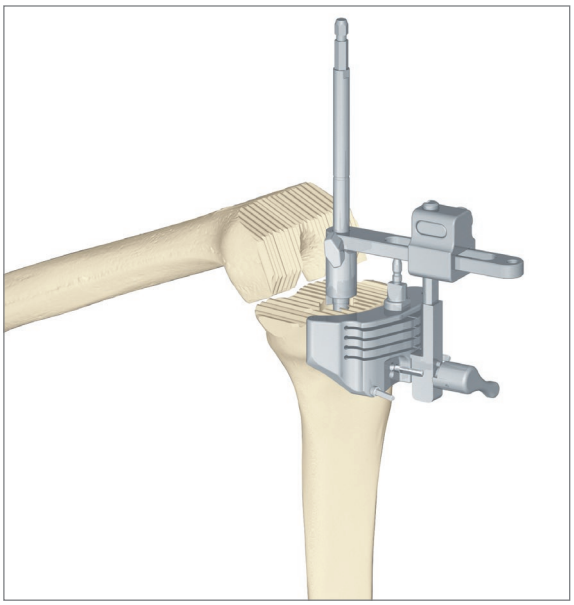
3. Version:
The complete IM alignment system including the tibial cutting block is attached to the reamer. The cutting depth gauge in the cutting slot is used for distal repositioning up to contact with the tibial plateau. Fix this position by tightening the fixation screw at the IM slide rail. The incision depth is now determined by distally moving the IM connecting rod.



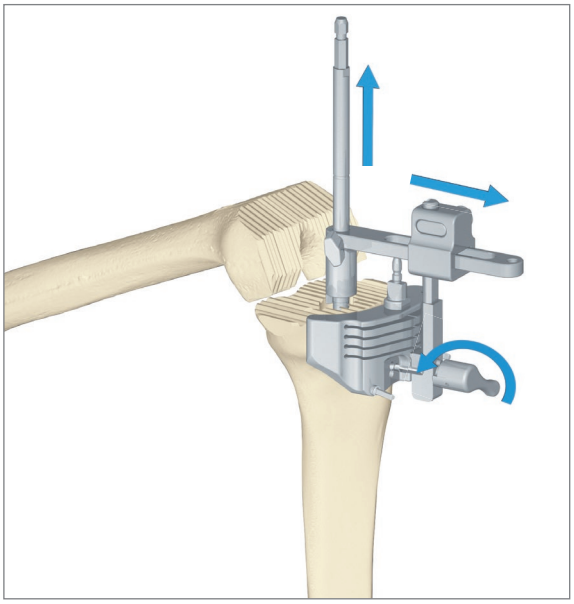
Assembly
1. Push IM slide rail A into IM socket B
2. Turn lever on the IM connecting rod to the 11 o'clock (OPEN) position and mount tibia cutting block C
3. Close the lever by turning it clockwise
4. Push the button at the IM socket and insert IM connecting rod D

A: NQ648R IM slide rail, B: NQ649R IM socket, C: NQ650R/NQ651R Tibia cutting block (Left/Right), D: NQ647R IM connecting rod

The tibial cutting block is fixed in the desired position via two parallel pins without head and a convergent headed pin.



The alignment system is removed. To do this, the lever of the IM connecting rod is turned counterclockwise to the 11 o'clock position. Remove the IM connecting rod ventrally from the cutting block and proximally from the reamer.



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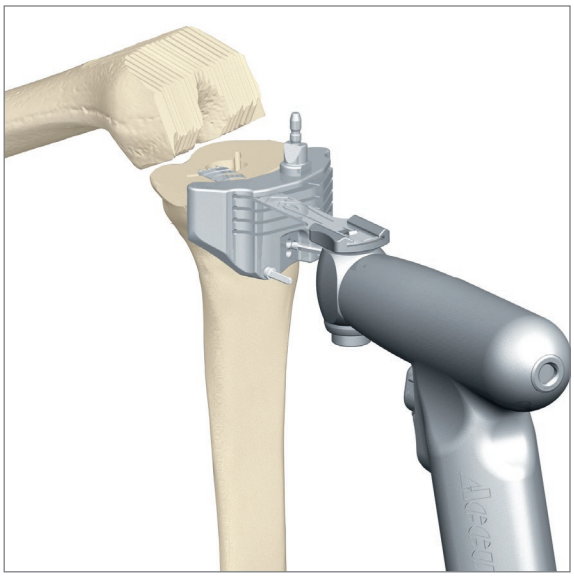
6 | TIBIA PREPARATION

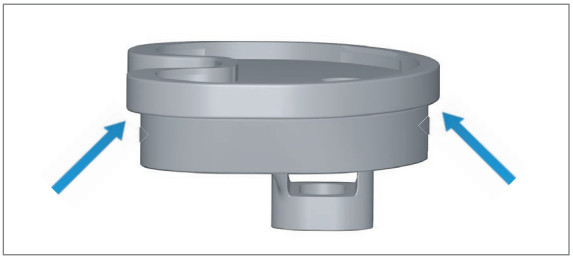


Tibial Resection

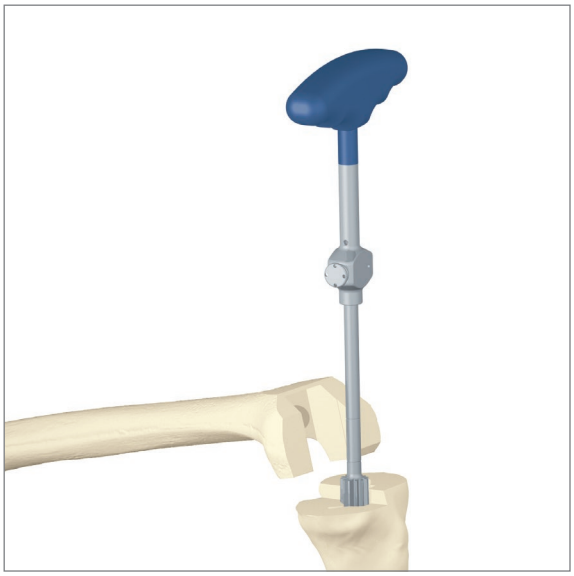
The tibial resection is performed using a 1.27 mm thick saw blade in the upper cutting slot.

Option:
Additional slots provide the option of making step cuts for the 5, 10 and 15 mm tibia augments. The position in which the augment ends sagittally in the center should be noted.

NOTE
To minimize the risk of tibial fracture, the horizontal cut should be made before the sagittal cut. The sagittal cut should not be deeper than the horizontal cut surface.



NOTE
For certain anatomies and defect situations, the unilateral use of augmentation with the Tibia Plus sizes may be necessary. This creates a step between the augment and tibial implant both anteriorly and posteriorly. This must be taken into account when assessing possible soft-tissue irritation.



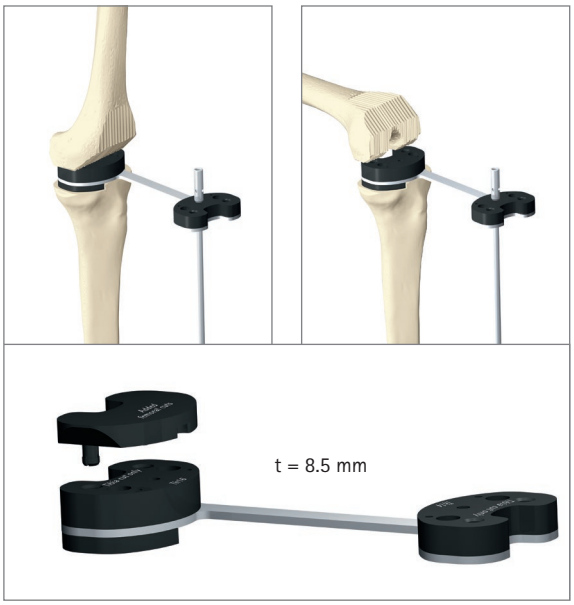
Following the tibial resection, it is reamed again to the required depth with the desired diameter in order to achieve pressfit in the case of a cementless stem fixation or, in the case of a cemented variant, to make room for the cement mantle.

NOTE
The reamers have markings for the different stem lengths. The reference of the marking, even when using augments, is always the backside of the metal trial tibial plateau.
The marking on the reamer includes the stem length and height of the tibial box.

Extension and flexion gap measurement with spacer blocks

Extension and flexion gaps can be measured with spacer blocks. For improved stability after an augment cut, a unilateral trial plate can be attached to the bottom side. In this case, a spacer block with a height of at least 18 mm without the femoral cut spacer should be used since this will represent the minimum space required by the implants (PE including tibial plateau = 10 mm; femur distal = 9 mm, dorsal = 8 mm). In the case of asymmetry, a ligament release on the tighter side may be considered. However, if the asymmetry is caused by a bone defect, this is not a viable option.

Optionally, after the distal femur resection of 9 mm, the joint stability can be simulated by additional mounting of the femoral cut spacer. In this case, a spacer block of the required PE height is used.

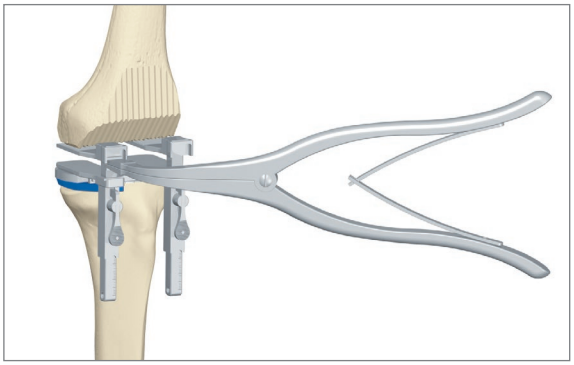


Extension and flexion gap measurement with distractor

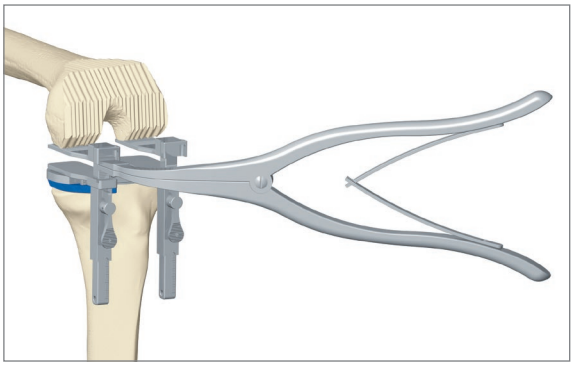
Extension and flexion gaps are measured medially and laterally with the distractor. This measurement is performed on the mounted trial tibial plateau with trial augments clicked into the bottom.

In the case of asymmetry, a ligament release on the tighter side may be considered. However, if the asymmetry is caused by a bone defect, this is not a viable option. Afterwards, an additional measurement needs to be performed. If the results are satisfactory, the values are recorded.

The material thickness of the trial tibial plateau is 5 mm.



NOTE
Distractor and spreader are not included in the standard set.



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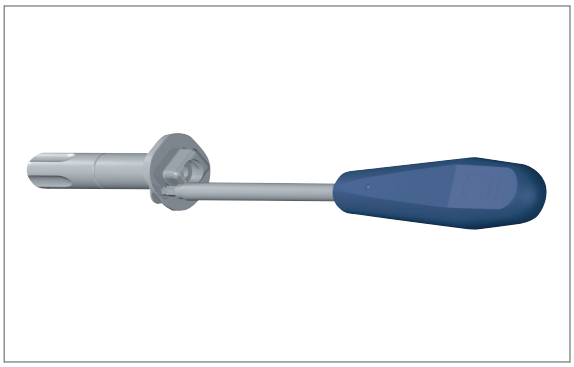
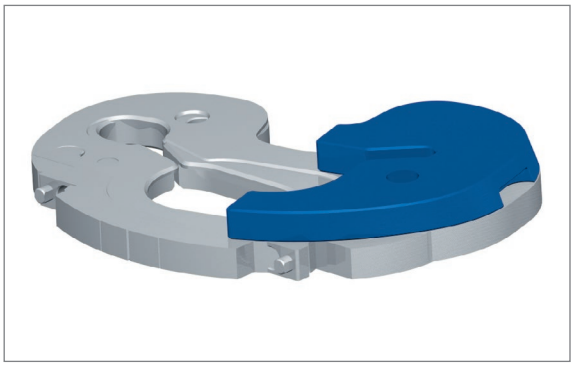
6 | TIBIA PREPARATION



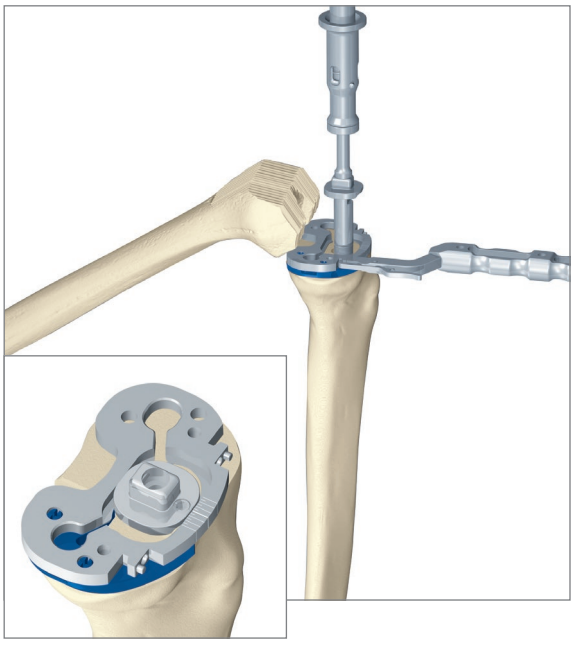
Determining the offset with a trial stem

The trial tibial plateau that best fits the bone in ML and AP is selected. The ML positioner is connected with the required trial stem.

NOTE
The small anterior attachment lug of the ML positioner must be turned to the open position (the engraved marking must be in the anterior position) in order to avoid bending it during introduction.



If necessary, trial augments of the required height and size are clicked under the respective side of the trial tibial plateau.



The trial tibial plateau, including clicked trial augments if applicable, is placed on top of the tibia. Then the ML positioner is introduced. The attachment lug of the ML positioner is tightened in an optimal ML, AP and rotation position of the trial tibial plateau. This ML value is recorded, and the trial plateau is fixed with two headed pins.

The position of the leg axis can be controlled via the alignment control rod, which is inserted into the handle.

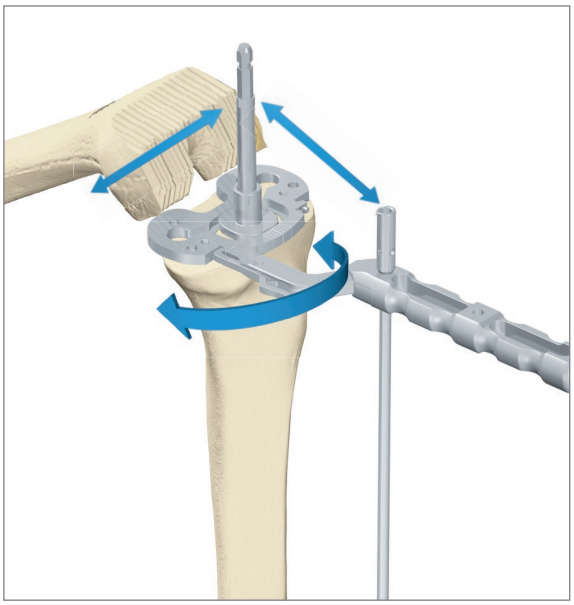
The continuous tibia offset is as follows:
- T0/T0+ = ± 4 mm
- T1-T5 = ± 6 mm

Determining the offset with a reamer

The reamer is introduced into the tibia canal again. The trial tibial plateau that best fits the bone in ML and AP is selected. The trial tibial plateau, including clicked trial augments if applicable, is placed on top of the tibia. Then the ML positioning chimney is introduced over the reamer. The attachment lug of the ML positioning chimney is tightened in an optimal ML, AP and rotation position of the trial tibial plateau.
This ML value is recorded, and the trial plateau is fixed with two headed pins.

NOTE
The small anterior attachment lug of the ML positioning chimney must be turned to the open position (the engraved marking must be in the anterior position) in order to avoid bending it during introduction.

The position of the leg axis can be controlled via the alignment control rod, which is inserted into the handle.



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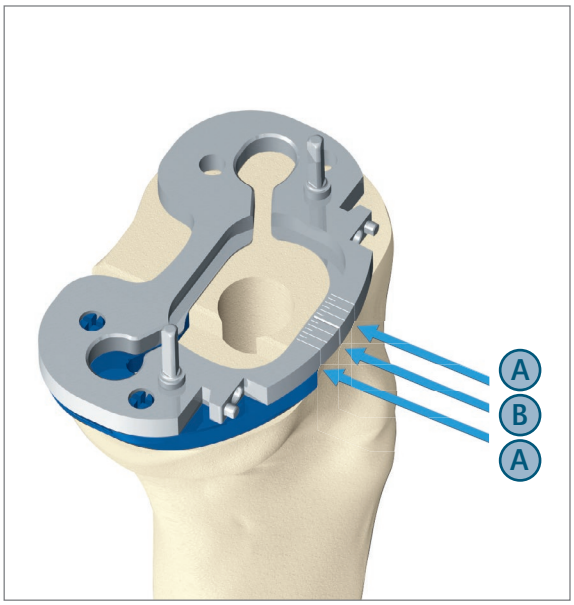
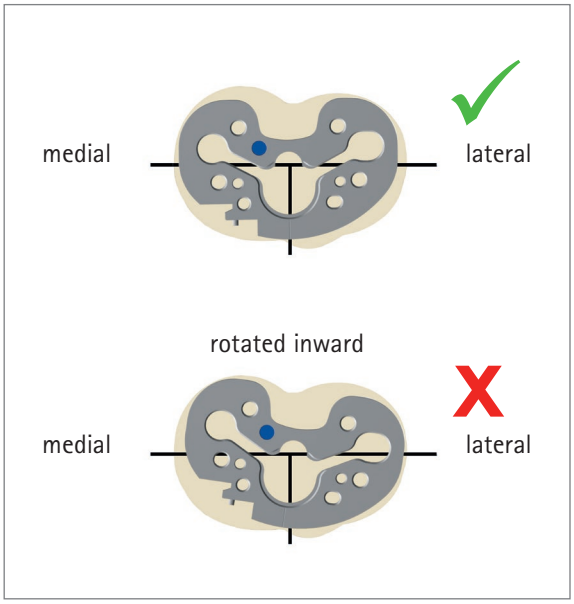
6 | TIBIA PREPARATION



In the correct ML, AP and rotational position, the trial tibial plateau is attached with two short headed pins. Then the handle, the ML positioning chimney/ML positioner and the reamer are removed.

The two outer markings indicate the positions where the augments will end medially (A), as a reference for the sagittal cuts. The central marking (B) indicates the center of the trial plateau.

The selected trial plateau is placed flush on the tibia resection, and the rotation is determined with the help of the EM rod placed through the holder. The transition from the medial to the central third of the anterior tuberosity and the second toe axis of the leg serve as reference points for the rotation. These two reference points often are not congruent with the mechanical axis of the tibia. The surgeon should take into account the rotation with respect to the tubercle in order to maintain the alignment of the extensor mechanism. The plateau is fixed inside the marked holes with short headed pins.



Another option is the assembly of the tibial and femoral trial implant with the matching trial gliding surface. Through flexion and extension movements in combination with slight rotations, the tibial plateau will move into its natural position under the trial femur. This position is marked anteriorly with an electric knife exactly where the plateau displays a centered anterior laser marking. Carefully evaluate the stability of the extensor mechanism before accepting this "free float" alignment of the tibial baseplate.

NOTE

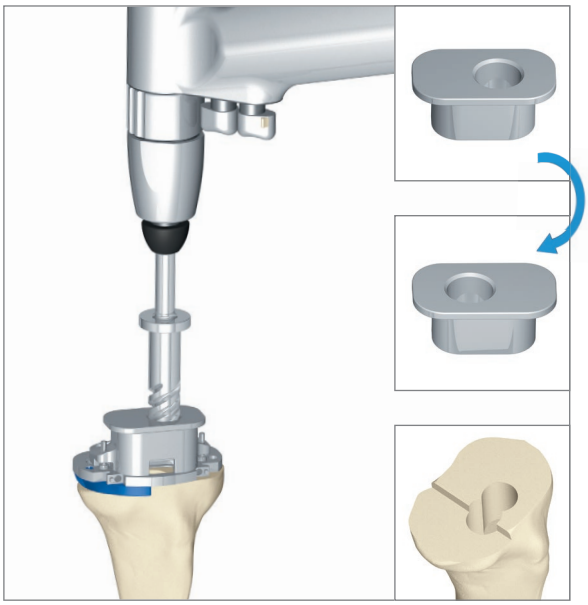
The Columbus® tibial plateau has a symmetric shape. Therefore, it is not possible to achieve a 100 % tibial bone coverage with correctly set tibial rotation. However, an overhang should be avoided (see illustration on the left).

After the ML positioner or reamer has been removed, the box preparation guide and the drill guide are mounted on the trial tibial plateau.

Using the stop drill, two holes merging into each other are drilled to the stop by repositioning the drill guide by 180°. The result is a bore with binocular geometry.

NOTE

In order to avoid perforation of the tibial cortex by the tibial keel in small tibial sizes with limited metaphyseal space and large bone loss, restoration of the tibial joint line through augmentation is preferable to higher PE. This applies both to the preparation and to the final implant.



The ML rasp for the stem sleeve is connected to the trial stem in the required dimension.

It is impacted through the box preparation guide to the stop, then rotated by 180° and once again impacted to the stop.

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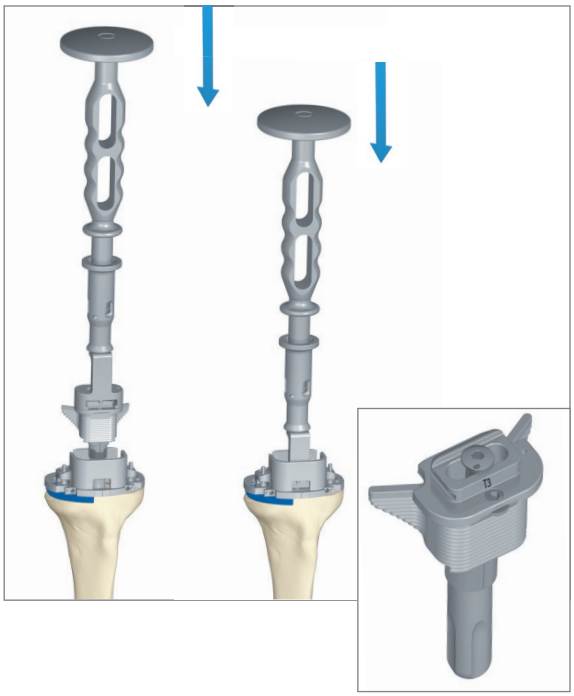
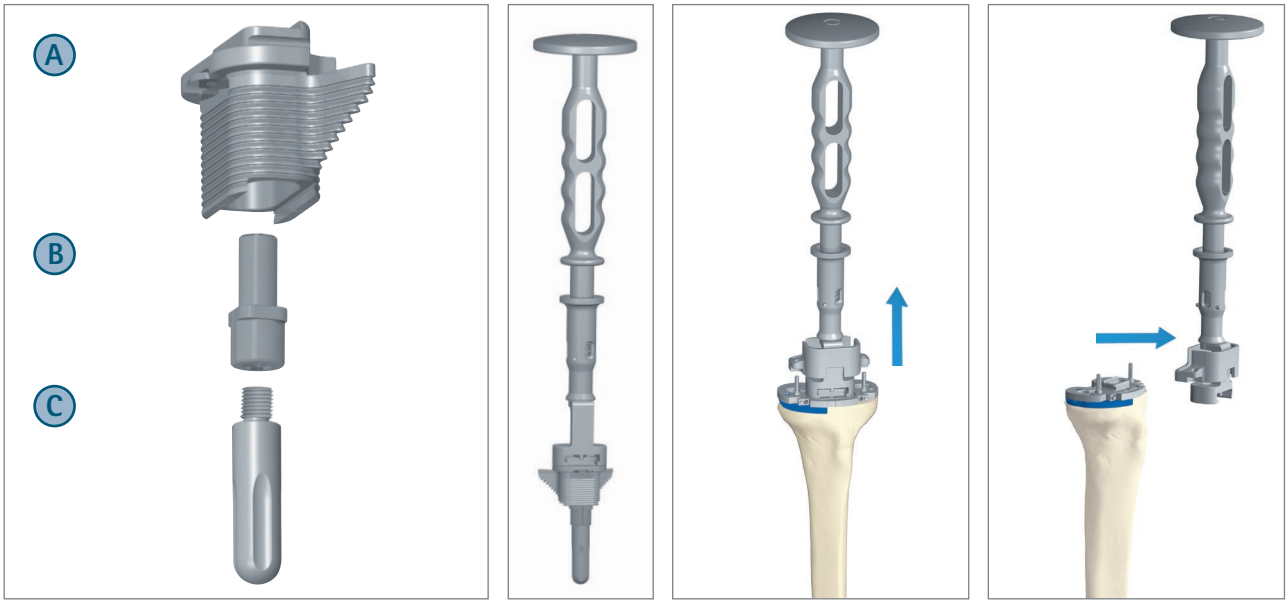


The osteodenser (A) identical in size to the trial tibial plateau is selected and connected to the tibial stem connector (B). For this purpose, the tibial stem connector with the cylindrical part is introduced from the bottom into the osteodenser and slightly fastened with the fastening screw from the top in such a way that ML movement is still possible. Then the required trial stem (C) is screwed to the tibial stem connector. The osteodenser, which is attached to the handle, is then pushed over the osteodenser assembly.

The osteodenser assembly is impacted to the stop into the trial tibial plateau through the box preparation guide. It is important to ensure that the trial stem fastening screw is only loosely tightened so that the stem can center itself in the ML. Then lift the box preparation guide and remove the holder of the osteodenser anteriorly. Then tighten the fastening screw for offset fixation and remove the pins from the trial tibial plateau.



A: Osteodenser, B: NQ833R tibial stem connector, C: Trial stem

If the Femur First Technique is used, femoral preparation is initiated as described below.

Determining Femur Size

The size of the femur is determined with the help of the femoral size determination gauges. The gauges indicate the respective AP and ML measurements. Further markings on the instrument indicate the respective available distal and posterior femoral segments. With an introduced reamer the AP offset of the stem can be preassessed.

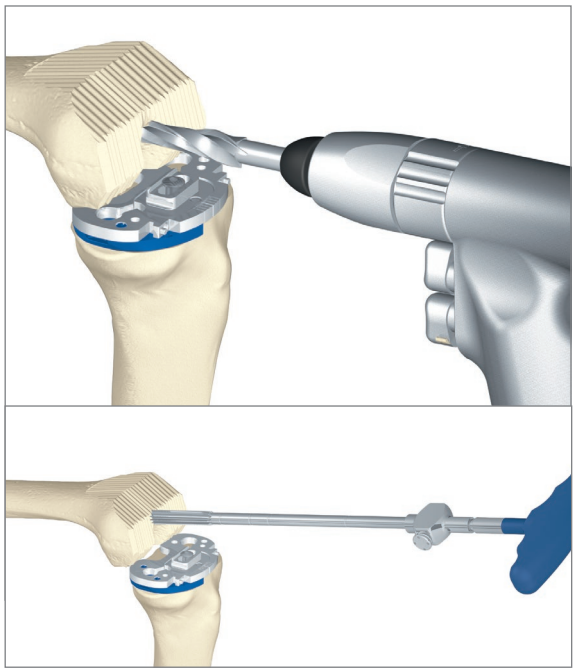
COMPATIBILITY Columbus® Revision TIBIA WITH
Columbus® Revision FEMUR WITH HC/MC GLIDING SURFACES

Size	F1	F2	F3	F4	F5	F6	F7
T0/0+							
T1/1+							
T2/2+							
T3/3+							
T4/4+							
T5							

Compatible

Compatible, but not recommended by AESCULAP®

Not compatible



Intramedullary Femoral Alignment

The entry point for the step drill in the distal femur can be determined using X-ray images. Drilling is performed at the selected angle, taking into account the femoral curvature and other patient-specific aspects.

Femoral stem offset:
AP: stepless ± 4 mm

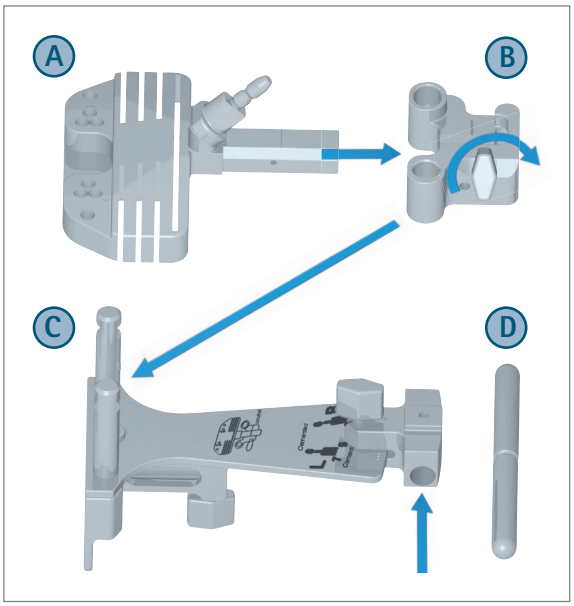
With the reamers or the IM alignment rod, the intramedullary canal is reamed as deeply as possible with the long reamer until a stable anchorage for precise axis alignment is achieved. Following the distal femur resection, it is reamed again to the required depth with the desired diameter in order to achieve pressfit in the case of a cementless stem fixation revision or, in the case of a cemented variant, to create space for the cement mantle. The reamers have markings for the different stem lengths. The depth reference is always the backside of the implant without augments. Since bone is removed during distal resection, it may be necessary to increase the depth so that the stem can be inserted correctly. For cemented stems, a cement mantle of at least 1 mm is required.

NOTE
Cementless femur stem implants have an excess size of 1 mm compared to the reamer. Reamers and implants are conically shaped up to 5.6 cm from the reamer tip. Therefore, the depth of the preparation is crucial.

WARNING
Too aggressive pressfit could lead to pain at the tip of the stem. Therefore, achieving a less aggressive glide fit is recommended.

Distal Femur Resection

The cutting block support for distal cutting block B is mounted on IM alignment system C. Distal femur cutting block A is pushed into the support and screwed tight in the neutral position. Additionally, handle D is connected to the IM alignment system.

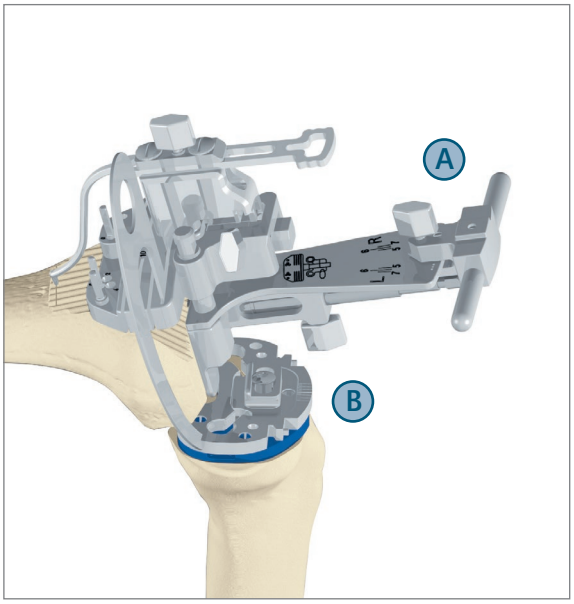


A: Distal femur cutting block NQ701R, B: Cutting block support NQ703R, C: Alignment system NQ702R, D: Handle NQ474R

Distal Femur Resection with Joint Line Positioner

If used, the joint line positioner is inserted into the neutral cutting slot. The desired angle between the anatomical leg axis and the mechanical axis for the leg side to be operated is set and fixed (A). Then the alignment system is slid onto the reamer until the tip of the joint line positioner reaches the marking determined during the first surgery step. Fix this position with screw (B).

If needed, the recorded joint line can now be repositioned. To do this, the repostioning holes on the cutting block or the scale on the joint line positioner can be used.



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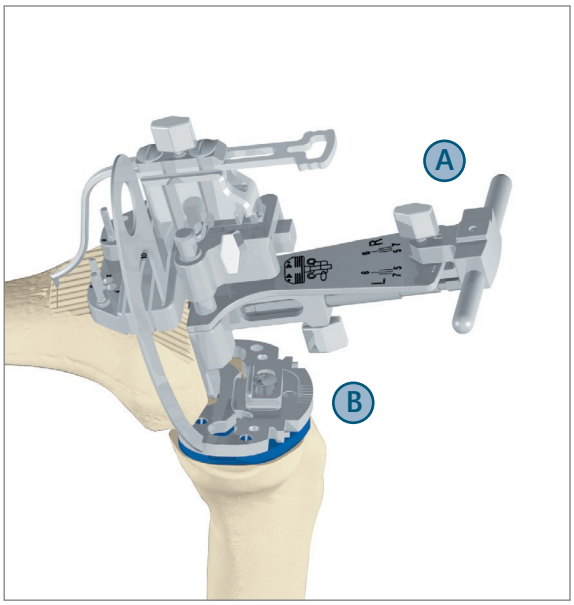
7 | FEMUR PREPARATION

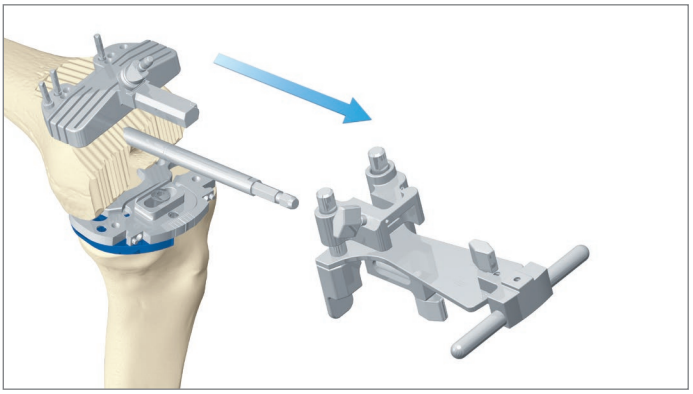


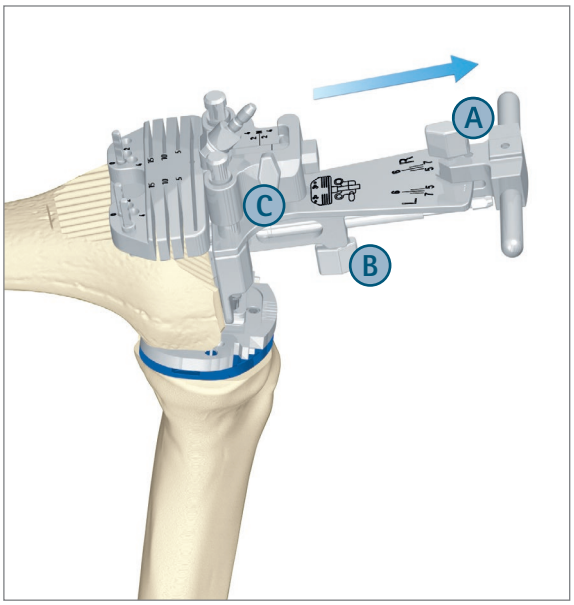
Distal Femur Resection with Incision Control Plate

If used, the cutting depth gauge can be placed into the neutral cutting slot. The desired angle between the anatomical leg axis and the mechanical axis for the leg side to be operated is set and fixed (A). Then the alignment system is pushed onto the reamer with the cutting depth gauge until distal contact is made with the bone. Fix this position with screw (B).

After removing the IM alignment system, the cutting block is moved by 2 mm proximally for a cleanup cut.

The cutting depth gauge, the joint line positioner and the alignment system [loosen screws A, B, and C] are removed distally. The reamer can remain inside the femur canal for alignment of the additional cuts.



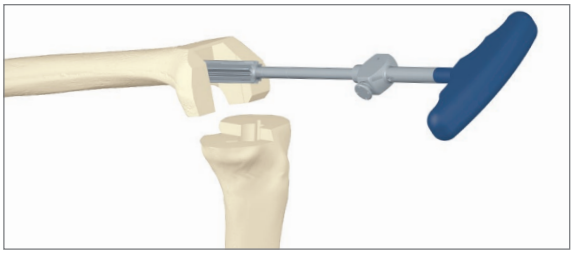


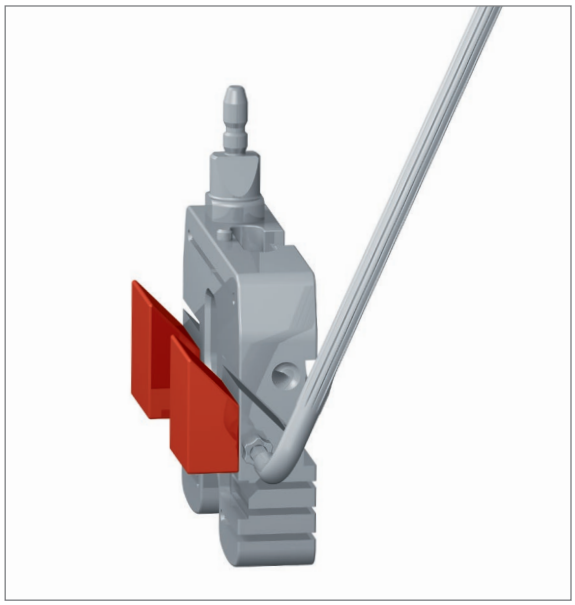
The distal femoral cut is performed in the selected resection direction. If necessary, resection is also performed for the distal femoral augments in the corresponding cutting slot.

Following the distal resection, it is reamed again to the required depth with the desired diameter in order to achieve pressfit in the case of a cementless stem fixation or, in the case of a cemented variant, to create space for the cement mantle. The reamers have markings for the different stem lengths. The reference of the marking, even when using augments, is always the metal backside of the trial femur.

NOTE

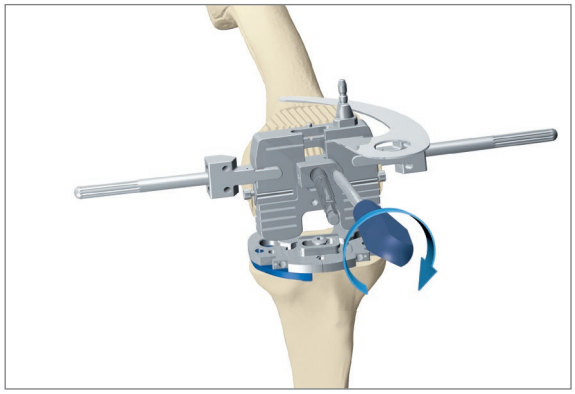
The implant matrix (see appendix) ensures that the required implants, as identified during planning of the required femur size, are available.





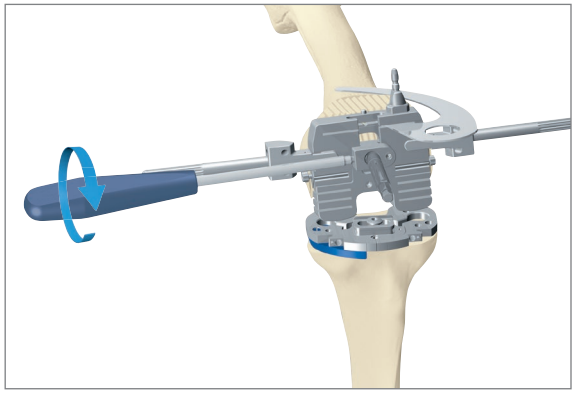
AP and Rotational Alignment

If a resection for distal femoral augments was performed, trial augments with analogous dimensions must be screwed to the backside of the 4-in-1 cutting block to ensure the correct distal distance of the interior femoral geometry to be sawed.



The 4-in-1 cutting block is pushed onto the reamer with the inserted angular sleeve and the screwed on handles for rotational alignment. The 4-in-1 cutting block is set to the correct AP and rotational position. To avoid anterior undercutting of the femoral cortex, the cutting depth gauge is inserted into the anterior cutting slot for verification.

By tightening the distal fastening screw, the cutting block is fixed in the defined anterior/posterior position. The value that is now obtained serves only as an initial, approximate offset estimate. The definite value will later be obtained from the trial femur with which the trial femoral stem is connected.

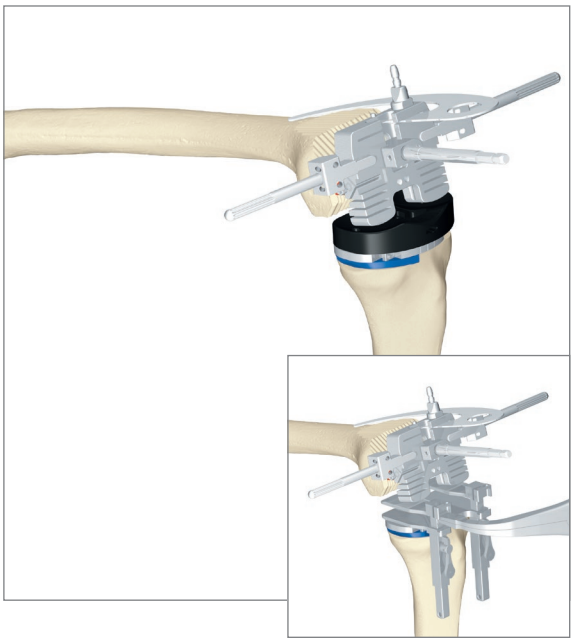


By tightening the horizontal fastening screw, the cutting block is fixed in the defined rotational position.

The flexion gap can now be measured with the trial gliding surface, or optionally with spreader and distractor, and can be compared with the extension gap. With an unbalanced flexion and extension gap, corrections should be undertaken on the femoral side (change of femur size, change of distal augmentation).

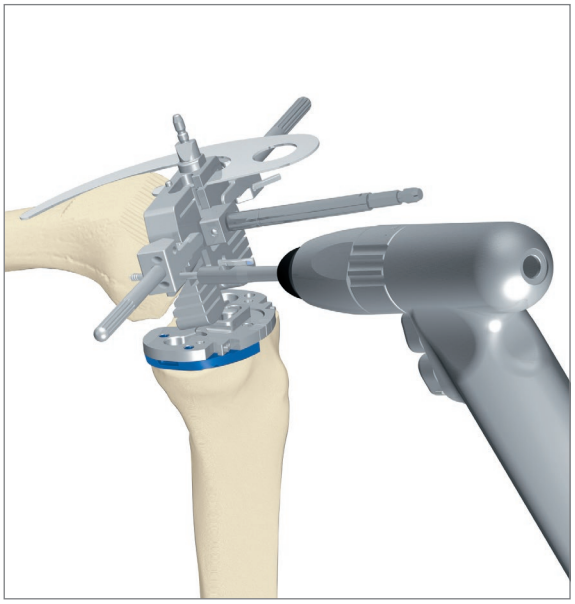
NOTE
The dorsal geometry of the 4-in-1 cutting block corresponds exactly to the dimensions of the definitive femoral implant. This measurement is also performed on the mounted trial tibial plateau with trial augments clicked into the bottom, if applicable. The values are recorded.

NOTE
The PE size is always chosen to match the size of the tibia.



With two long headless pins, the cutting block is fastened through the holes in the handles in the defined rotational position. Additional stability can be achieved with a long headless pin, which is fastened in the cutting block through the distal anchoring bore. The holes are marked with L (left leg) / R (right leg). Select the side to be operated on. For space reasons, only the handle opposite to the everted patella may be used.

Option:
The setting of the femoral rotation can also be performed by using a trial gliding surface at the required height and the 4-in-1 cutting block. To do this, the flexion gap must be filled with the trial gliding surfaces to the point where the ligaments are taut.



NOTE
In cases of insufficient collateral ligaments, this technique can cause an incorrect rotation of the 4-in-1 cutting block. Therefore the rotation must also be referenced with the epicondyles.

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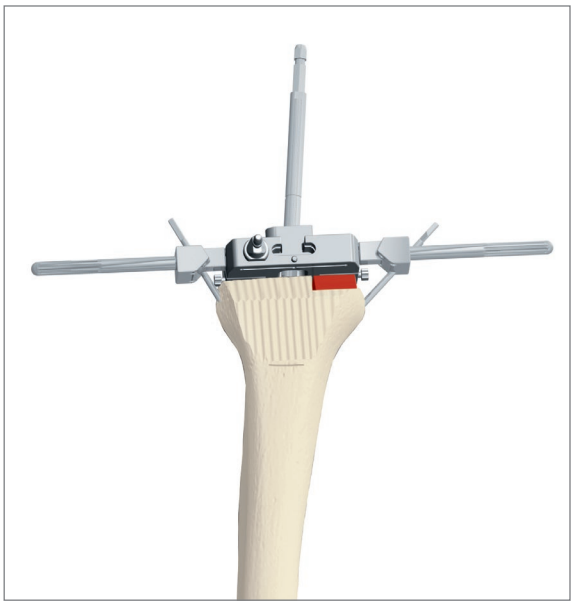
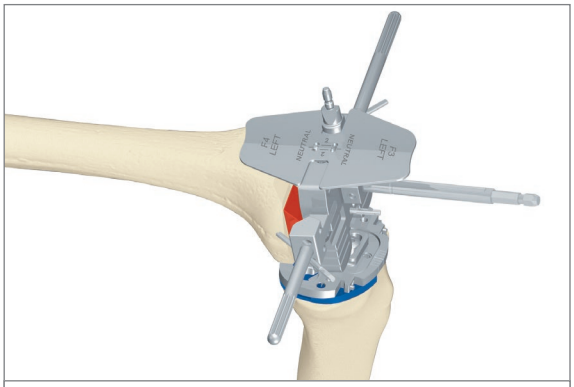
7 | FEMUR PREPARATION

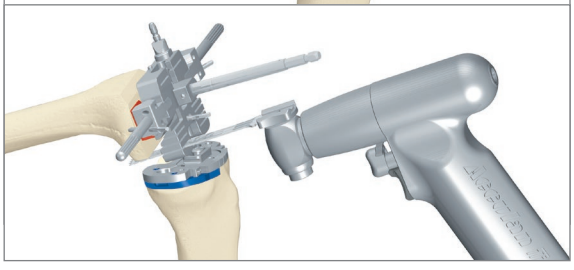


It must be verified that the cutting block is in direct contact with the distal femur, and that the distal trial augments are securely fastened, if used.



Size assessment of the anterior femoral shield

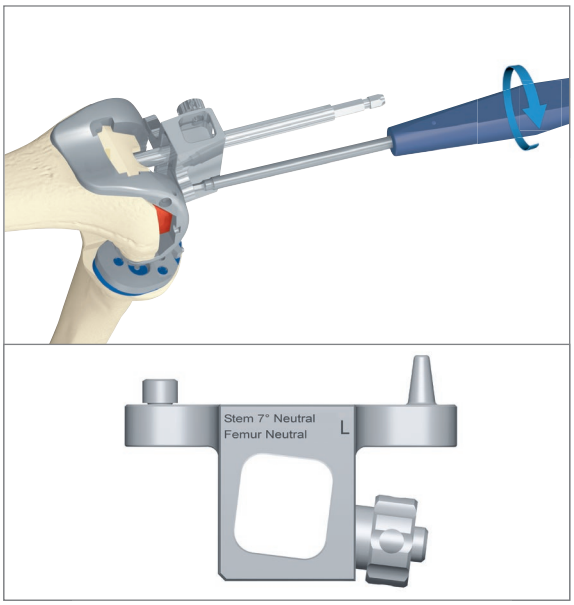
Option:
The size and position of the femoral implant can be simulated by anteriorly applying the applicable femoral control plate.



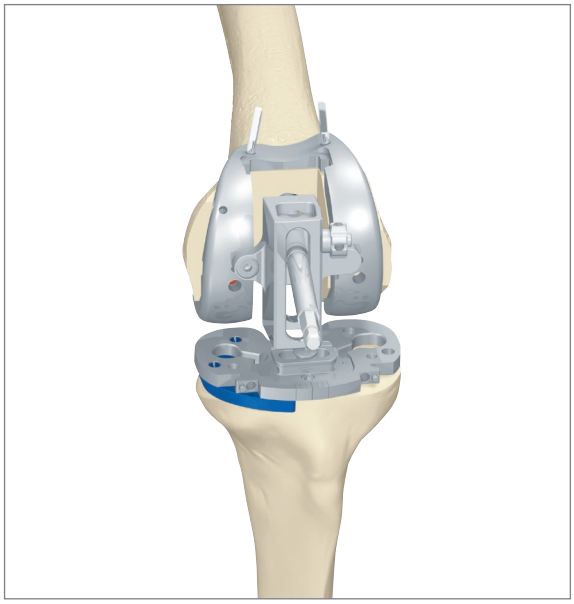
4-in-1 Resection

The four femoral resections are performed in the following order:
1. Anterior parallel cut
2. Posterior parallel cut (including augment cut if required)
3. Posterior chamfer cut
4. Anterior chamfer cut

The correct offset adapter is screwed onto the selected trial femur with optional posterior/distal trial augments with the applicable angle (5°/7° for cementless stems; 6° for cemented stems) and the correct side L or R facing upwards. Then the trial femur is pushed on the reamer until full contact is made with the bone.



In this position, the trial femur is fastened anteriorally with two headed pins. Afterwards, the AP offset adapter and the reamer are removed.



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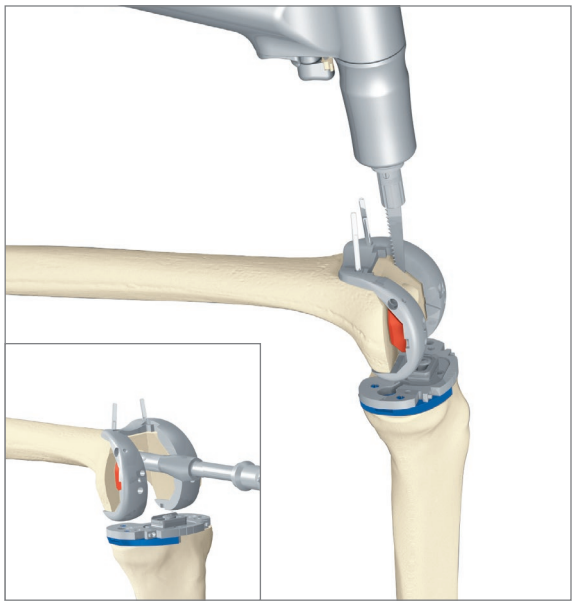
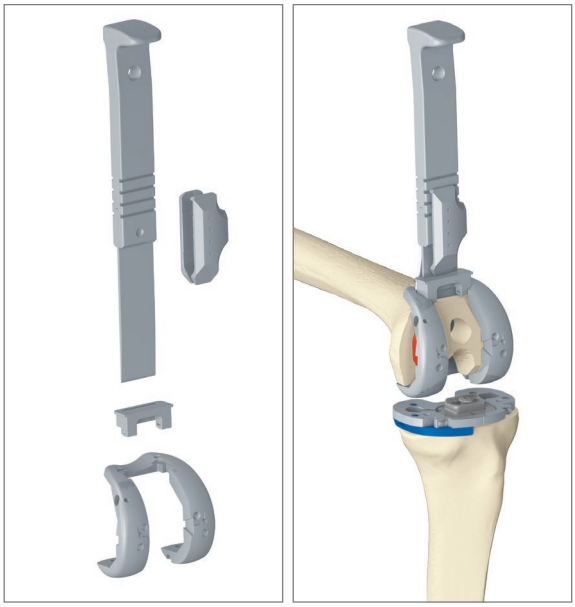
7 | FEMUR PREPARATION



Femur Box Preparation

The resection of the interior medial and lateral side of the femoral box is performed with the oscillating jigsaw and a narrow saw blade. If necessary, remaining bone pieces are removed with a chisel.

To ensure an optimal fit of the femoral stem, the medial and lateral internal geometry is prepared with the rasp. This is guided by the trial stem connected to it. The rasp is impacted twice up to the wide, distal end.

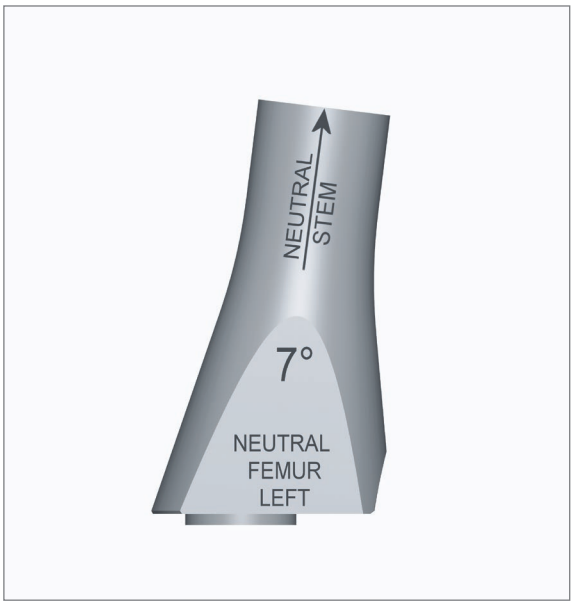


Option:
The proximal box cut can also be performed with a box chisel. To do this, the box chisel guide needs to be mounted to the trial femur. Then the depth limiter is inserted into the slot on the box chisel that matches the femur size group. The box chisel is then impacted up to the stop.

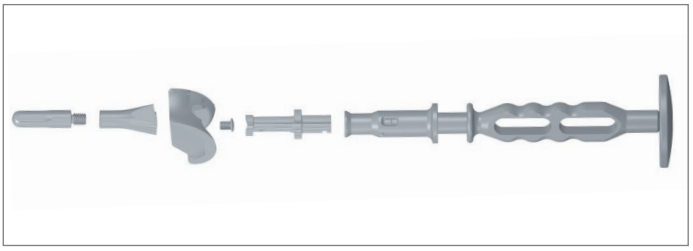
Assembling the trial femoral box:

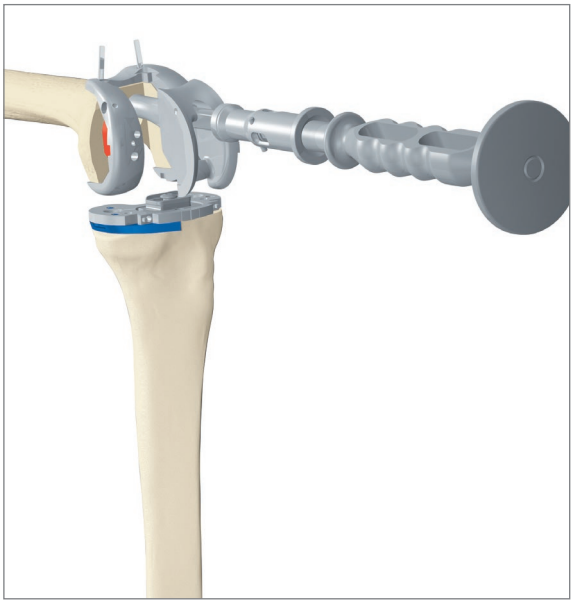
The selected trial femoral stem is screwed to the adapter with the correct angle and in the needed length. Then it is inserted into the proximal guide of the trial femoral box and loosely screwed in from the distal side to allow clearance in the AP for self-centering. The trial box holder is connected to the handle and inserted distally with the laterally-positioned spring ball anteriorly.

This stem assembly is inserted into the guide of the trial femoral box. The configured trial femoral box is completely impacted into the trial femur.



- use long adapter with long trial stem
- use short adapter with short trial stem





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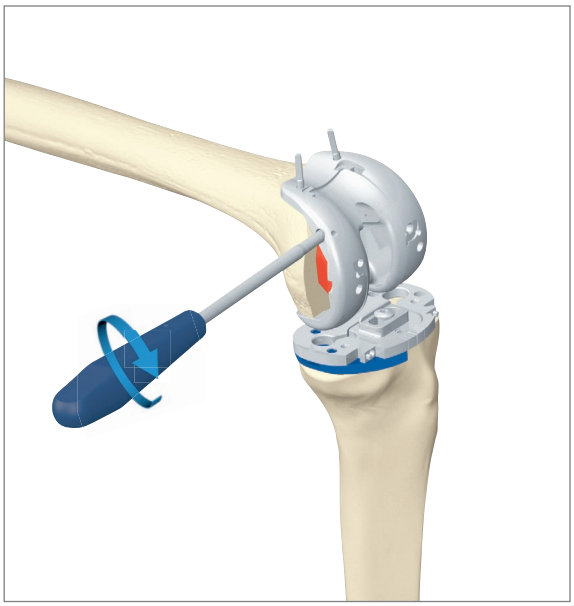
7 | FEMUR PREPARATION



The trial box is secured by tightening the medially-positioned fastening screw in the trial femur.

The trial stem, which is now self-aligned in AP, is fastened into this position by tightening the intercondylar fastening screw.

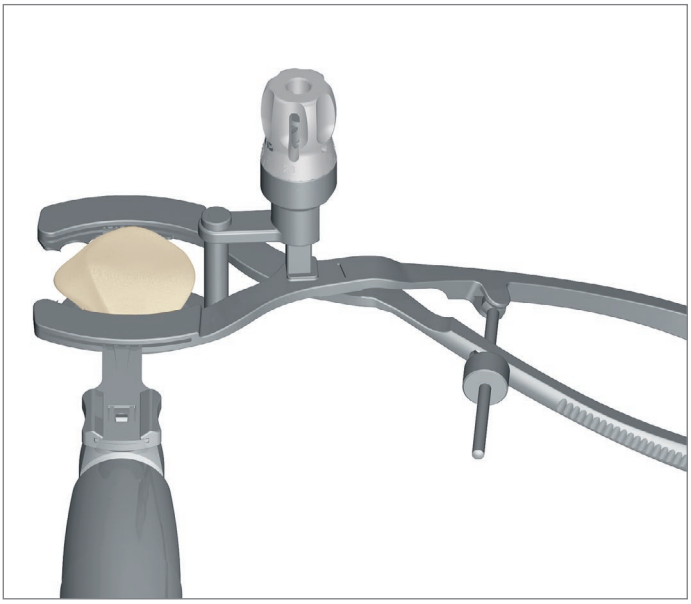
Option:
A trial PE gliding surface of the required size and height as well as a trial PS peg can be selected and placed on the trial tibial plateau. Now, the joint stability during flexion and extension can be checked. Depending on the result, a higher or lower PE sliding surface is selected.

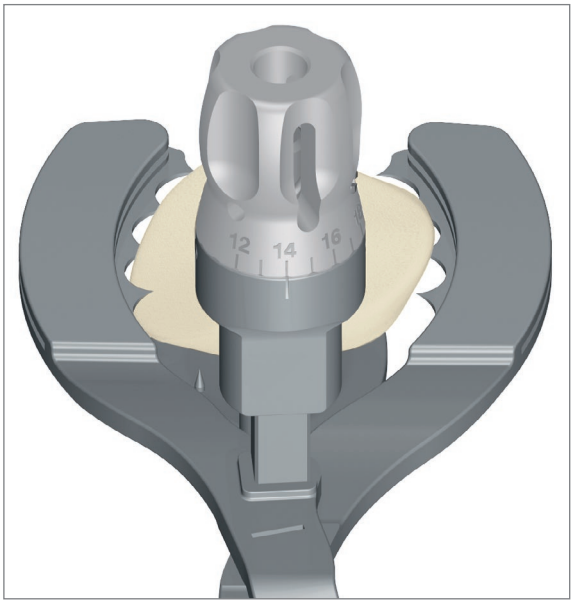
8 | PATELLA PREPARATION

The thickness of the patella is measured using the caliper. This thickness should not be exceeded after implantation of the patella implant. The level of bone resection is calculated. A minimum thickness of the remaining patella bone should not be less than 12 mm.

The resection level is adjusted by turning the resection depth wheel to the planned level of remaining patellar bone thickness. Then the patella is fixed into the patella resection clamp.

The resection is performed through the cutting slot with a 1.27 mm thick saw blade.





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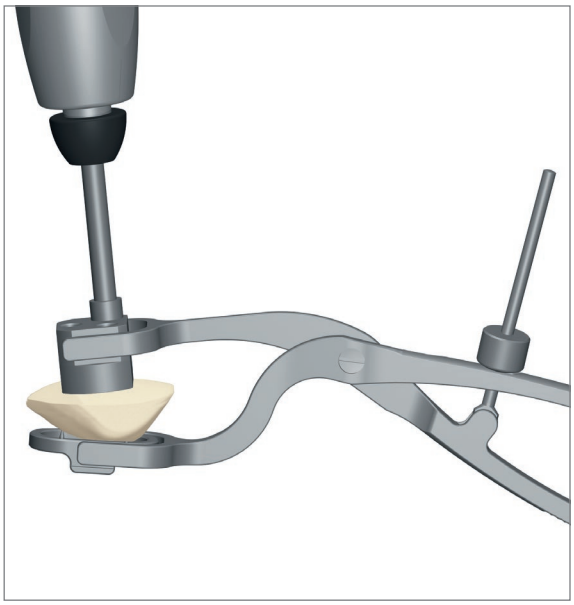
8 | PATELLA PREPARATION



The patella resection clamp is removed. The patella drill/impaction clamp is set onto the osteotomized patellar surface choosing a medialized position to recreate the resected apex of the articular surface; the trial patella can be placed on top of the drill guide in order to check its position to the medial rim and appropriate positioning in the superior and inferior direction.

The peg holes for the implant are drilled through the holes with the Ø 6 mm drill until the stop is reached. The size of the patella is established with the corresponding trial patella implant.

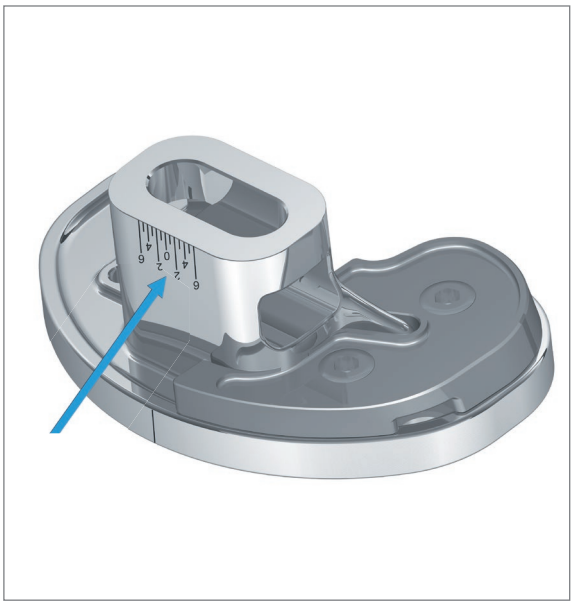
Assembling the Final Implants

The required final implants are selected and made available based on the result of the trial repositioning.

NOTE
Please note: To apply the required torque, all implants that are tightened with a defined torque (tibial / femoral stem, PE fastening screw) must be subjected to the torque three times.

NOTE
It is of advantage to have two persons perform the implant assembly. To avoid slippage when tightening to the torque, pressure should be applied to the torque wrench from above.

NOTE
To protect the sterile pad from being pierced during implant assembly, an abdominal cloth should be used as a pad.



Tibia Assembly

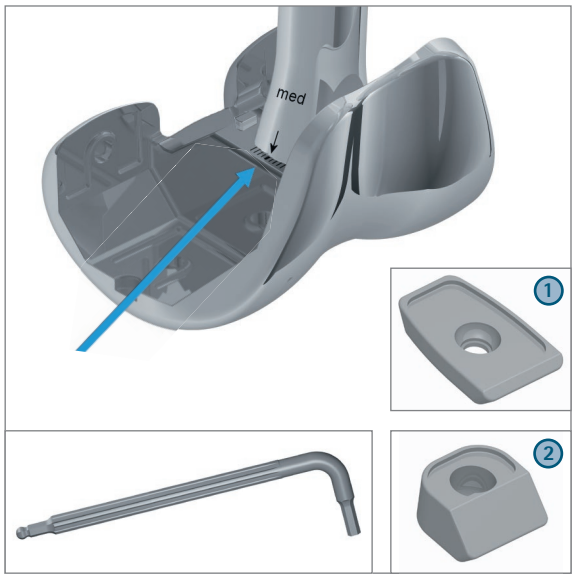
If needed, the tibial augments are screwed under the tibial plateau without defined torque.

The counterholder for the tibial stem fixation is placed on the tibial implant from the bottom and fastened by turning the handle.

Then the torque wrench is connected to the adapter. This is used to tighten the tibial extension stem with 20 Nm, under consideration of the mediolateral position of the trial tibial stem.

AESCULAP® Columbus® Revision

9 | ASSEMBLING THE FINAL IMPLANTS



Femur Assembly

The distal and posterior femoral augments are screwed tightly onto the femoral implant with the screwdriver without defined torque, if needed.

Sequence:

1. Distal augments
2. Posterior augments

For the posterior augments, the spherical head or the short end of the cranked wrench should be used. The AP stem position of the explanted trial stem serves as reference for the assembly of the final femoral implant.

The torque wrench is connected to the adapter. Then the femoral stem nut is pushed into the box top of the femoral implant. Then the femoral stem is mounted with the right alignment and AP position and prefastened tightly.

The counterholder is attached to the femoral stem, which is then tightened with the torque wrench with 27 Nm.

To fasten the cementless stems, the counterholder is positioned with its small slots on the fins of the stem and then tightened.

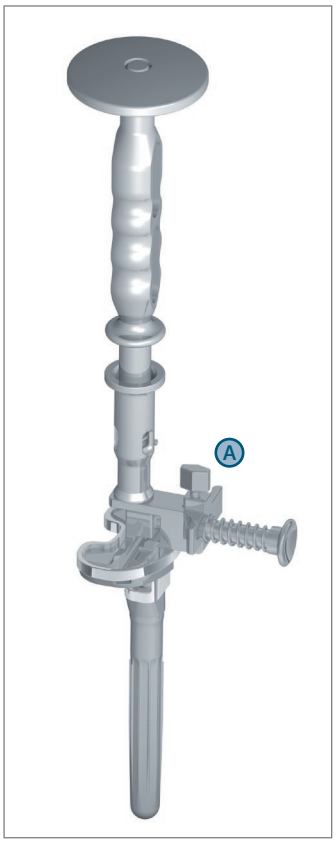
To fasten cemented stems, the counterholder is positioned in the indentations of the stem and then tightened.

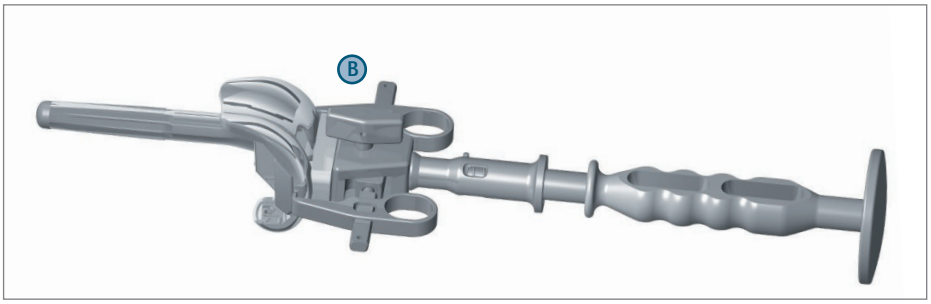
Preparation

The tibial plateau holder is inserted into the tibial implant, spread apart until it securely holds the implant. This position is secured by tightening the fastening screw A. Then the handle is attached for impaction.

The femoral insert is inserted into the femur holder. The two grippers are pushed apart and guided into the lateral recesses of the femoral implant. In this position, fastening screw B is tightened and the implant is set. Then the handle is attached for impaction.

After the implants have been assembled and are fixed in the holders, the cementation can be started. Please also review the notes regarding the cementation technique on page 38 and in the brochure 061802 "AESCULAP® Implant Fixation". Depending on defect size, stem length and type of extension stems, the amount of cement may need to be adjusted.





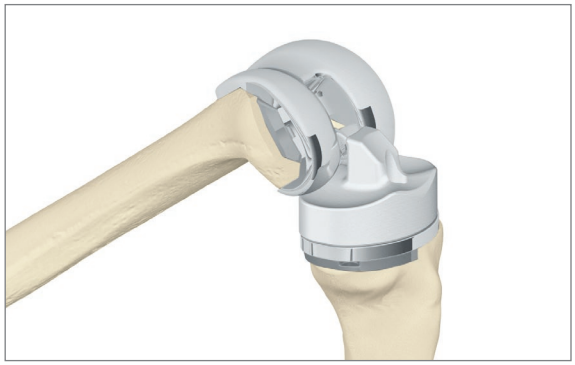
AESCULAP® Columbus® Revision

10 | IMPLANTING THE FINAL COMPONENTS

Sequence of implantation:

- Tibial Implant
- Femur Implant
- PE gliding surface
- Patella

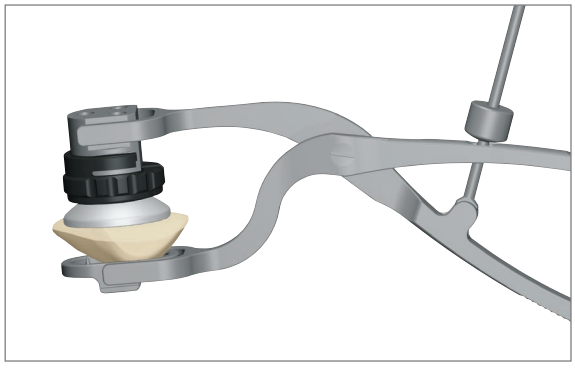
The tibial implant is introduced in the predefined rotational and slope position with the tibial plateau holder and then impacted with the tibial impactor. Excess cement residues must be removed to avoid third-body wear. Then the femoral implant is introduced in the predefined rotational and extension/flexion position with the femoral holder. Then it can be further impacted with the femoral impactor. Here too, excess cement residues must be removed. When introducing the implant, it is possible that cement residues may enter the PS box. These must also be carefully removed.



NOTE

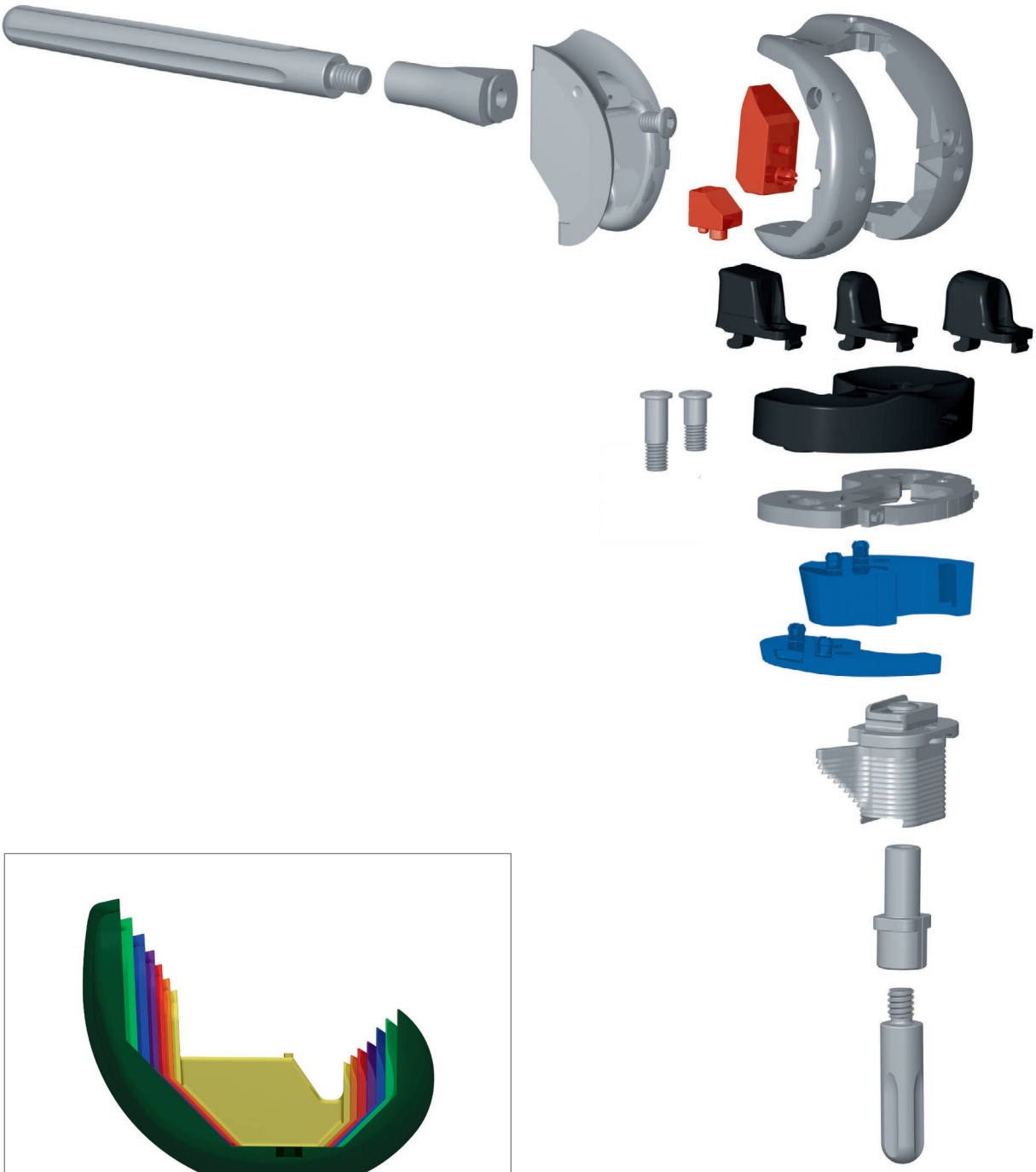
It is recommended to use a trial gliding surface for hardening the bone cement. This way, the range of motion and joint stability can be checked once again before the type and thickness of the final gliding surface is selected.

The final PE gliding surface is initially inserted into the tibial plateau with the posterior retaining clips in a slanted position. With the tibial impactor, it is impacted anteriorly so that the two anterior clips lock into the recesses. When the cement is completely hardened, the PE gliding surface is fastened with the included locking screw. To do this, the torque wrench with mounted adapter is turned clockwise until the torque limiter is audibly released.



The patella is implanted using the patella drill/impaction clamp and the concave plastic cap, which allows good transmission of forces during the cement hardening process and at the same time protects the patella implant against damage.

11 | Columbus® Revision TRIAL COMPONENTS



Exploded diagram of the Columbus® Revision Knee System trial instruments

AESCULAP® Columbus® Revision

12 | CEMENTING TECHNIQUE

- Regardless of what fixation method is utilized it is critical that correct techniques are employed in order to avoid complications and early failure. Also, even with accurate cuts it is important to ensure that components are fully seated, as it is easy for this to be obscured when cementing is taking place. Varus/valgus alignment can be significantly affected by unequal medial-lateral cement mantles and poorly seated components and there can be a tendency to place femoral components in relatively flexed positions if specific care is not taken.

- It should also be noted that when definitive components are cemented in, they may prove more stable and seat better than the trials, which are often a little loose. It is therefore worthwhile to recheck the balancing and stability at this point so that further adjustments can be made if necessary. It has been possible to relate poor cementing techniques to early and continuous component migration, which in turn is of positive prognostic significance when predicting aseptic loosening so proper attention to the cementation steps must be taken (2).

- Preparation of the bony surfaces and cancellous bone should be performed with pulsatile type lavage with the knee under a pressure tourniquet. This step allows for well-fitting cement penetration and interlocking to the bony prepared surfaces and also removes bone debris that can serve as third body particles that increase polyethylene wear after surgery (3, 4). The surfaces should be properly dried prior to cementation and appropriate exposure of all bony surfaces achieved (5, 6). All of the surfaces should be pressurized for optimal cement penetration. Emphasizing the importance of effective cementation of the posterior femoral condylar surfaces is also recommended since it can have a major effect on the longevity of the fixation of the femoral implant (7). A further point worth noting is that if holding the knee out in full extension while cement is hardening is used to compress components down and possibly improve cement intrusion.

- Care should be taken to completely remove all excess cement that protrudes from the implant bone interface. Any remnants of overhanging cement can impinge on surrounding soft tissue or can provide a source of debris that can serve as a generator of third body wear and may contribute to the demise of the fixation earlier than expected (8). Further recommendations for cementation technique are published in the scientific information brochures „Aesculap Implant Fixation in TKA“, order number 061802 and BonOs® R and BonOs® R Genta, order number 065002.

13 | WOUND CLOSURE

- After cement polymerization and removal of all cement excess, thoroughly irrigate the joint. If a tourniquet is used, hemostasis is achieved after its deflation.

- Close soft tissue in the normal layered fashion.

AESCULAP® Columbus® Revision

14 | OVERVIEW OF INSTRUMENTS

Art. Nr.	Description	Container recommended	Lid	Height of tray incl. lid
NQ600	Columbus® Revision F Instrumentation (consisting of):			
NQ601	Columbus® Revision F Set General Instruments	JK444	JK489	114 mm
NQ602	Columbus® Revision F Set Manual Femur Instruments	JK444	JK489	114 mm
NQ603	Columbus® Revision F Set Manual Tibia Instruments	JK444	JK489	114 mm
NQ604	Columbus® Revision F Set Femur Preparation	JK444	JK489	114 mm
NQ605	Columbus® Revision F Set Tibial Trial Gliding Surfaces	JK442	JK489	84 mm
NQ606	Columbus® Revision F Set Femoral Trial Components - left	JK442	JK489	84 mm
NQ607	Columbus® Revision F Set Femoral Trial Components - right	JK442	JK489	84 mm
NQ608	Columbus® Revision F Set Tibial Trial Augments	JK444	JK489	114 mm
NQ609	Columbus® Revision F Set Stem Preparation Cemented	JK444	JK489	114 mm
NQ610	Columbus® Revision F Set Stem Preparation Cementless	2 x JK442	2 x JK489	84 mm
NQ612	Columbus® Revision F Set Tibia Preparation Size 0	JK442	JK489	84 mm
NS709	IQ Patella Preparation	JK444	JK489	119 mm
Option:				
NQ594	OrthoPilot® TKR – Navigation Columbus® Revision, passive	JK442	JK489	84 mm

If a Columbus® PS implant is revised, the NE358R torx screwdriver to loosen the PE fixation screw must be ordered separately too.

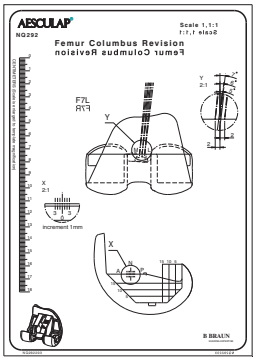
If a Columbus® CR Femur with corresponding CR/DD/UC PE gliding surface and Columbus® Revision tibial plateau are to be implanted, the corresponding Columbus® Primary trial femur or the femur of this side to be operated on, and the stop drill for the femoral pegs, must be ordered separately too.

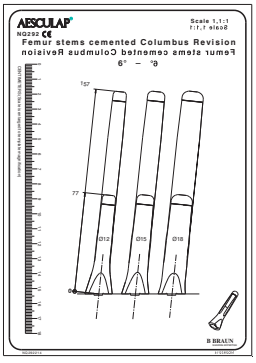
To measure the ligament tension with a spreader, it must be ordered separately.

Please check if your implants and instruments, provided by the AESCULAP® loan service, are complete and correspond with your preoperative planning.

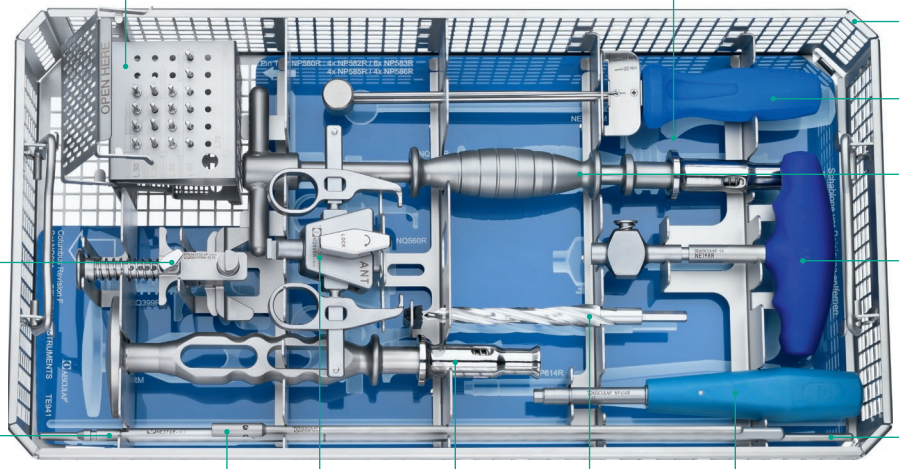
X-RAY TEMPLATES

Item No.	Name
NQ292	Set of X-ray Templates (incl. axis planning), scale 1.10:1
NQ293	Set of X-ray Templates (incl. axis planning), scale 1.15:1





NQ601 | Columbus® Revision F SET GENERAL INSTRUMENTS



NP580R Pin box
NP582R 4 x pin w/o head Ø 3.2 mm x 38 mm
NP583R 6 x pin w/o head Ø 3.2 mm x 63 mm
NP585R 4 x pin with head Ø 3.2 mm x 30 mm
NP586R 4 x pin with head Ø 3.2 mm x 50 mm

TE941
Graphic template for NQ621R (NQ601)

NQ621R
Columbus® Revision F Tray gen. instruments

NE184RM
Torque wrench 20/27 Nm

NQ564R
Impactor/extractor

NE198R
Revision T-handle navigated

NP471R
Alignment control rod w/o sleeve

NP614R
Inserter for pins, manual

NP410R
Step drill Ø 10 mm

NQ565RM
Handle impactor/extractor

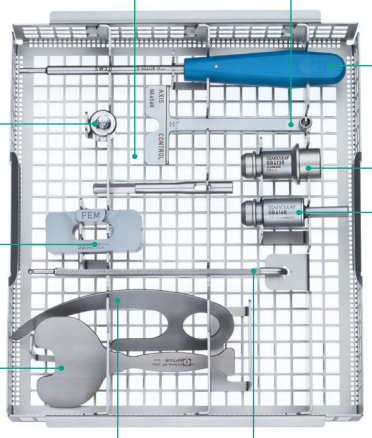
NQ560R
Implant holder/impactor

NE331R
Alignment control rod with sleeve

NE376R
Intramed. alignment rod Ø 8.0 mm

NQ399RM
Tibial plat. holder/impactor

TRAY INSERT FOR NQ601



NP613R
Pin driver attachment

NE456R
Receptacle for alignment control rod

NQ642R
Screw driver SW 3.0

GB413R
Acculan II hex. chuck

GB414R
Hex. chuck with 3 KT shaft

NE185R
Adapter for ext. stems/NE184R

NQ561
Insert for femur for NQ560R

NP741R
Tibial protection plate

NM350R
Cutting depth gauge

NQ643R
Cranked wrench SW 3.0

AESCULAP® Columbus® Revision

NQ602 | Columbus® Revision F SET MANUAL FEMUR INSTRUMENTS

Femur size gauge
NQ711R F1/F2
NQ712R F3/F4
NQ713R F5/F6
NQ714R F7

NQ794R
Femoral box chisel

NQ701R
Distal femoral cutting block

NQ796R
Guide for femoral box chisel

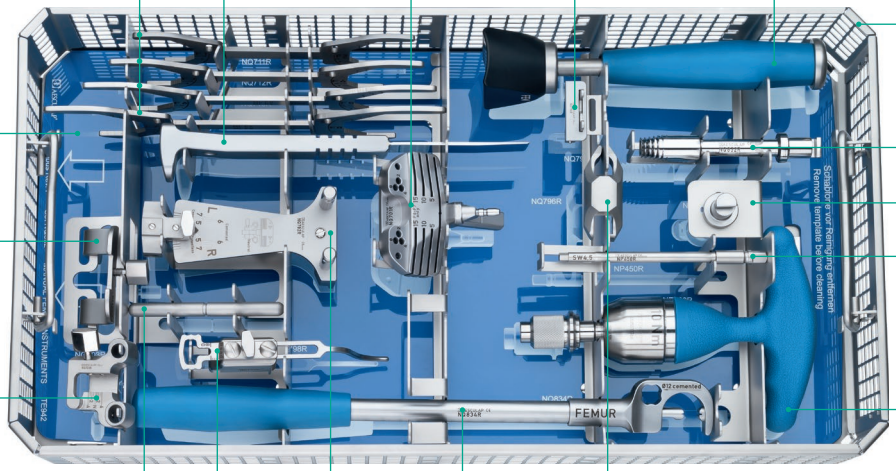
NQ644
Impactor for femur comp.

NQ622R
Columbus® Revision F Tray man. femur instr.

TE942
Graphic template for NQ622R (NQ602)

NQ799R
Distal femur contact plate for NQ798R

NQ703R
Distal femur cutting guide support



NQ832R
Rasp for femoral ext. stem

NQ770R
Holder/extracor for trial box

NP450R
Adapt. SW 4.5 torque wrench

NE160R
Torque wrench 10 Nm w. T-handle

NQ474R
Handle for femoral alignm. system

NQ798R
Joint line positioner

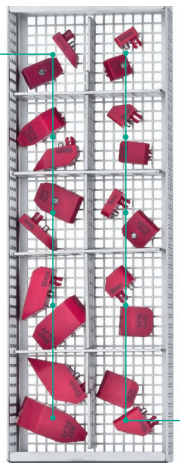
NQ702R
Femoral alignment system dist.

NQ834R
Femoral stem holding key

NQ795R
Stop f. femoral box chisel

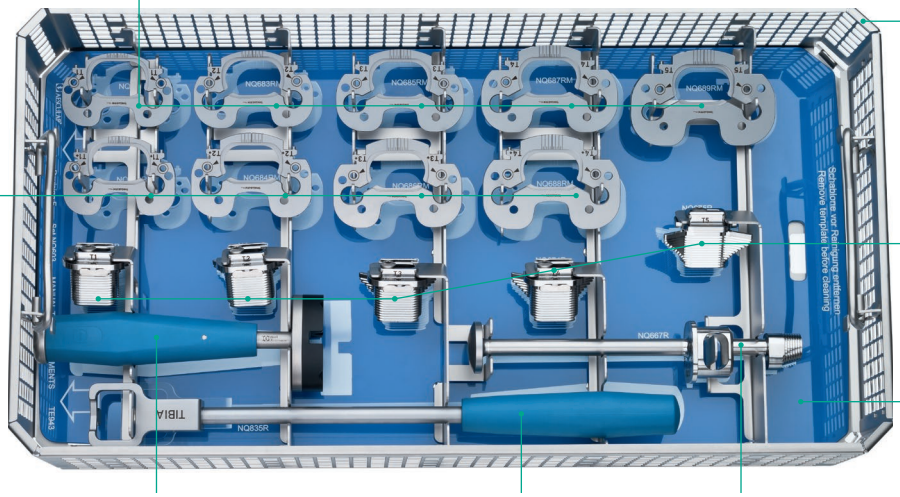
TRAY INSERT FOR NQ602

Femoral trial augments distal
2 x **NQ740** F1-F3 5 mm
2 x **NQ741** F1-F3 10 mm
2 x **NQ742** F4-F7 5 mm
2 x **NQ743** F4-F7 10 mm
2 x **NQ744** F4-F7 15 mm



Femoral trial augments posterior
2 x **NQ745** F1-F3 5 mm
2 x **NQ746** F1-F3 10 mm
2 x **NQ747** F4-F7 5 mm
2 x **NQ748** F4-F7 10 mm
2 x **NQ749** F4-F7 15 mm

NQ603 | Columbus® Revision F SET MANUAL TIBIA INSTRUMENTS



NQ681RM
Tibial trial / prep. plat. T1

NQ683RM
Tibial trial / prep. plat. T2

NQ685RM
Tibial trial / prep. plat. T3

NQ687RM
Tibial trial / prep. plat. T4

NQ689RM
Tibial trial / prep. plat. T5

NQ623R
Columbus® Revision F Tray man. tibia instr.

NQ682RM
Tibia-Probe-/ Präp. Plat. T1+

NQ684RM
Tibia-Probe-/ Präp. Plat. T2+

NQ686RM
Tibia-Probe-/ Präp. Plat. T3+

NQ688RM
Tibia-Probe-/ Präp. Plat. T4+

NQ671R–NQ675R
Osteodenser T1 / 1+, T2 / 2+, T3 / 3+, T4 / 4+, T5

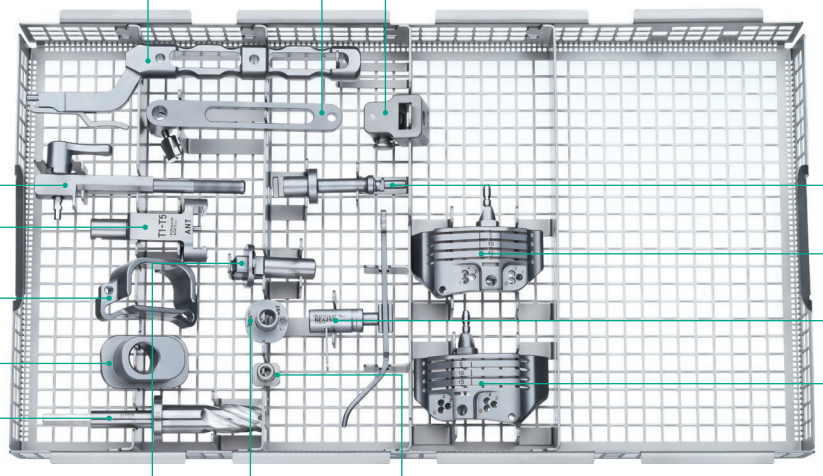
TE943
Graphic template for NQ623R (NQ603)

NQ645
Impactor f. Tibial plateau

NQ835R
Tibial counterholder

NQ667R
Rasp f. stem sleeve T1-T5

TRAY INSERT FOR NQ603



NQ678RM
Holder f. tibial trial plateau

NQ648R
Intramed. sliding rail

NQ649R
Intramed. socket

NQ647R
Intramed. Connecting rod

NQ665R
Holder for osteodenser T1-T5

NQ669R
Osteodenser guide T1-T5

NQ663R
Drill sleeve T1-T5

NQ661R
Stop drill Ø 16 mm

NQ397R
Holder for ML positioner NQ676R

NQ650R
Tibial cutting block asym. left

NE425R
Tibia cutting height stylus

NQ651R
Tibial cutting block asym. right

NQ676R
ML positioner

NQ677R
ML positioner chimney

NQ833R
Tibial stem connection

AESCULAP® Columbus® Revision

NQ604 | Columbus® Revision F SET FEMUR PREPARATION

Femoral control plate
NQ715R F1/F2
NQ716R F3/F4
NQ717R F5/F6
NQ718R F7

NP584R
4 x pin w/o head Ø 3.2 mm
L. 88 mm

4-in-1 femoral cutting block
NQ722R F2
NQ721R F1

4-in-1 femoral cutting block
NQ725R F5
NQ724RM F4
NQ723R F3

NQ624R
Columbus® Revision F
Tray femur preparation

NQ720R
2 x handle for 4-in-1 cutting block

TE944
Graphic template for NQ624R (NQ604)

Trial augment for 4-in-1 cutting block
2 x **NQ733** F3/F4 10 mm
2 x **NQ732** F3/F4 5 mm
2 x **NQ731** F1/F2 10 mm
2 x **NQ730** F1/F2 5 mm

4-in-1 femoral cutting block
NQ727R F7
NQ726R F6

NQ729
2 x Trial augment for 4-in-1 cutting block F4 15 mm

NQ735
2 x Trial augment for 4-in-1 cutting block F5/F6 10 mm

NQ737
2 x Trial augment for 4-in-1 cutting block F7 5 mm

NQ739
2 x Trial augment for 4-in-1 cutting block F7 15 mm

NQ734
2 x Trial augment for 4-in-1 cutting block F5/F6 5 mm

NQ736
2 x Trial augment for 4-in-1 cutting block F5/F6 15 mm

NQ738
2 x Trial augment for 4-in-1 cutting block F7 10 mm

NQ605 | Columbus® Revision F SET TIBIAL TRIAL GLIDING SURFACES

Trial gliding surf. T5
NP096M 24 mm
NP092M 14 mm
NP091M 12 mm
NP090M 10 mm

Trial gliding surf. T4/4+
NP086M 24 mm
NP082M 14 mm
NP081M 12 mm
NP080M 10 mm

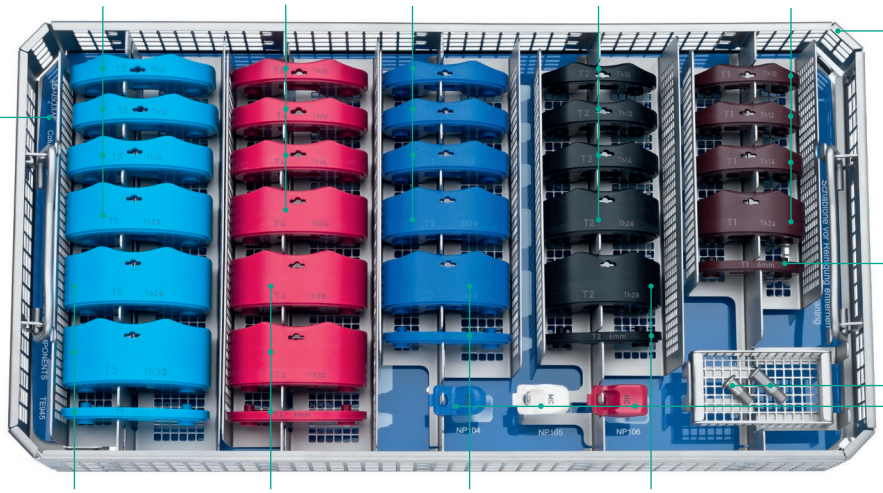
Trial gliding surf. T3/3+
NP076M 24 mm
NP072M 14 mm
NP071M 12 mm
NP070M 10 mm

Trial gliding surf. T2/2+
NP066M 24 mm
NP062M 14 mm
NP061M 12 mm
NP060M 10 mm

Trial gliding surf. T1/1+
NP056M 24 mm
NP052M 14 mm
NP051M 12 mm
NP050M 10 mm

NQ625R
Columbus® Revision F
Tray tibial trial comp.

TE945
Graphic template for NQ625R (NQ605)



NP059
Trial spacer T1/1+ 6 mm

NP038R
Fastening screw M7 short for trial gliding surf.

NP039R
Fastening screw M7 long for trial gliding surf.

NP104
PS trial post

NP105
MC trial post

NP106
HC trial post

Trial gliding surf. T5
NP097M 28 mm
NP098M 32 mm

Trial spacer T5
NP099 6 mm

Trial gliding surf. T4/4+
NP087M 28 mm
NP088M 32 mm

Trial spacer T4/4+
NP089 6 mm

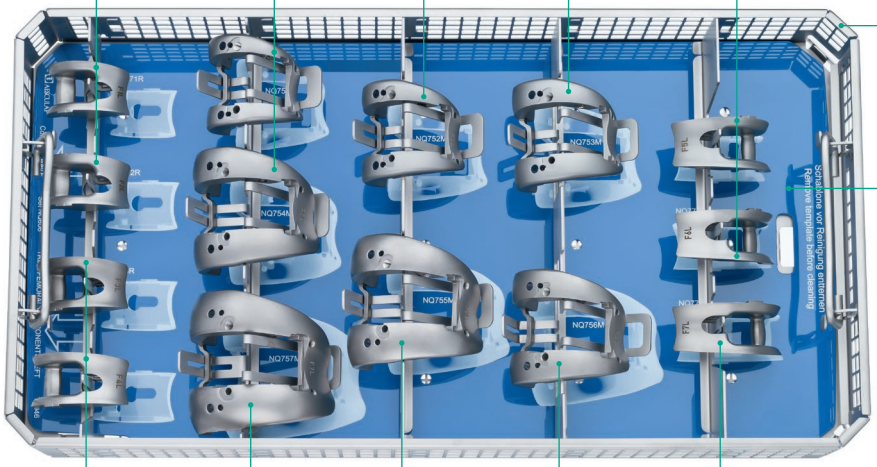
Trial gliding surf. T3/3+
NP077M 28 mm

Trial spacer T3/3+
NP079 6 mm

Trial gliding surf. T2/2+
NP067M 28 mm

Trial spacer T2/2+
NP069 6 mm

NQ606 | Columbus® Revision F SET FEMORAL TRIAL COMPONENTS - LEFT



Removov. femoral trial box
NQ772R F2L
NQ771R F1L

Femoral trial component
NQ754M F4L
NQ751M F1L

Femoral trial component
NQ752M F2L

Femoral trial component
NQ753M F3L

Removov. femoral trial box
NQ775R F5L
NQ776R F6L

NQ626R
Columbus® Revision F Tray femoral trial comp. left

TE946
Graphic template for NQ626R (NQ606)

Removov. femoral trial box
NQ773R F3L
NQ774R F4L

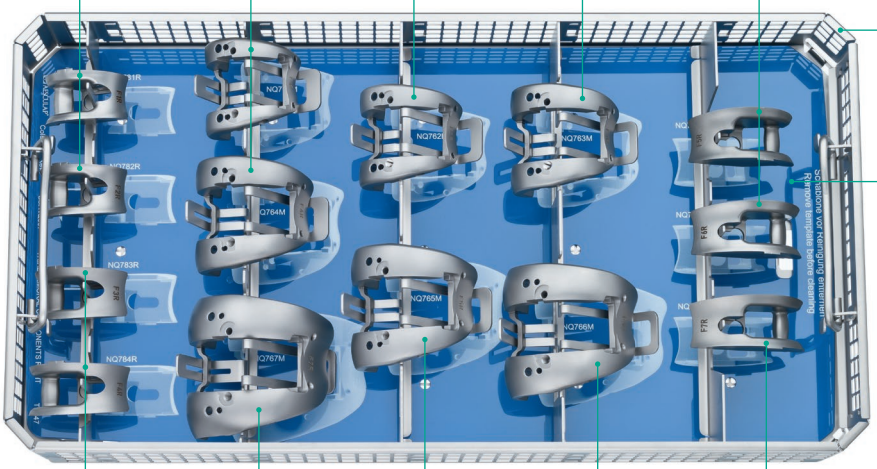
Femoral trial component
NQ757M F7L

Femoral trial component
NQ755M F5L

Femoral trial component
NQ756M F6L

Removov. femoral trial box
NQ777R F7L

NQ607 | Columbus® Revision F SET FEMUR PROBEKOMPONENTEN RECHTS



Removov. femoral trial box
NQ782R F2R
NQ781R F1R

Femoral trial component
NQ764M F4R
NQ761M F1R

Femoral trial component
NQ762M F2R

Femoral trial component
NQ763M F3R

Removov. femoral trial box
NQ785R F5R
NQ786R F6R

NQ627R
Columbus® Revision F Tray femoral trial comp. right

TE947
Graphic template for NQ627R (NQ607)

Removov. femoral trial box
NQ783R F3R
NQ784R F4R

Femoral trial component
NQ767M F7R

Femoral trial component
NQ765M F5R

Femoral trial component
NQ766M F6R

Removov. femoral trial box
NQ787R F7R

AESCULAP® Columbus® Revision

NQ608 | Columbus® Revision F SET TIBIAL TRIAL AUGMENTS

Tibial trial augments
5 mm RL/LM
NS144 T1/1+
NS148 T2/2+
NS152 T3/3+
NS156 T4/4+
NS160 T5

Tibial trial augments
15 mm RL/LM
NS146 T1/1+
NS150 T2/2+
NS154 T3/3+
NS158 T4/4+
NS162 T5

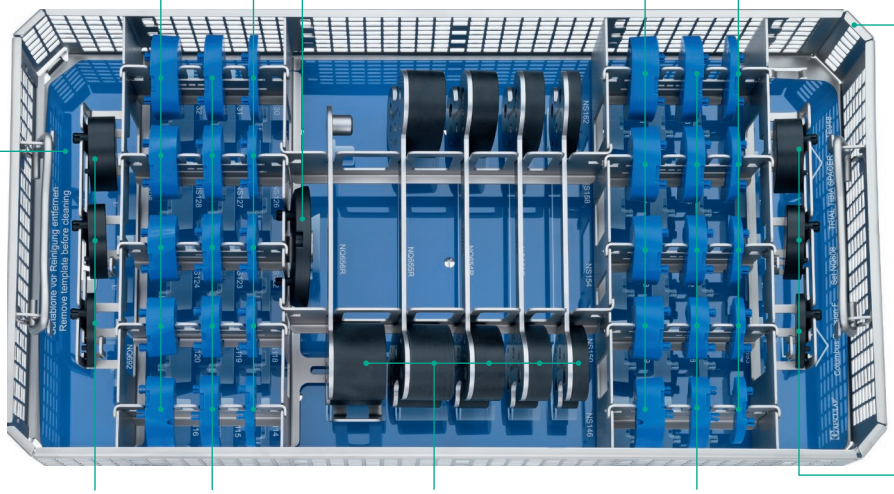
NQ710
Femoral cut spacer

Tibial trial augments
5 mm RM/LL
NS114 T1/1+
NS118 T2/2+
NS122 T3/3+
NS126 T4/4+
NS130 T5

Tibial trial augments
15 mm RM/LL
NS116 T1/1+
NS120 T2/2+
NS124 T3/3+
NS128 T4/4+
NS132 T5

NQ628R
Columbus® Revision F Tray tibial trial augments

TE948
Graphic template for NQ628R (NQ608)



Unilateral trial plate for spacer RL/LM
NQ693 5 mm
NQ695 10 mm
NQ697 15 mm

Tibial trial augments
10 mm RL/LM
NS161 T5
NS157 T4/4+
NS153 T3/3+
NS149 T2/2+
NS145 T1/1+

Spacer for tibial cut
NQ652R 10+12 mm
NQ653R 14+16 mm
NQ654R 18+20 mm
NQ655R 24+28 mm
NQ656R 32 mm

Tibial trial augments
10 mm RM/LL
NS131 T5
NS127 T4/4+
NS123 T3/3+
NS119 T2/2+
NS115 T1/1+

Unilateral trial plate for spacer RM/LL
NQ692 5 mm
NQ694 10 mm
NQ696 15 mm

NQ609 | Columbus® Revision F SET STEM PREPARATION CEMENTED

Adapter fem. trial stem
6° 77 mm cemented
NQ838R 77 mm
NQ837R 37 mm

NQ836R
Adapter neutral 6° L+R trial stem cemented

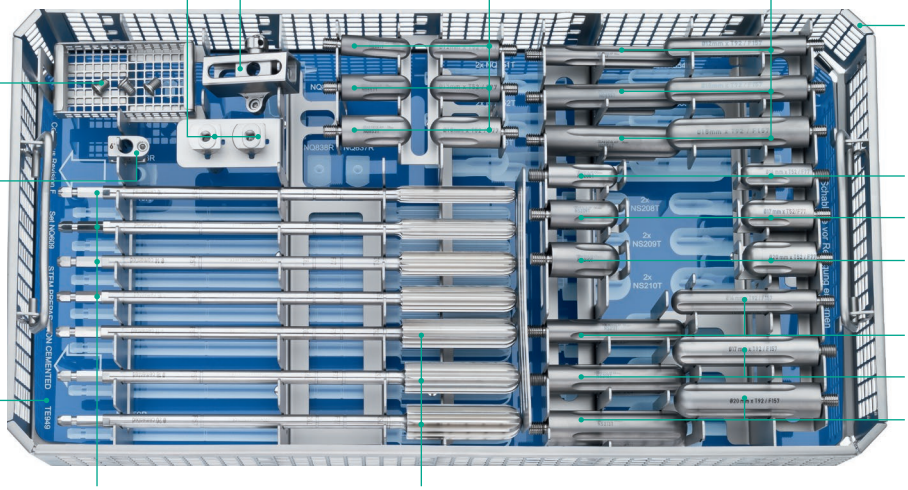
Trial stem cemented
2 x **NQ851T** Ø 12 x 52 mm
2 x **NQ852T** Ø 15 x 52 mm
2 x **NQ853T** Ø 18 x 52 mm
2 x **NQ854T** Ø 12 x 92 mm
2 x **NQ855T** Ø 15 x 92 mm
2 x **NQ856T** Ø 18 x 92 mm

NQ629R
Columbus® Revision F Tray stem prep. cemented

NS001R
3 x trial stem screw SW 3.0

NQ706R
Femor. alignm. sleeve AP 6° L/R

TE949
Graphic template for NQ629R (NQ609)



Trial stem cemented
2 x **NS208T** Ø 14 x 52 mm
2 x **NS209T** Ø 17 x 52 mm
2 x **NS210T** Ø 20 x 52 mm
2 x **NS211T** Ø 14 x 92 mm
2 x **NS212T** Ø 17 x 92 mm
2 x **NS213T** Ø 20 x 92 mm

Reamer cemed stem
NQ840R Ø 10 mm
NQ842R Ø 12 mm
NQ844R Ø 14 mm
NQ845R Ø 15 mm

Reamer cemed stem
NQ847R Ø 17 mm
NQ848R Ø 18 mm
NQ850R Ø 20 mm

NQ610 | Columbus® Revision F SET STEM PREPARATION - CEMENTLESS

Reamer cementless stem
NS030R Ø 20 mm
NS029R Ø 19 mm
NS028R Ø 18 mm
NS027R Ø 17 mm
NS026R Ø 16 mm

Adapter trial stem cementless
NS002R Neutral 5° L+R

3 x **NS001R**
Trial stem screw
SW 3.0

NQ630R
Columbus® Revision F Tray
cementless - Reamers

Adapter fem. trial stem
cementless
NS008R 5° Ntr. 37 mm

NS011R 5° Ntr. 57 mm

NS014R 7° Ntr. 37 mm

NS017R 7° Ntr. 57 mm

Reamer cementless stem
NS025R Ø 15 mm
NS024R Ø 14 mm
NS023R Ø 13 mm
NS022R Ø 12 mm
NS021R Ø 11 mm

Adapter trial stem cementless
NS005R Neutral 7° L+R

Femoral alignm. sleeve
NQ705R AP 7° L/R
NQ707R AP 7° L/R

TE938
Graphic template for
NQ630R (NQ610)

Trial stem cementless
2 x **NS033T** Ø 13 x 92 mm
2 x **NS034T** Ø 14 x 92 mm
2 x **NS035T** Ø 15 x 92 mm

Trial stem cementless
2 x **NS038T** Ø 18 x 92 mm
2 x **NS039T** Ø 19 x 92 mm
2 x **NS040T** Ø 20 x 92 mm

Trial stem cementless
2 x **NS043T** Ø 13 x 132 mm
2 x **NS044T** Ø 14 x 132 mm
2 x **NS045T** Ø 15 x 132 mm

NQ646R
Columbus® Revision Tray
cementless - Trial stems

Trial stem cementless
2 x **NS050T** Ø 20 x 132 mm

2 x **NS049T** Ø 19 x 132 mm

2 x **NS048T** Ø 18 x 132 mm

2 x **NS047T** Ø 17 x 132 mm

2 x **NS046T** Ø 16 x 132 mm

Trial stem cementless
2 x **NS032T** Ø 12 x 92 mm
2 x **NS031T** Ø 11 x 92 mm

Trial stem cementless
2 x **NS037T** Ø 17 x 92 mm
2 x **NS036T** Ø 16 x 92 mm

Trial stem cementless
2 x **NS042T** Ø 12 x 132 mm
2 x **NS041T** Ø 11 x 132 mm

TE939
Graphic template for
NQ646R (NQ610)

AESCULAP® Columbus® Revision

NQ612 | Columbus® Revision F SET TIBIA PREPARATION SIZE T0

Trial gliding surf. T0/0+
NP042M 14 mm
NP041M 12 mm
NP040M 10 mm

NQ664R
Holder for osteodenser T0/0+

NQ668R
Osteodenser guide T0/0+

NQ666R
Rasp for stem sleeve T0/0+

NQ662R
Drill sleeve T0/0+

NQ632R
Columbus® Revision F Tray tibial instr. Size T0

TE934
Graphic template for NQ632R (NQ612)

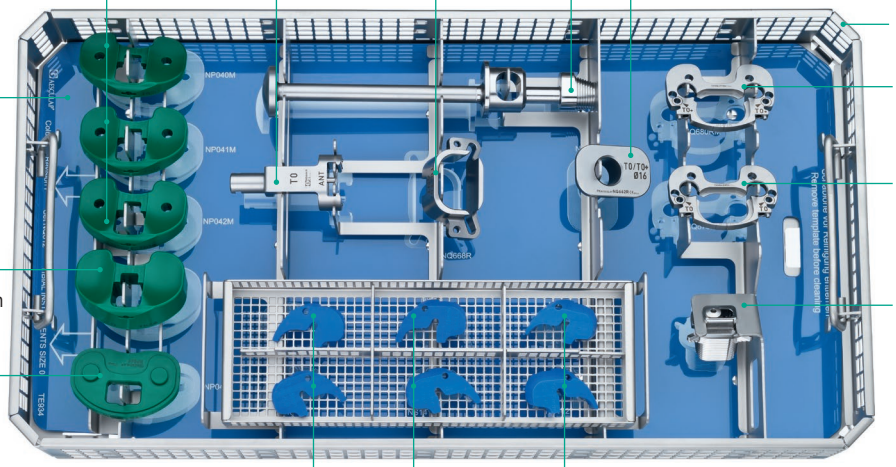
NQ679RM
Tibial trial/prep. plat. T0+

NQ680RM
Tibial trial/prep. plat. T0

NP046M
Trial gliding surf. T0/0+ 24 mm

NQ670R
Osteodenser T0/0+

NP049
Trial spacer T0/0+ 6 mm



Tibial trial augments T0/0+
NS110 5 mm RM/LL
NS140 5 mm RL/LM

Tibial trial augments T0/0+
NS111 10 mm RM/LL
NS141 10 mm RL/LM

Tibial trial augments T0/0+
NS112 15 mm RM/LL
NS142 15 mm RL/LM

NS709 | IQ PATELLA PREPARATION

NS841R
Patella drilling and impacting clamp

AA847R
Caliper with nonius measurement range 100 mm

NS719R
Tray patella preparation

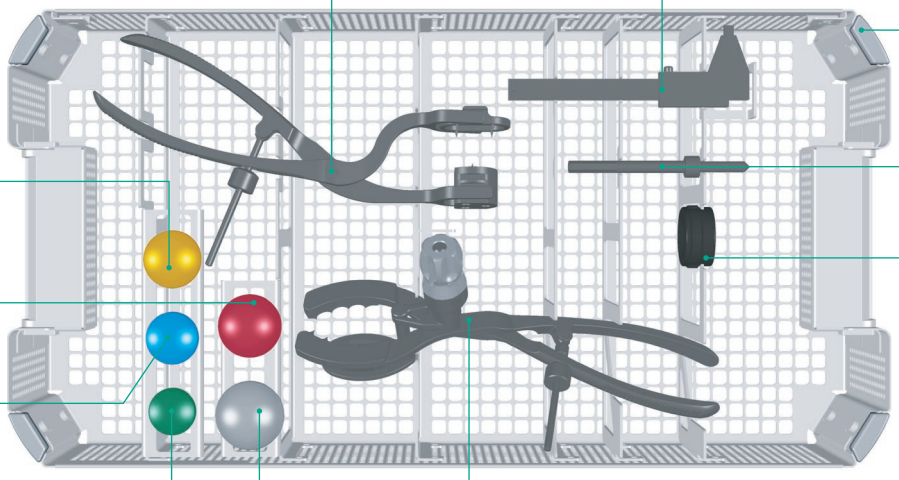
NQ283
Trial patella 3 pegs
P3 Ø 32 x 9 mm

NQ449R
Drill with stop Ø 6 mm

NQ284
Trial patella 3 pegs
P4 Ø 35 x 10 mm

NS842
Insert for NS841R

NQ282
Trial patella 3 pegs
P2 Ø 29 x 8 mm



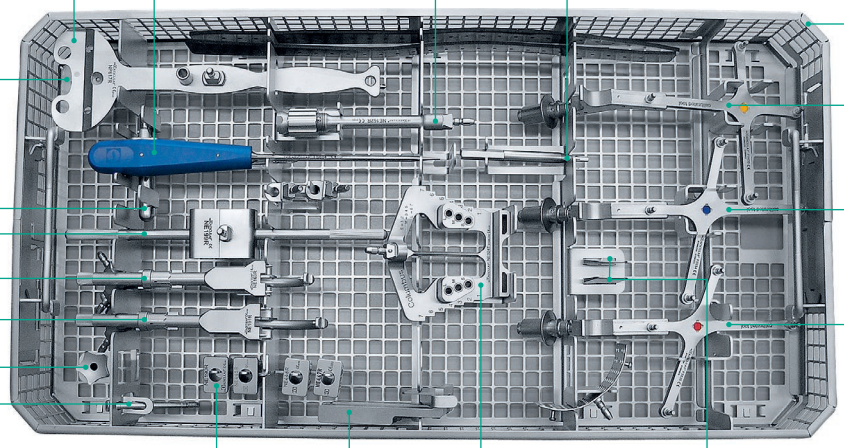
TF069
Graphic template for NS719R (NS709)

NQ281
Trial patella 3 pegs
P1 Ø 26 x 7 mm

NQ285
Trial patella 3 pegs
P5 Ø 38 x 11 mm

NS840R
Patella resection clamp

NQ594 | OrthoPilot® TKR – NAVIGATION Columbus® Revision, PASSIVE INSTRUMENTS



NP617RM
Tibia control plate

FS604
Pointer

NE162R
Rigid body offset adapter, 100 mm

NP618R
Screwdriver, RB screw for motor

NP615R
Spiral drill, Ø 3.2 mm

NE292R
Revision screw tap for tibia RB adapt

NE199R
Navigation adapter for T-handle

NE163R
Revision femur Rigid Body adapter, small

NE191R
Revision femur Rigid Body adapter, large

NE192R
Tibial RB rev. adapter

NQ595R
Columbus® PS/Rev Tray for NQ594

FS633
Passive rigid body, yellow

FS634
Passive rigid body, blue

FS635
Passive rigid body, red

Sliding block

NE190R Glide conn. block 0° for tibia cutting guide

NE445R 5° insert for femoral cutting block

NE446R 6° insert for femoral cutting block

NE447R 7° insert for femoral cutting block

NE171R
Revision adapter for distal cutting guide

NE324T
Femur alignment block, navig.

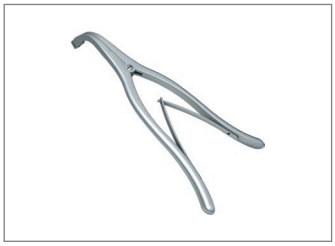
NE441RM
Dorsal condylar plate, left

NE442RM
Dorsal condylar plate, right

AESCULAP® Columbus® Revision

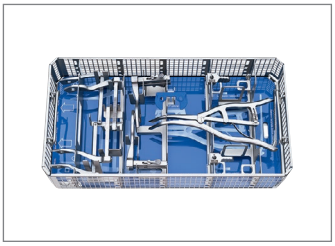
15 | OPTIONAL INSTRUMENTS

GENERAL



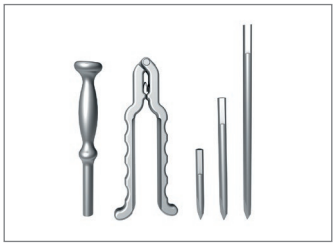
NP609R distractor clamp

NE750R Femur/tibia distractor



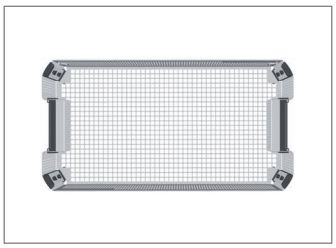
NM640 Force controlled spreader set

NE150R leg positioner for TKA, NE153R fixation frame

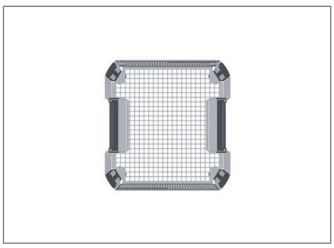


Pin set (NP742R, NP743R, NP748R, NP749R, NP750R)

STORAGE OF OPTIONAL INSTRUMENTS

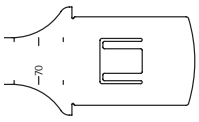
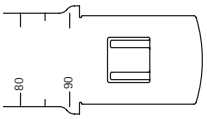
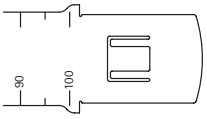
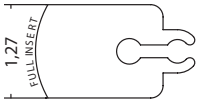
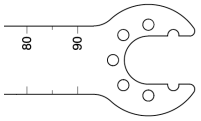
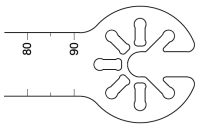


NQ1429R Storage of optional instruments, small, lid JA455R

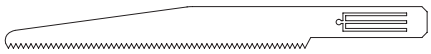
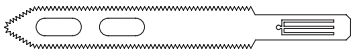


NE1029R Storage of optional instruments, small, lid JA415R

NOTE
For the optional trays we recommend the following containers and lids:
NQ1429R: container JK442, cover JK489
NE1029R: container JK342, cover JK389

System	Item No.	Width	Thickness	Saw Blades 1 steril 2
AESCULAP® Acculan Length 75 mm	GE231SU	9 mm	1.27 mm	
AESCULAP® Acculan Length 90 mm	GE233SU	13.5 mm	1.27 mm	
	GE236SU	13 mm	1.27 mm	
	GE241SU	19 mm	1.27 mm	
	GE246SU	23 mm	1.27 mm	
AESCULAP® Acculan Length 100 mm	GE249SU	19 mm	1.27 mm	
Stryker System 2000, System 6-8 Length 90 mm	GE330SU	13 mm	1.27 mm	
	GE331SU	19 mm	1.27 mm	
	GE332SU	25 mm	1.27 mm	
DePuy Synthes **Trauma Recon System** **Battery Power Line II** Length 90 mm	GE323SU	13 mm	1.27 mm	
Zimmer Biomet Universal Length 90 mm	GE326SU	25 mm	1.27 mm	
Conmed Mpower 2 Length 90 mm	GE327SU	13 mm	1.27 mm	
	GE329SU	25 mm	1.27 mm	

For a complete overview of all available saw blades with AESCULAP® coupling, see our Burrs & Blades catalog O17599.

System	Saw blade for jigsaw 75/10/1.0/1.2 mm	Saw blade for jigsaw 75/12/1.0/1.2 mm
Acculan	 GC769R	 GC771R

AESCULAP® Columbus® Revision

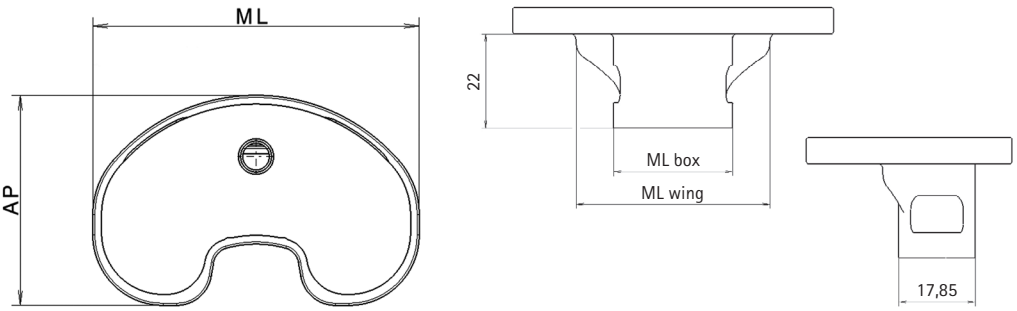
17 | IMPLANT DIMENSIONS AND DESIGN

TIBIA IMPLANT

Dimensions in mm

Size	T0	T0+	T1	T1+	T2	T2+	T3	T3+	T4	T4+	T5
ML	62	62	65	65	70	70	75	75	80	80	85
AP	41	44	43	46	45	49	48	52	51	55	56
ML wing	37	37	39	39	42	42	45	45	48	48	51
ML box	24	24	28	28	28	28	28	28	28	28	28

- 11 sizes
- Seating for tibia extension stems
- Offset:
  T0/T0+ = ± 4 mm,
  T1-T5 = ± 6 mm
- Flexion angle 130°
- Symmetrical plateau design
- Cemented

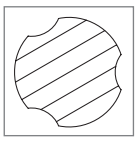


TIBIA EXTENSION STEMS, CEMENTED

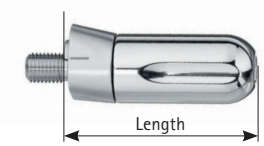
Dimensions in mm

Length	Diameter		
52	12	15	18
92			

Stem profile



- Cylindrical
- Polished
- With an asymmetrical "collar" for increased stability
- Three longitudinal grooves to avoid the risk of embolism

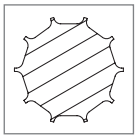


TIBIA EXTENSION STEMS, CEMENTLESS

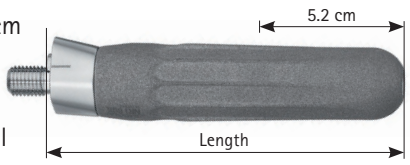
Dimensions in mm

Length	Diameter									
92	11	12	13	14	15	16	17	18	19	20
132										

Stem profile



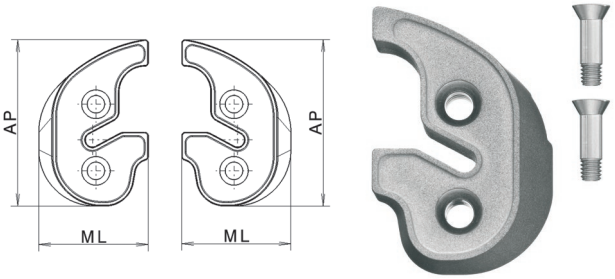
- 3° conical up to 5.2 cm from the stem tip
- Corundum radiated
- With an asymmetrical "collar" for increased stability
- 10 longitudinal grooves (Wagner profile)



TIBIAL AUGMENTS

Dimensions in mm

Size	T0	T1	T2	T3	T4	T5
AP	40	42	44	47	51	56
ML	25	26	29	31	34	36

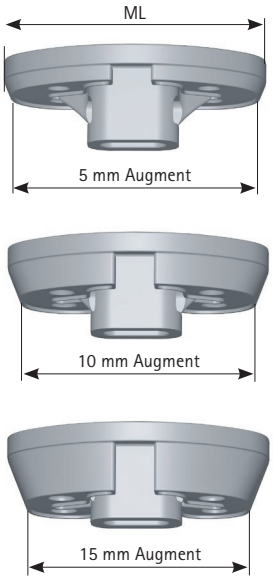


- Augments in heights of 5, 10 and 15 mm
- Screwed in the bottom
- Anatomic medial or lateral design
- Cement pockets: 1 mm deep

MEDIO-LATERAL TAPERING WITH TIBIAL AUGMENTS

Dimensions in mm

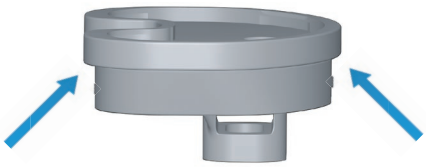
Columbus® Revision tibial augments	Tibia 0/0+	Tibia 1/1+	Tibia 2/2+	Tibia 3/3+	Tibia 4/4+	Tibia 5
Original ML Width	**62**	**65**	**70**	**75**	**80**	**85**
With two tibial augments 5 mm	58	61	66	71	76	81
With two tibial augments 10 mm	54	57	62	67	72	77
With two tibial augments 15 mm	50	53	58	63	68	73



ANTERO-POSTERIOR TAPERING WITH TIBIAL AUGMENTS

Dimensions in mm

Columbus® Revision tibial augments	Tibia 0/0+	Tibia 1/1+	Tibia 2/2+	Tibia 3/3+	Tibia 4/4+	Tibia 5
Original AP Width	**41/44**	**43/46**	**45/49**	**48/52**	**51/55**	**56**
With two tibial augments 5 mm	40	42	44	47	51	56
With two tibial augments 10 mm	40	42	44	47	51	56
With two tibial augments 15 mm	37	39	41	44	48	53



NOTE

For certain anatomies and defect situations, the unilateral use of augmentation with the Tibia Plus sizes may be necessary. This creates a step between the augment and tibial implant both anteriorly and posteriorly. This must be taken into account when assessing possible soft-tissue irritation.

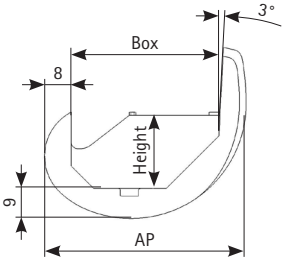
AESCULAP® Columbus® Revision

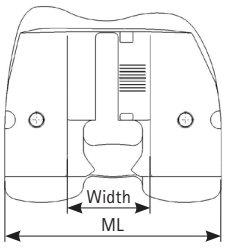
17 | IMPLANT DIMENSIONS AND DESIGN

FEMUR IMPLANTAT

Dimensions in mm

Size	ML	AP	Box	Hight	Width
F1	56	50	34	19	25.5
F2	59	53	37	20.5	25.5
F3	62.5	56.5	40	22	25.5
F4	66.5	60.5	43.5	22	25.5
F5	71	65	47.5	22	25.5
F6	76	70	52	22	25.5
F7	82	75.5	57	22	25.5





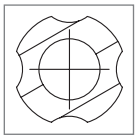
- Seven sizes, left/right
- Bone cuts identical to Columbus® Primary
- Hyperextension 4°
- Flexion angle 130°
- Cemented

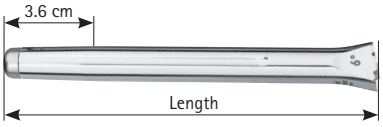
FEMUR EXTENSION STEMS, CEMENTED

Dimensions in mm

Length	Diameter		
77	12	15	18
157			

Stem Profil





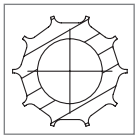
- Valgus angle: 6°
- ML offset: Neutral AP offset: +- 4 mm
- 3° conically shaped up to 3.6 cm from the stem tip
- Polished
- 4 longitudinal grooves to avoid the risk of embolism

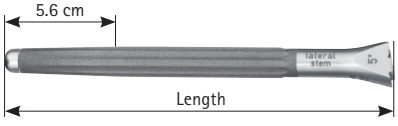
FEMUR EXTENSION STEMS, CEMENTLESS

Dimensions in mm

Length	Diameter								
117	12	13	14	15	16	17	18	19	20
177									

Stem Profil





- Valgus angle: 5°/7°
- AP offset: +- 4 mm
- 3° conically shaped up to 5.6 cm from the stem tip
- Corundum radiated
- Ten longitudinal grooves (Wagner profile)

Femoral stem nut

FEMUR AUGMENTS

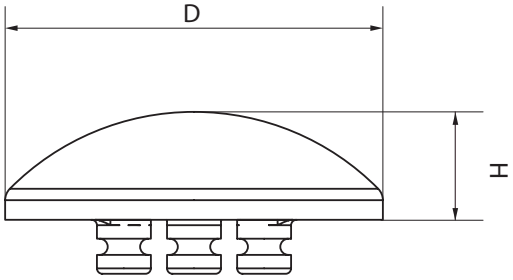
	distal			posterior		
	5 mm	10 mm	15 mm	5 mm	10 mm	15 mm
F1	x	x		x	x	
F2	x	x		x	x	
F3	x	x		x	x	
F4	x	x	x	x	x	x
F5	x	x	x	x	x	x
F6	x	x	x	x	x	x
F7	x	x	x	x	x	x

- Distal augments for F1 – F3: 5, 10 mm
- Distal augments for F4 – F7: 5, 10 and 15 mm
- Dorsal augments for F1 – F3: 5, 10 mm
- Dorsal augments for F4 – F7: 5, 10 and 15 mm
- Augments are screwed to the femoral component
- 1 mm cement pockets in the augment

PATELLA

Dimensions in mm

	Patella P1	Patella P2	Patella P3	Patella P4	Patella P5
D Patella x H	Ø 26 x 7	Ø 29 x 8	Ø 32 x 9	Ø 35 x 10	Ø 38 x 11



AESCULAP® Columbus® Revision

NOTE

The PE size is always chosen to match the size of the tibia.

PE GLIDING SURFACE MEDIUM CONSTRAINT (MC) DESIGN

Dimensions in mm

Size	10	12	14	16	18	20	24	28	32
T0/0+ - T1/1+	x	x	x	x	x	x	x		
T2/2+ - T3/3+	x	x	x	x	x	x	x	x	
T4/4+ - T5	x	x	x	x	x	x	x	x	x

- Rotational freedom +- 5°
- Securing in the tibial plateau with four retaining clips
- Including locking screw (AS coated)

PE GLIDING SURFACE HIGH CONSTRAINT (HC) DESIGN

Dimensions in mm

Size	10	12	14	16	18	20	24	28	32
T0/0+ - T1/1+	x	x	x	x	x	x	x		
T2/2+ - T3/3+	x	x	x	x	x	x	x	x	
T4/4+ - T5	x	x	x	x	x	x	x	x	x

- Varus/valgus stability +- 2°
- Rotational freedom +- 3°
- Securing in the tibial plateau with four retaining clips
- Including locking screw (AS coated)

COMPATIBILITY Columbus® Revision TIBIA WITH Columbus® Revision FEMUR WITH HC/MC GLIDING SURFACES

Größe	F1	F2	F3	F4	F5	F6	F7
T0/0+							
T1/1+							
T2/2+							
T3/3+							
T4/4+							
T5							

Compatible

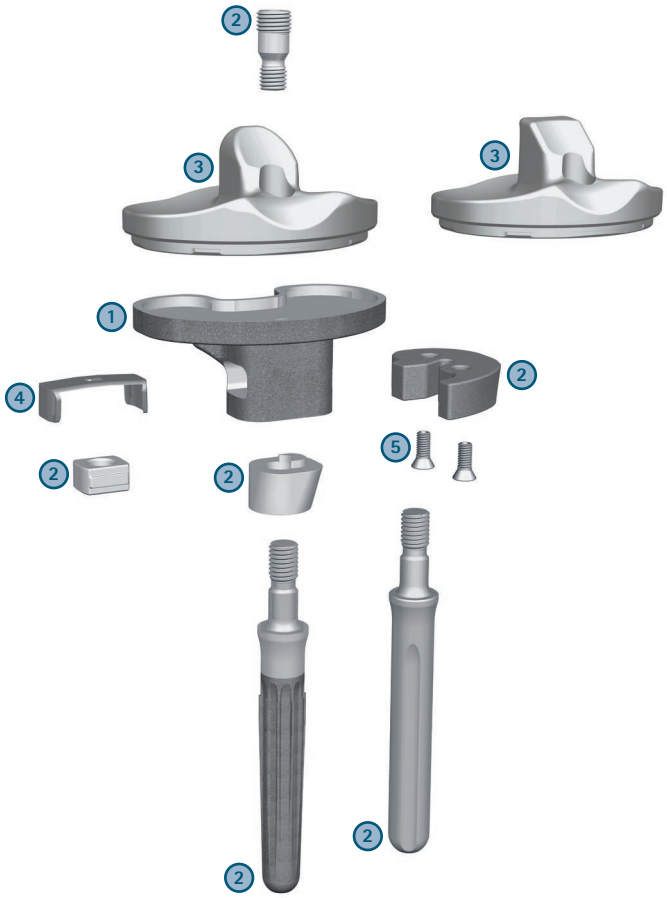
Compatible, but not recommended by AESCULAP®

Not compatible

Tightening torque information:

- 27 Nm for femur extension stems
- 20 Nm for tibia extension stems
- 10 Nm for PE locking screw

MATERIAL OVERVIEW



1. CoCrMo (casting alloy)
2. CoCrMo (forge alloy)
3. UHMWPE
4. PEEK-OPTIMA™ (LT1)
5. Ti6Al4V

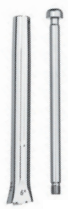
CoCrMo (casting alloy)	Cobalt chromium molybdenum casting alloy to ISO 5832-4
CoCrMo (forge alloy)	Cobalt chromium molybdenum casting alloy to ISO 5832-12
UHMWPE	Ultra-high molecular weight polyethylene to ISO 5834-2
PEEK-OPTIMA™ (LT1)	Medicinal polyether ether ketones (Invibio)
Ti6Al4V	Titanium aluminum vanadium forge alloy to ISO 5832-3

NOTES

FEMUR, CEMENTED

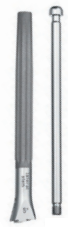
Variant:	F1	F2	F3	F4	F5	F6	F7
Links CoCr	NR001K	NR002K	NR003K	NR004K	NR005K	NR006K	NR007K
Links AS	NR001Z	NR002Z	NR003Z	NR004Z	NR005Z	NR006Z	NR007Z
Rechts CoCr	NR011K	NR012K	NR013K	NR014K	NR015K	NR016K	NR017K
Rechts AS	NR011Z	NR012Z	NR013Z	NR014Z	NR015Z	NR016Z	NR017Z

FEMUR EXTENSION STEMS, CEMENTED 6°



Variant [mm]:	77	157	77	157	77	157
	Ø 12 mm		Ø 15 mm		Ø 18 mm	
F1-F7 CoCr	NR291K	NR294K	NR292K	NR295K	NR293K	NR296K
F1-F7 AS	NR291Z	NR294Z	NR292Z	NR295Z	NR293Z	NR296Z

FEMUR EXTENSION STEMS, CEMENTLESS, 5° / 7°



Variant [mm]:	117	177	117	177	117	177
	Ø 12 mm		Ø 13 mm		Ø 14 mm	
F1-F7 5° Neut CoCr	NR402K	NR432K	NR403K	NR433K	NR404K	NR434K
F1-F7 5° Neut AS	NR402Z	NR432Z	NR403Z	NR433Z	NR404Z	NR434Z
F1-F7 7° Neut CoCr	NR502K	NR532K	NR503K	NR533K	NR504K	NR534K
F1-F7 7° Neut AS	NR502Z	NR532Z	NR503Z	NR533Z	NR504Z	NR534Z
	Ø 15 mm		Ø 16 mm		Ø 17 mm	
F1-F7 5° Neut CoCr	NR405K	NR435K	NR406K	NR436K	NR407K	NR437K
F1-F7 5° Neut AS	NR405Z	NR435Z	NR406Z	NR436Z	NR407Z	NR437Z
F1-F7 7° Neut CoCr	NR505K	NR535K	NR506K	NR536K	NR507K	NR537K
F1-F7 7° Neut AS	NR505Z	NR535Z	NR506Z	NR536Z	NR507Z	NR537Z
	Ø 18 mm		Ø 19 mm		Ø 20 mm	
F1-F7 5° Neut CoCr	NR408K	NR438K	NR409K	NR439K	NR410K	NR440K
F1-F7 5° Neut AS	NR408Z	NR438Z	NR409Z	NR439Z	NR410Z	NR440Z
F1-F7 7° Neut CoCr	NR508K	NR538K	NR509K	NR539K	NR510K	NR540K
F1-F7 7° Neut AS	NR508Z	NR538Z	NR509Z	NR539Z	NR510Z	NR540Z

FEMUR STEM NUT

Variant:	Neutral
F1-F7 CoCr	NR400K
F1-F7 AS	NR400Z

PATELLAE WITH THREE PEGS

	P1	P2	P3
Variant:	Ø 26 x 7	Ø 29 x 8	Ø 32 x 9
F1-F7	NX041	NX042	NX043
	P4	**P5**	
Variant:	Ø 35 x 10	Ø 38 x 11	
F1-F7	NX044	NX045	

TORQUES FOR IMPLANT ASSEMBLY

Femur extension stems	27 Nm
Tibia extension stems	20 Nm
Locking screw for PE gliding surface	10 Nm

COMPATIBILITY Columbus® Revision TIBIA WITH Columbus® Revision FEMUR WITH HC/MC GLIDING SURFACES

Größe	F1	F2	F3	F4	F5	F6	F7
T0/0+							
T1/1+							
T2/2+							
T3/3+							
T4/4+							
T5							

Compatible

Compatible, but not recommended by AESCULAP®

Not compatible

FEMORAL AUGMENTS DISTAL WITH SCREW

FEMORAL AUGMENTS POSTERIOR WITH SCREW

Variant:	5 mm	10 mm	15 mm	5 mm	10 mm	15 mm
F1 CoCr	NR461K	NR471K	–	NR561K	NR571K	–
F1 AS	NR461Z	NR471Z	–	NR561Z	NR571Z	–
F2 CoCr	NR462K	NR472K	–	NR562K	NR572K	–
F2 AS	NR462Z	NR472Z	–	NR562Z	NR572Z	–
F3 CoCr	NR463K	NR473K	–	NR563K	NR573K	–
F3 AS	NR463Z	NR473Z	–	NR563Z	NR573Z	–
F4 CoCr	NR464K	NR474K	NR484K	NR564K	NR574K	NR584K
F4 AS	NR464Z	NR474Z	NR484Z	NR564Z	NR574Z	NR584Z
F5 CoCr	NR465K	NR475K	NR485K	NR565K	NR575K	NR585K
F5 AS	NR465Z	NR475Z	NR485Z	NR565Z	NR575Z	NR585Z
F6 CoCr	NR466K	NR476K	NR486K	NR566K	NR576K	NR586K
F6 AS	NR466Z	NR476Z	NR486Z	NR566Z	NR576Z	NR586Z
F7 CoCr	NR467K	NR477K	NR487K	NR567K	NR577K	NR587K
F7 AS	NR467Z	NR477Z	NR487Z	NR567Z	NR577Z	NR587Z

COCR VERSION

AS VERSION

TIBIA, CEMENTED

Variant:	T0	T0+	T1	T1+	T2	T2+	T3	T3+	T4	T4+	T5
CoCr	NR070K	NR068K	NR071K	NR072K	NR073K	NR074K	NR075K	NR076K	NR077K	NR078K	NR079K
AS	NR070Z	NR068Z	NR071Z	NR072Z	NR073Z	NR074Z	NR075Z	NR076Z	NR077Z	NR078Z	NR079Z

TIBIA EXTENSION STEMS, CEMENTED

	Ø 12 mm		Ø 15 mm		Ø 18 mm	
Variant:	52 mm	92 mm	52 mm	92 mm	52 mm	92 mm
T0-T5 CoCr	NR191K	NR194K	NR192K	NR195K	NR193K	NR196K
T0-F5 AS	NR191Z	NR194Z	NR192Z	NR195Z	NR193Z	NR196Z

TIBIA EXTENSION STEMS, CEMENTLESS

	Ø 11 mm		Ø 12 mm		Ø 13 mm		Ø 14 mm		Ø 15 mm	
Variant:	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm
T0-T5 CoCr	NR171K	NR181K	NR172K	NR182K	NR173K	NR183K	NR174K	NR184K	NR175K	NR185K
T0-T5 AS	NR171Z	NR181Z	NR172Z	NR182Z	NR173Z	NR183Z	NR174Z	NR184Z	NR175Z	NR185Z
	Ø 16 mm		**Ø 17 mm**		**Ø 18 mm**		**Ø 19 mm**		**Ø 20 mm**	
Variant:	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm	92 mm	132 mm
T0-T5 CoCr	NR176K	NR186K	NR177K	NR187K	NR178K	NR188K	NR179K	NR189K	NR180K	NR190K
T0-T5 AS	NR176Z	NR186Z	NR177Z	NR187Z	NR178Z	NR188Z	NR179Z	NR189Z	NR180Z	NR190Z

TORQUES FOR IMPLANT ASSEMBLY

Femur extension stems	27 Nm
Tibia extension stems	20 Nm
Locking screw for PE gliding surface	10 Nm

PE GLIDING SURFACE MEDIUM CONSTRAINT WITH LOCKING SCREW AS COATED

Variant:	10 mm	12 mm	14 mm	16 mm	18 mm	20 mm	24 mm	28 mm	32 mm
T0/0+	NR100M	NR101M	NR102M	NR103M	NR104M	NR105M	NR106M	–	–
T1/1+	NR110M	NR111M	NR112M	NR113M	NR114M	NR115M	NR116M	–	–
T2/2+	NR120M	NR121M	NR122M	NR123M	NR124M	NR125M	NR126M	NR127M	–
T3/3+	NR130M	NR131M	NR132M	NR133M	NR134M	NR135M	NR136M	NR137M	–
T4/4+	NR140M	NR141M	NR142M	NR143M	NR144M	NR145M	NR146M	NR147M	NR148M
T5	NR150M	NR151M	NR152M	NR153M	NR154M	NR155M	NR156M	NR157M	NR158M

PE GLIDING SURFACE HIGH CONSTRAINT WITH LOCKING SCREW AS COATED

Variant:	10 mm	12 mm	14 mm	16 mm	18 mm	20 mm	24 mm	28 mm	32 mm
T0/0+	NR600M	NR601M	NR602M	NR603M	NR604M	NR605M	NR606M	–	–
T1/1+	NR610M	NR611M	NR612M	NR613M	NR614M	NR615M	NR616M	–	–
T2/2+	NR620M	NR621M	NR622M	NR623M	NR624M	NR625M	NR626M	NR627M	–
T3/3+	NR630M	NR631M	NR632M	NR633M	NR634M	NR635M	NR636M	NR637M	–
T4/4+	NR640M	NR641M	NR642M	NR643M	NR644M	NR645M	NR646M	NR647M	NR648M
T5	NR650M	NR651M	NR652M	NR653M	NR654M	NR655M	NR656M	NR657M	NR658M

	TIBIAL AUGMENTS RM/LL WITH SCREWS			TIBIAL AUGMENTS RL/LM WITH SCREWS		
Variant:	5 mm	10 mm	15 mm	5 mm	10 mm	15 mm
T0 CoCr	NR040K	NR041K	NR042K	NR240K	NR241K	NR242K
T0 AS	NR040Z	NR041Z	NR042Z	NR240Z	NR241Z	NR242Z
T1 CoCr	NR044K	NR045K	NR046K	NR244K	NR245K	NR246K
T1 AS	NR044Z	NR045Z	NR046Z	NR244Z	NR245Z	NR246Z
T2 CoCr	NR048K	NR049K	NR050K	NR248K	NR249K	NR250K
T2 AS	NR048Z	NR049Z	NR050Z	NR248Z	NR249Z	NR250Z
T3 CoCr	NR052K	NR053K	NR054K	NR252K	NR253K	NR254K
T3 AS	NR052Z	NR053Z	NR054Z	NR252Z	NR253Z	NR254Z
T4 CoCr	NR056K	NR057K	NR058K	NR256K	NR257K	NR258K
T4 AS	NR056Z	NR057Z	NR058Z	NR256Z	NR257Z	NR258Z
T5 CoCr	NR060K	NR061K	NR062K	NR260K	NR261K	NR262K
T5 AS	NR060Z	NR061Z	NR062Z	NR260Z	NR261Z	NR262Z

19 | LITERATURE

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