EnduRo™ AS

Knee Endoprosthesis Surgical Technique – Fully Articulating Constraint

Aesculap Orthopaedics

AESCULAP®
Implant Systems

EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

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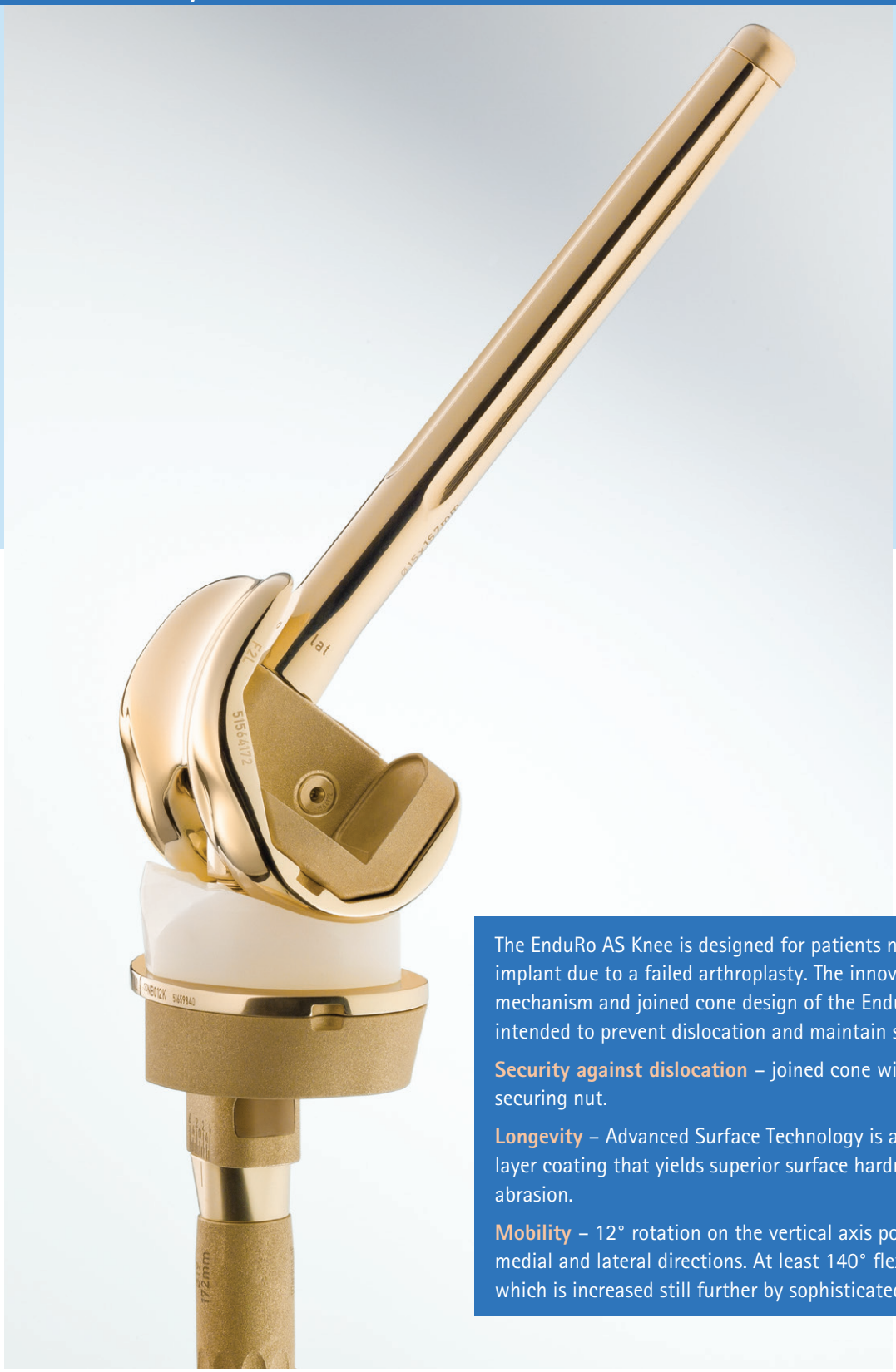
1. EnduRo AS Knee System Overview



The EnduRo AS Knee is designed for patients needing a knee implant due to a failed arthroplasty. The innovative hinge mechanism and joined cone design of the EnduRo AS are intended to prevent dislocation and maintain stability.

Security against dislocation – joined cone with additional securing nut.

Longevity – Advanced Surface Technology is a proprietary 7 layer coating that yields superior surface hardness and reduces abrasion.

Mobility – 12° rotation on the vertical axis possible – in both medial and lateral directions. At least 140° flexion angle, which is increased still further by sophisticated lift technology.

2. Indications and Contraindications

EnduRo™ Total Knee System

Indicated for use in reconstruction of the diseased knee joint caused by osteoarthritis, rheumatoid arthritis, post-traumatic arthritis, the need to revise failed arthroplasties or osteotomies where pain, deformity or dysfunction persist, and for patients suffering from correctable valgus or varus deformity and moderate flexion contracture.

Hinge knee systems are designed for use in patients in primary or revision surgery, where the posterior cruciate ligament and one or both of the collateral ligaments are absent or insufficient. The femoral and tibial augments are to be attached to their respective components with a fixation screw or screws.

Warning: The EnduRo Knee System is intended for cemented use only.

Contraindications

Contraindications include, but are not limited to:

- Joint conditions that can be treated by reconstructive surgery (e.g. osteotomy)
- Acute or chronic infections near the joint, or systemic infections
- Secondary diseases that could influence joint implant functionality
- Systemic diseases and metabolic disorders
- Severe osteoporosis or osteomalacia
- Severely damaged bone structures that could prevent stable implantation of implant components
- Bone tumors in the region of implant fixation
- Bone malformations, axial misalignments or other bone conditions that rule out implantation of a prosthetic joint
- Predictable overload of the joint implant (e.g. due to adiposity)
- Dependency on pharmaceutical drugs, drug abuse or alcoholism
- Fever, infection or inflammation (systemic or local)
- Pregnancy
- Mental illness
- Severe osteopenia (or any other medical or surgical finding) that would preclude any benefit from the implants
- Combination with implant components from other manufacturers
- Inadequate patient compliance
- Foreign body sensitivity to the implant materials
- All cases not listed under indications

Note: *The EnduRo AS knee system is used in cases of severe primary bone defects, collateral ligament insufficiency and in cases where revision is indicated. In these cases, varus/valgus and rotational forces are brought to bear on the linked femoral and tibial components, resulting in a potentially increased risk of loosening. Aesculap therefore recommends the femoral and tibial components for the EnduRo AS knee system only be implanted with extension stems. The surgeon may deviate from this at his/her own discretion.*

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3. Precautions & Warnings

Precautions

Aesculap Knee Systems are intended to be used by surgeons specializing in orthopedic surgery who have a thorough knowledge of knee arthroplasty, joint morphology and the biomechanical principles of the knee.

Preoperative assessment of the suitability of the patient's anatomy for receiving implants is made on the basis of X-Rays, CT scans and other radiological studies.

Only patients that meet the criteria described in the Indications for Use section should be selected.

Correct selection of the implant is extremely important. The morbidity as well as patient weight, height, occupation and/or degree of physical activity should be considered.

Proper implant handling before and during the operation is crucial. Handle the implant components properly. Ensure packaging integrity for implant sterility. Do not use any implant where the packaging has been breached. Do not resterilize an implant. Do not allow the implants surfaces to be damaged.

Adequately instruct the patient. The physician should inform the patient about knee implant advantages and disadvantages, post-operative limitations, weight/load bearing stresses which could affect bone healing, implant limitations and the fact that premature physical activity and full weight/load bearing stresses have been implicated in premature loosening, damage and/or fracture of knee prostheses.

Aesculap Knee Systems have not been evaluated for safety and compatibilityin the MR environment. Aesculap Knee Systems have not been tested for heating or migration in the MR environment.

Warnings and Potential Risks

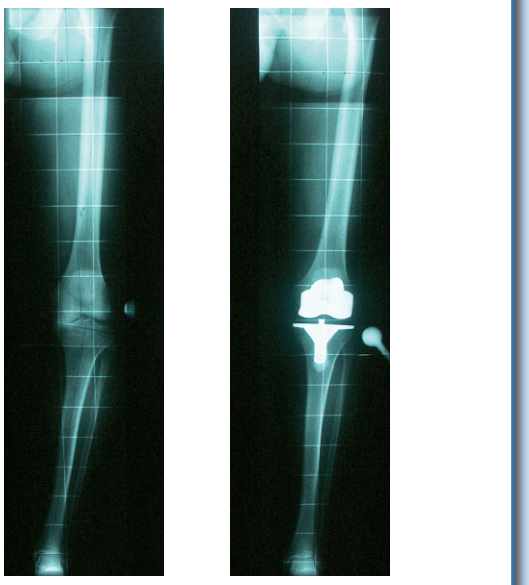
Implants are designed for single patient use only and must never be reused. As with all other orthopedic implants, the components should never be reimplanted under any circumstance.

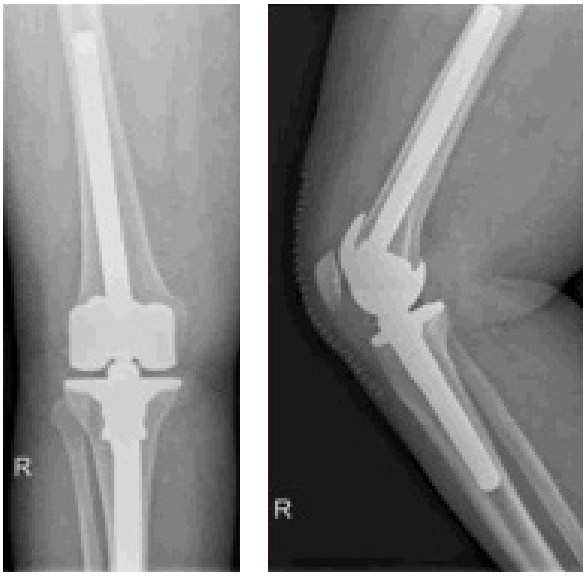
The mixing of different manufacturer implant components is not recommended due to metallurgical, mechanical and functional reasons. Dissimilar metals in contact with each other can accelerate the corrosion process due to galvanic corrosion effects. Do not use implants or instruments from other systems or manufacturers, and do not mix cobalt-chromium and titanium implant components together in a total knee system.

The implants can become loose or break if subjected to increased loading. Factors such as the patient's weight, activity level and adherence to weight-bearing or load-bearing instructions can affect the implant's longevity. Damage to the weight-bearing bone cement and/or bone structures caused by infection can give rise to loosening of the components and/or fracture of the bone.

These warnings do not include all adverse effects which could occur with surgery, but are important considerations specific to metallic devices. The risks associated with orthopedic surgery, general surgery and the use of general anesthesia should be explained to the patient prior to surgery. See the instructions for use for additional information, warnings, potential risks, precautions and possible adverse effects.

4. Preoperative Planning





To help achieve satisfying therapy results with the EnduRo™ AS knee system, bone defects as well as any possible functional disorders of the soft tissue must be analyzed carefully. It is important to know the reasons why a primary endoprosthesis failed so that any errors are not repeated. Additional parameters for ensuring best possible operative results are:

- Functionality of the extensor mechanism
- Removal of the primary endoprosthesis
- Preservation of bone
- Restoration of good axis orientation
- Functional stability
- Restoration of the joint line

EnduRo AS X-Ray templates for X-Ray image analysis during
preoperative planning are available, which help to determine the following parameters:

- Angle between anatomic and mechanical femur axis
- Resection heights
- Size of the implants
- Entry points for intramedullary alignment
- Need for and dimensions of spacers and extension stems

Extensive loss of bone can be compensated with the EnduRo AS knee system:

- Maximum distal femur bone loss:
  F1 distal: 19 mm, F2 distal: 20.5 mm, F3 distal: 22 mm
  F1 posterior: 15 mm, F2 posterior: 20.5 mm, F3 posterior: 22 mm
- Maximum tibial bone loss:
  T1-T3: 40 mm

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5. Workflow Guide

1

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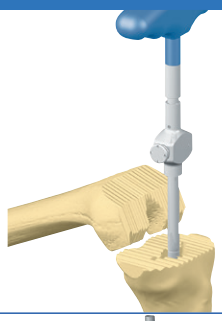

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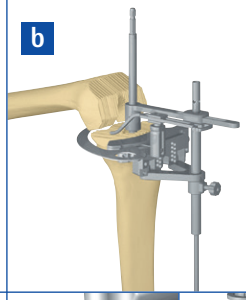

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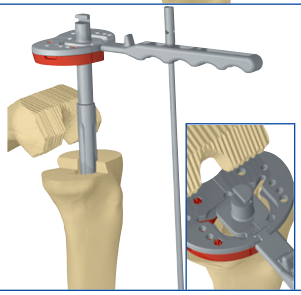

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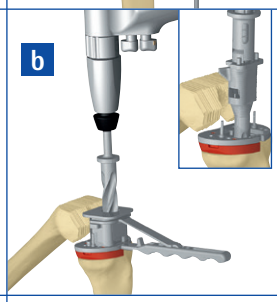

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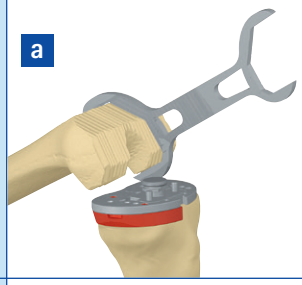

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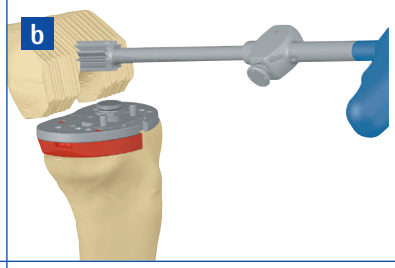

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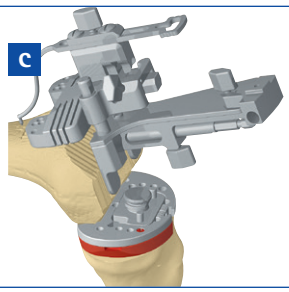

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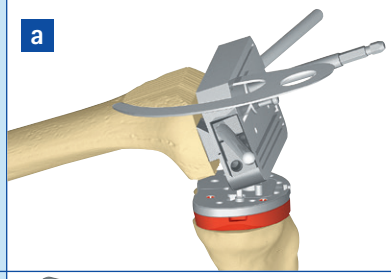

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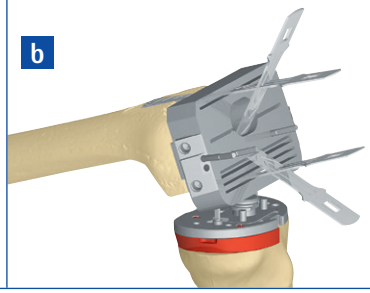

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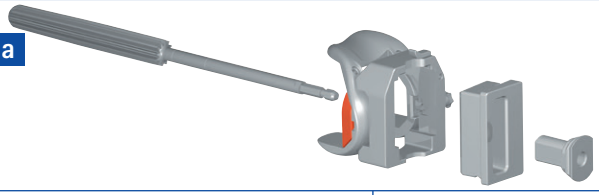

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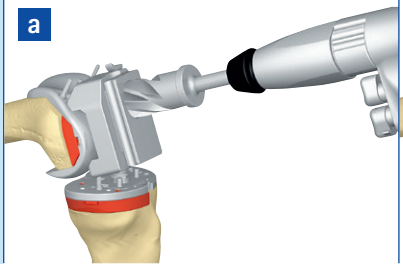

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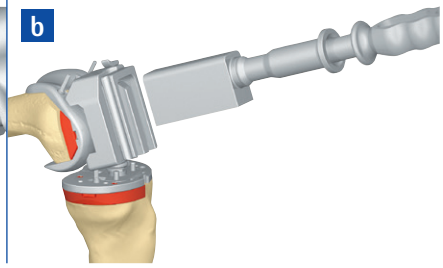

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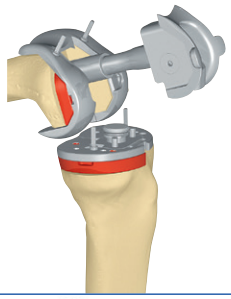

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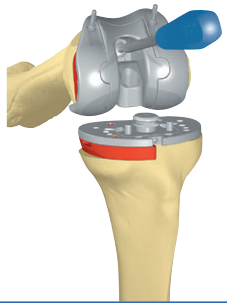

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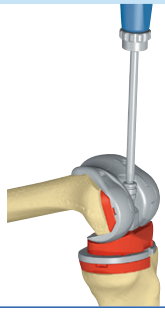

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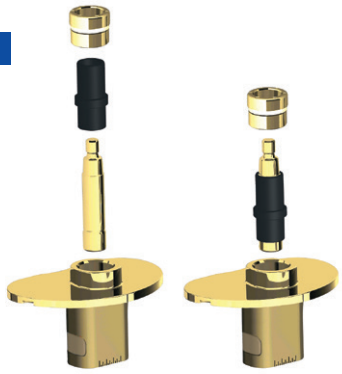

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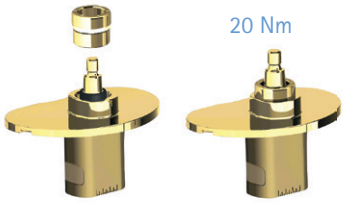

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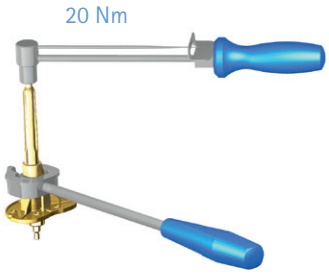

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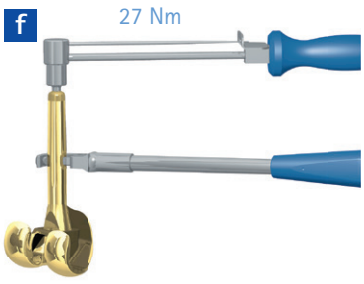

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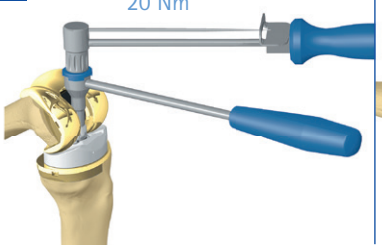

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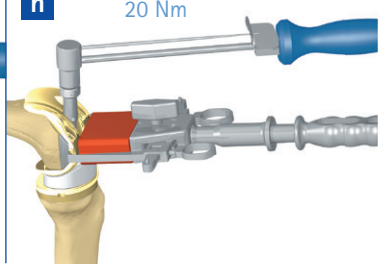

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6. Surgical Technique

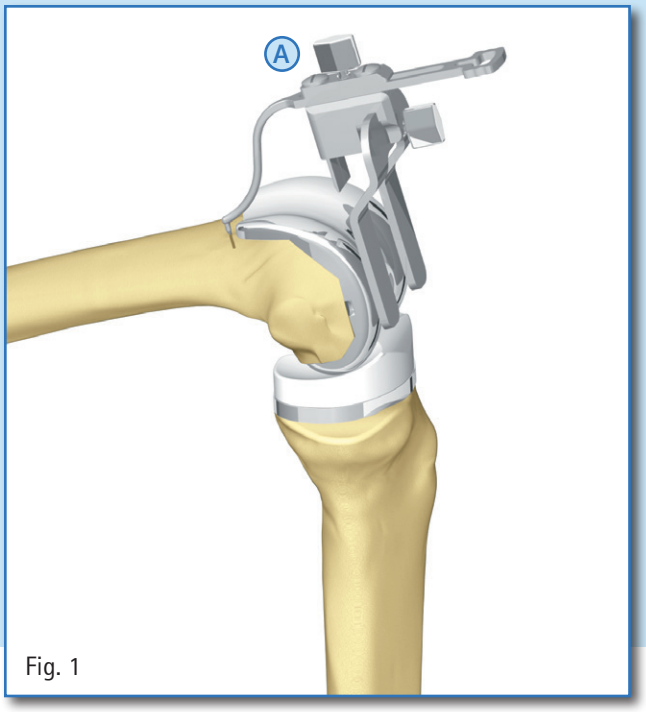


Fig. 1

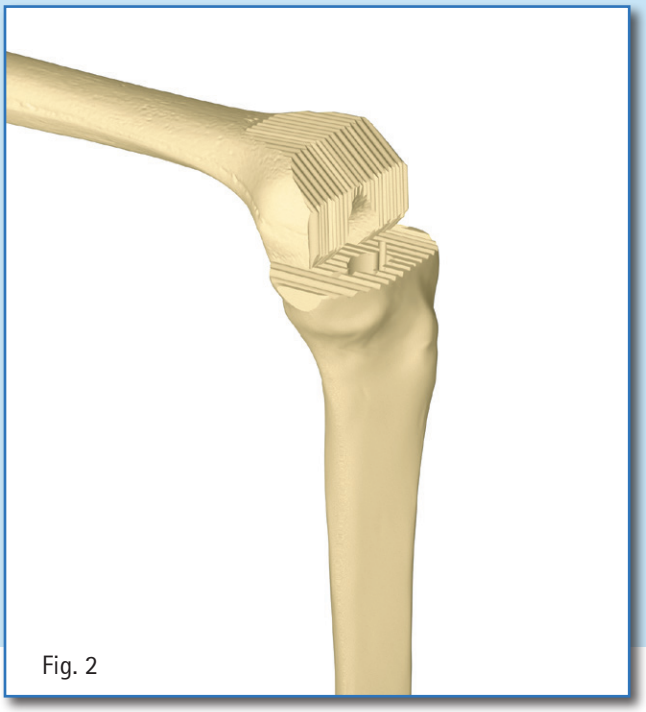


Fig. 2

6.1 Applying Reference Marks

Attach the joint line positioner (NQ708R) to the distal contact plate (NQ709R) and screw in place. A mark is made as reference on the anterior side of the femur (e.g. level with the proximal end of the primary femoral shield). The joint line stylus is fixed in this position by means of the screw (A), which remains tightened and is not loosened again during the remaining course of the surgery.

Remove all primary implants. Collateral ligaments may also be resected.

Note: *Ensure the availability of the required implants, according to preoperative planning, using the implant ordering details (page 51).*

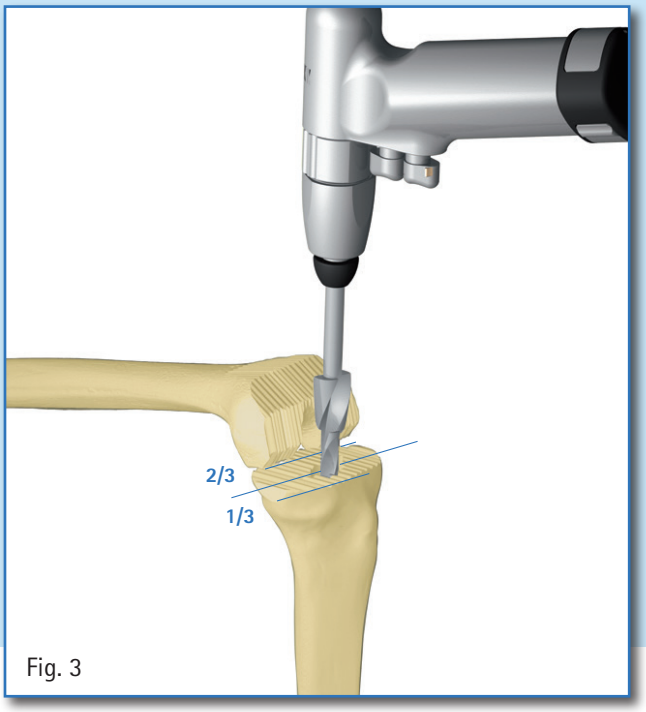


Fig. 3

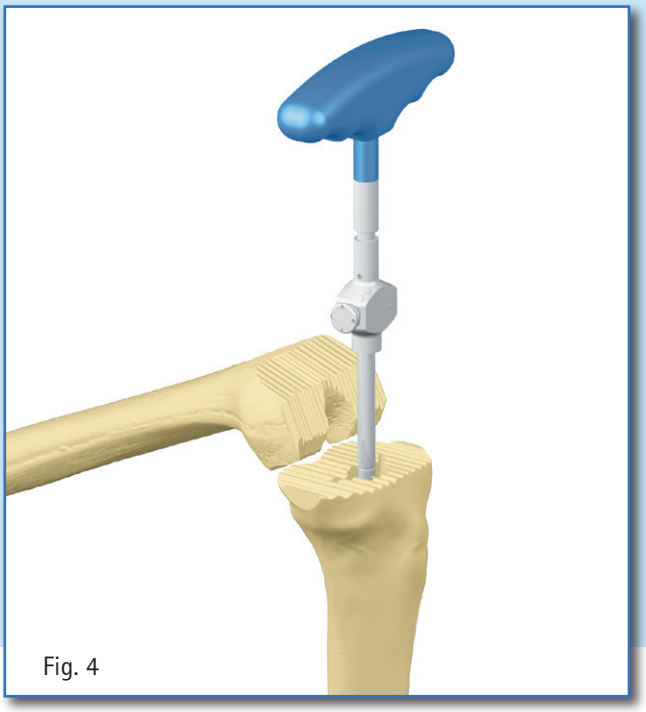


Fig. 4

6.2 Tibia Preparation

Determine the point of entry for step drill (NP410R) and reamers, if necessary, with assistance from X-Rays or via the AP distance from 1/3 to 2/3. Ream the intramedullary canal as deeply as possible using the long reamer until stable anchorage is achieved for precise axis alignment.

After tibial resection, repeat reaming at the desired diameter to the required depth in order to achieve a pressfit connection in Pressfit procedures or to make room for the cement layer in cemented variants. The reamers have markings for the different extension stem lengths.

6. Surgical Technique *(continued)*

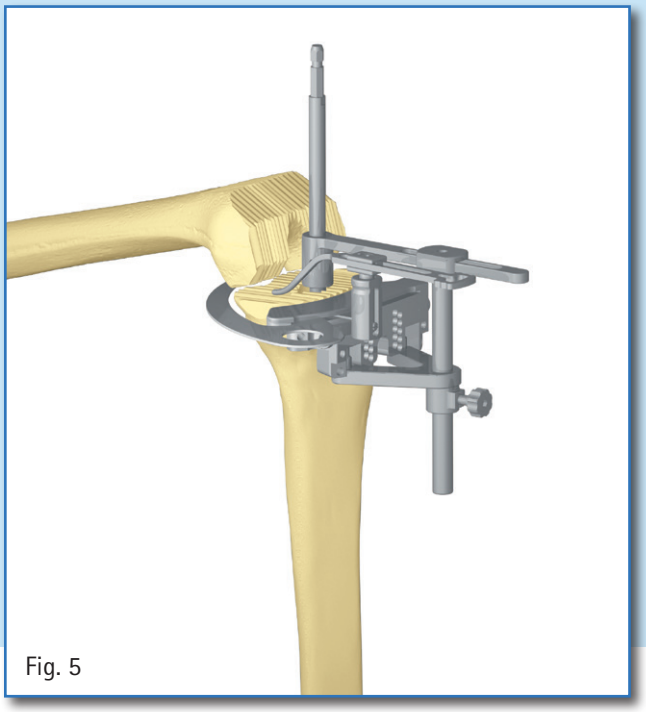


Fig. 5

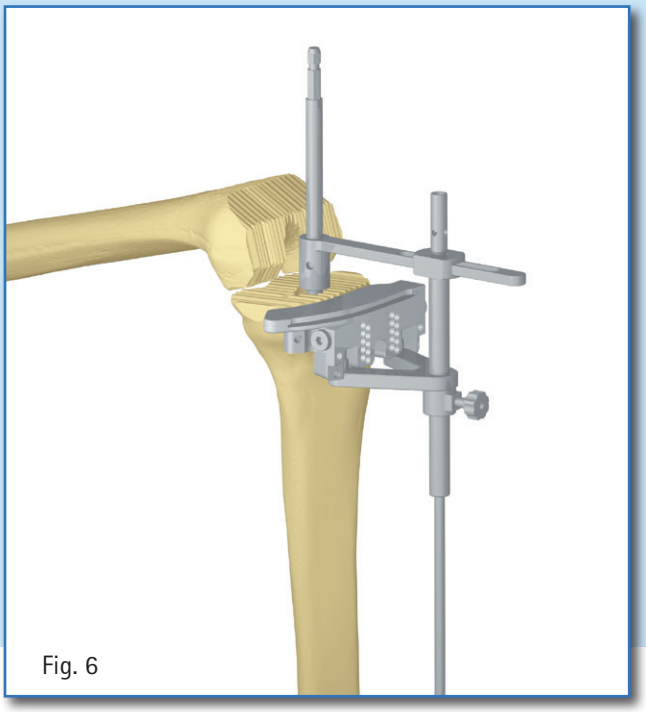


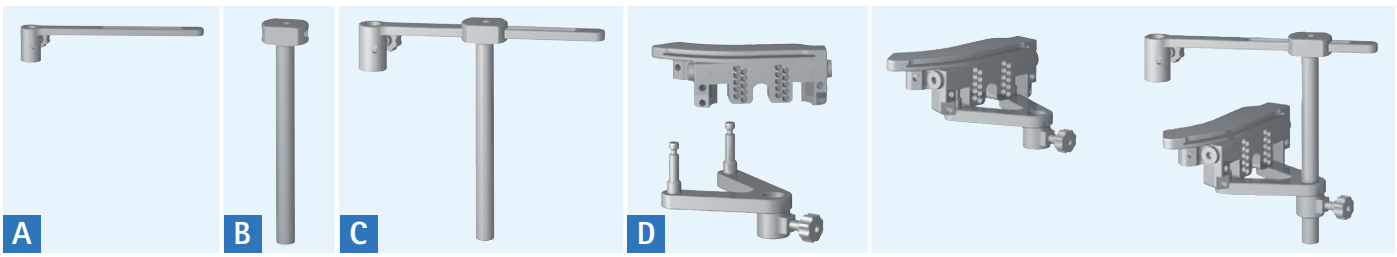
Fig. 6

6.3 Tibial Resection Variants

1. Option 1
Assemble the alignment system, including tibial cutting guide, completely and fit onto the reamer. Determine the resection height by means of the tibial cutting guide stylus (NE425R) in the cutting slot, which has been adjusted to the desired resection. Fix this position by tightening the fixation screw at the side. The position of the cut can be checked by means of the cutting depth check plate (or angeling) (NM350R).

2. Option 2
Fit the complete alignment system, including tibial cutting guide, onto the shaft of the reamer. Make contact with the tibial plateau by means of the cutting depth gauge in the cutting slot. Determine the cutting depth stepwise via the inserted tibial cutting guide stylus (shift distally with fixation screw loosened) by means of the cutting height feeler (NE425R Stylus).

Optional:
Check the position of the leg axis by means of the axis control rod (NE331R) (with sleeve)/(NP471R) (without sleeve), which is inserted into the borehole of the slide bar.



A: Connector (w), B: Connection block (slide bar) (NP678R), C: Adapter for tibial cutting guide (NE195R), D: Tibial cutting guide (right NP196R/left NP197R)

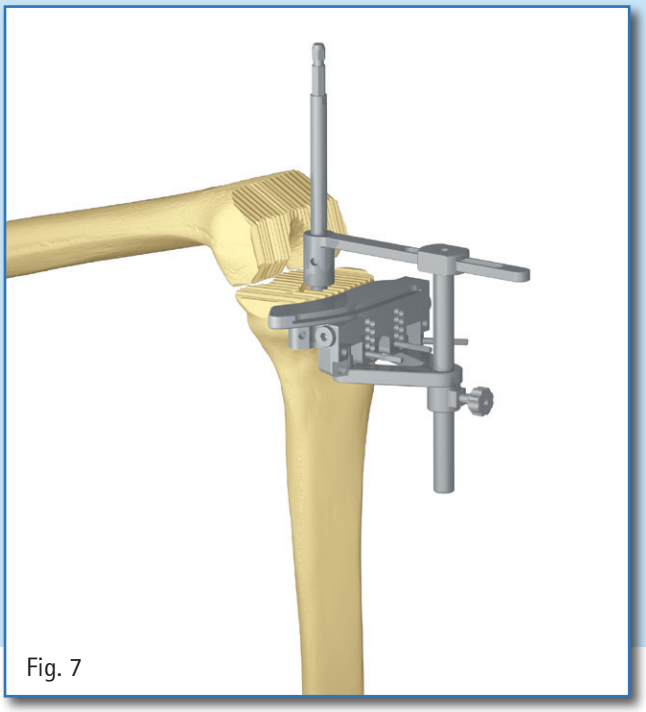


Fig. 7

Fix the tibial cutting guide in the desired position by means of two parallel headless pins and one convergent headed pin.

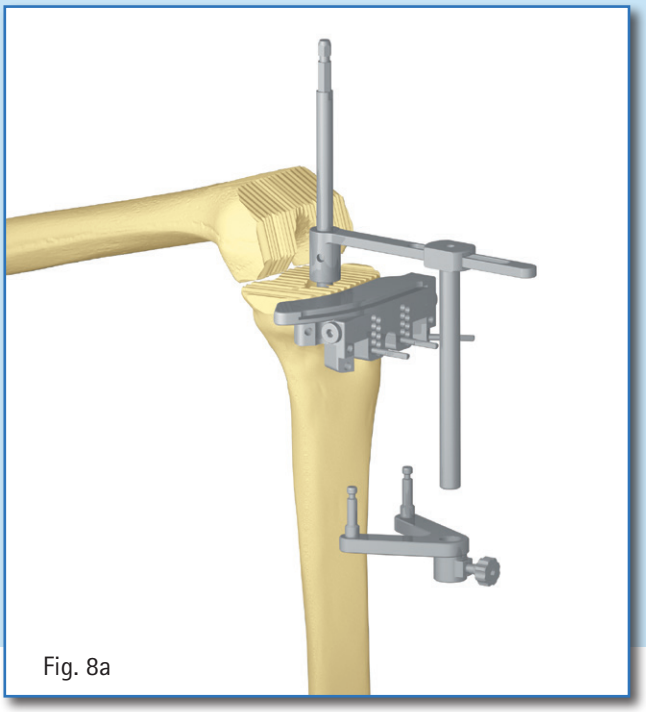


Fig. 8a

Remove the alignment system and the reamer. Release the adapter (NE195R) by simultaneously pressing the two push buttons of the tibial cutting guide, and then remove by pulling in a distal direction.

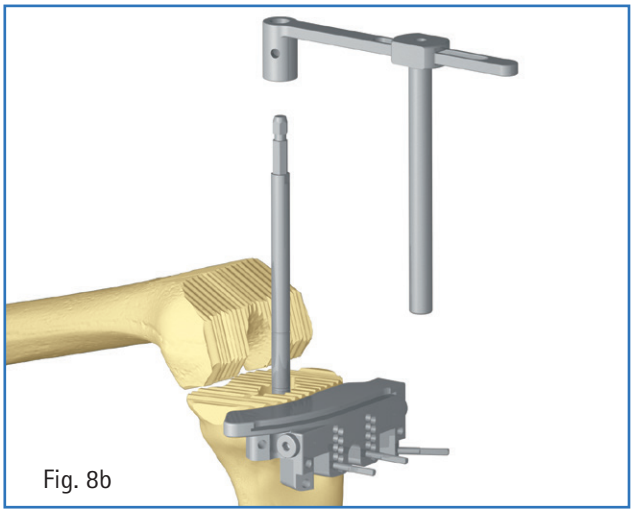


Fig. 8b

Next, remove the connector (NP677R) and the connection block (NP678R) in a proximal direction. The reamer is removed by first reattaching the handle, then turning the handle clockwise to remove the reamer in a proximal direction.

6. Surgical Technique *(continued)*

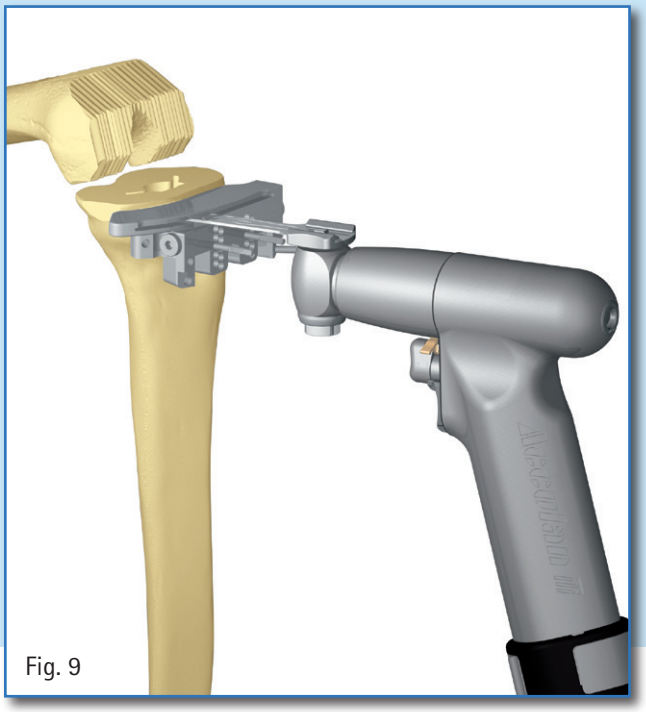


Fig. 9

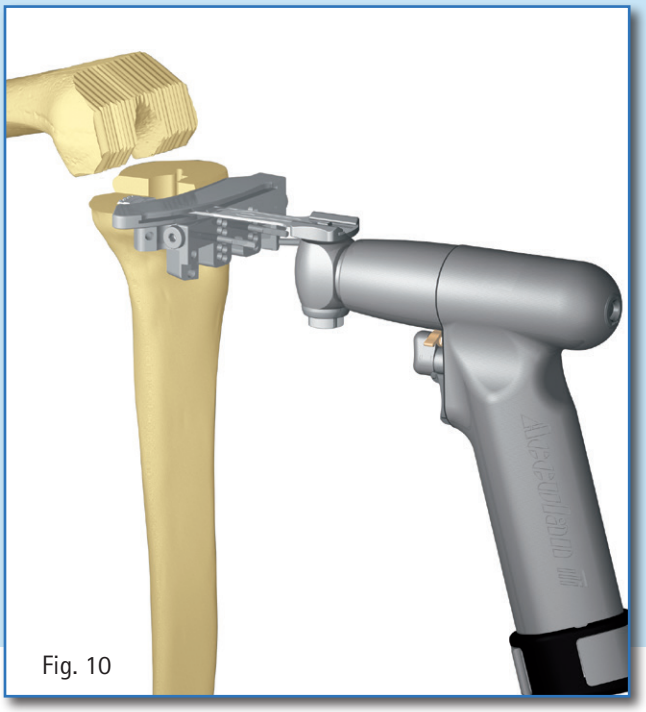


Fig. 10

6.4 Tibial Resection

Perform tibial resection using a 1.27 mm thick cutting blade.

Cuts for the 4, 8, 12 and 16 mm hemispacers may also be performed by changing distal position of the cutting guide. The positions at which the hemispacers end in a sagittal and medial/lateral direction must be taken into account.

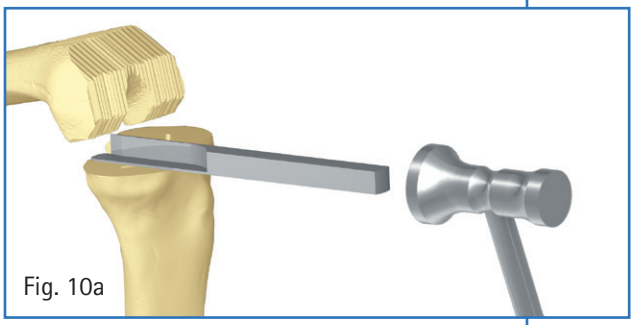


Fig. 10a

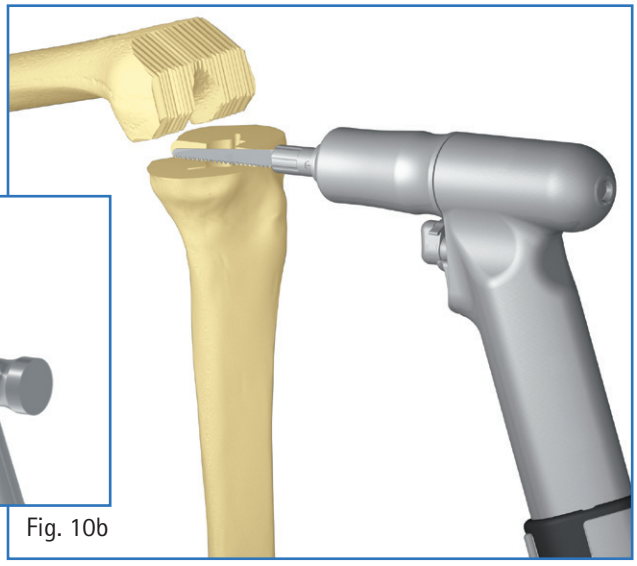


Fig. 10b

Depending on which side is being operated on, either chisel (NP024 or NP025R) or reciprocating saw is used for sagittal hemispacer resection.

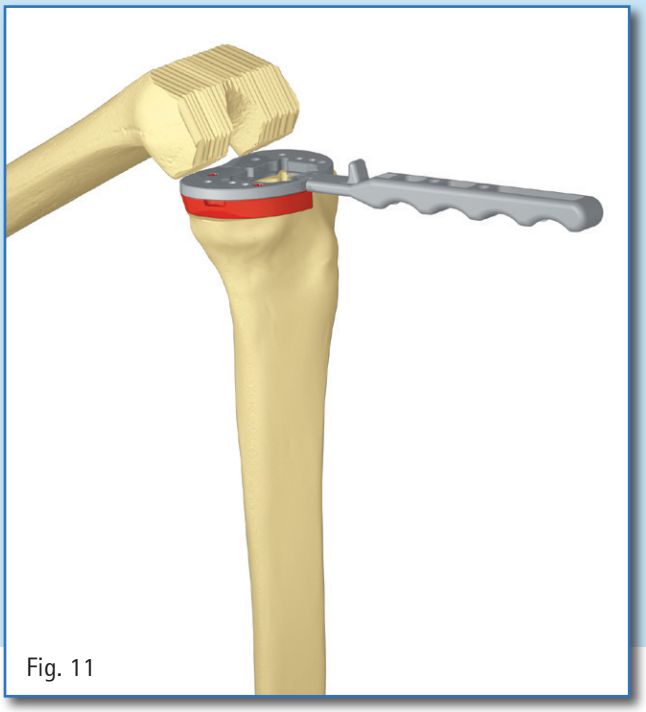


Fig. 11

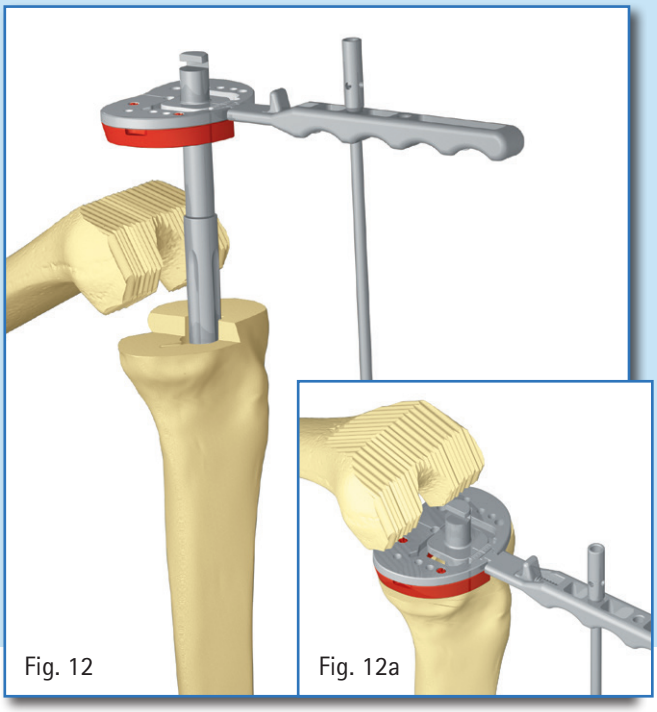


Fig. 12

Fig. 12a

6.5 Tibial Component Sizing

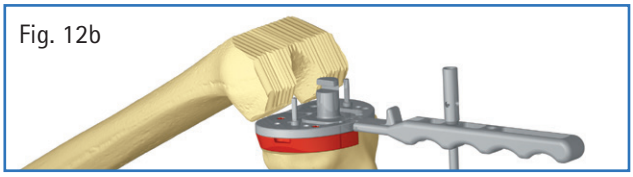
Depending on the tibia resection, the medullary cavity must now be reamed out again to the required depth using the reamer. If hemispacers are used on both sides, substract their height from the reaming depth.

Select the trial tibial plateau which best covers the bone in ML and AP directions, and snap the corresponding trial hemispacer into place underneath the trial tibial plateau, if applicable.

Option:
The position of the leg axis can be checked by means of the axis control rod, which is inserted into the handle.

Determine the optimal ML, AP and rotational position by means of the ML positioning device (NP466R), which is inserted and on which the required trial tibia extension stem has been screwed in place. The anterior mark indicates the ML position. This ML value is noted.

Fig. 12b



Fix the tibial trial plateau in place in the correct ML, AP and rotational position by means of two short headed pins.

Note: *When preparing the tibia, the required buildup height required (thickness of tibial plateau + PE sliding surface + optional spacers) for reconstruction of the joint line should be taken into account at an early stage. In particular, the tibial plateau should not end up too far distal; otherwise, there may not be sufficient space in the ML dimension to accommodate the plateau box in the tibial head, which could result in fractures due to excessive strain. The buildup height should therefore preferably be achieved by using hemispacers on both sides rather than by a higher uniform surface.*

6. Surgical Technique *(continued)*

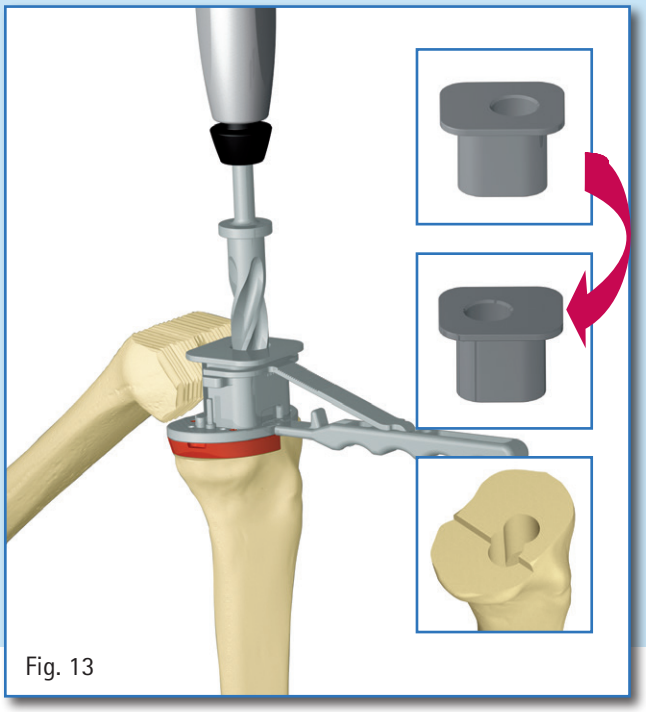


Fig. 13

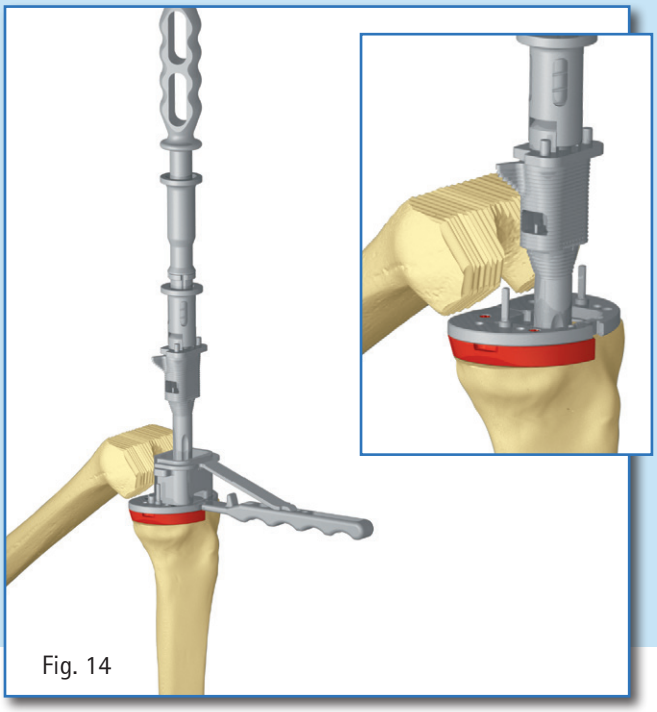


Fig. 14

6.6 Tibial Box Preparation

Remove the ML positioning device.

Fit the broach guide (NP463R) and the drilling sleeve in the respective required size (T1-NP457R, T2/T3-NP458R) onto the tibial trial plateau (T1-NP451R, T2-NP452R, T3-NP453R). Position the holder (NP459R) on the handle and the drilling sleeve for steadying. Drill two overlapping holes – by reattaching the drilling sleeve in a 180° rotated position – up to the depth gauge limit using the 18 mm depth gauge drill (NP456R).

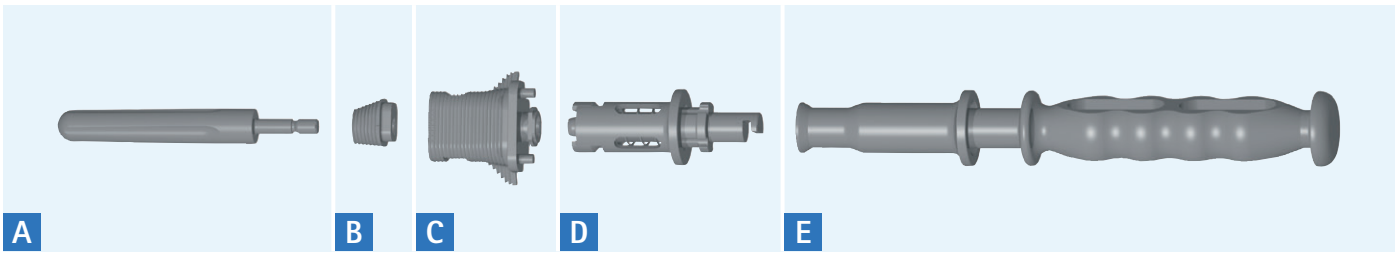
The result is a binocular-shaped contour.

Complete the box shape as follows using the rasp:

Assemble the handle (NP495R), adapter (NP467R), box rasp (T1-NP464R, T2/T3-NP465R) + connecting piece (up to 14 mm NQ846R, up to 17 mm NQ843R, up to 20 mm NQ831R) and trial shaft in the required size and ML position.

Drive this rasp assembly into the tibial plateau up to the stop position through the guide link – or without the guide link.

The depth of the plateau box seating must be taken into account.



A: Trial shaft, B: Connecting piece, C: Box rasp, D: Adapter (NP467R), E: Handle (NP495R)

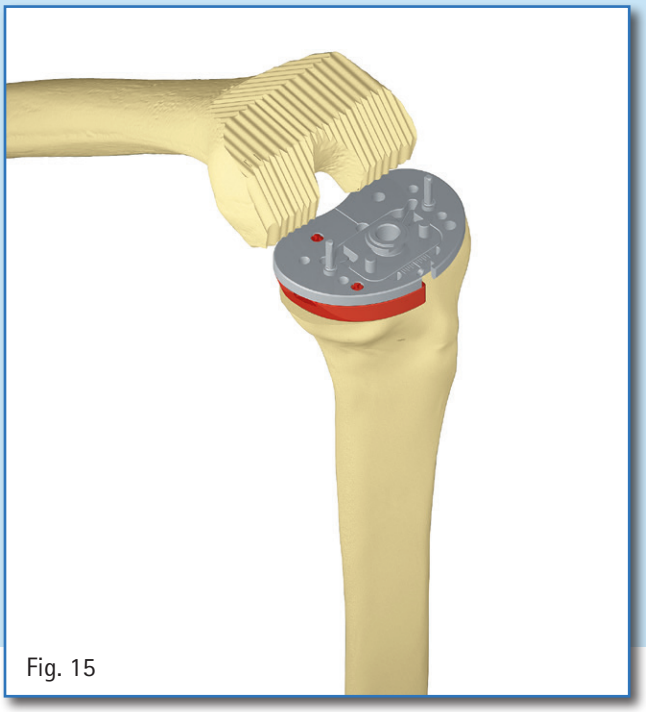


Fig. 15

Preparation of the tibia is now complete, and the tibia is fixed securely against rotation by the box rasp. Both pins can now be removed.

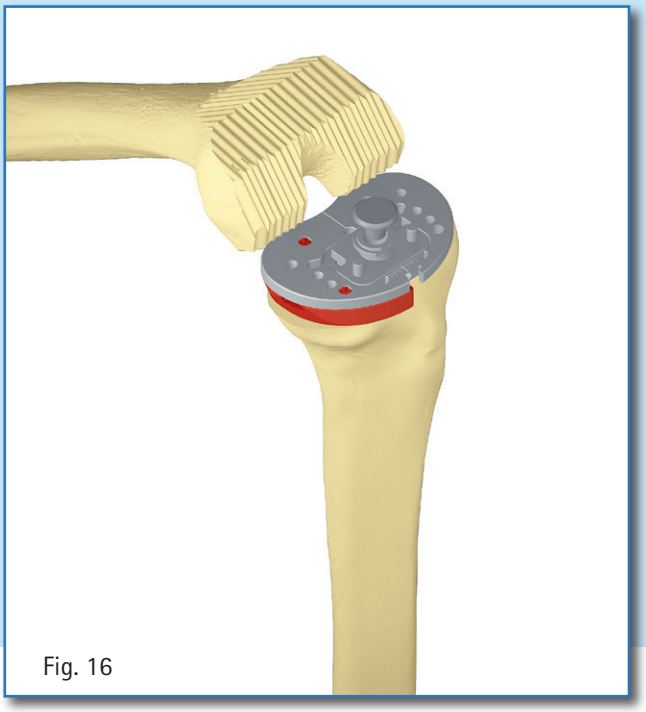


Fig. 16

Insert covering (NP479R) in order to prevent debris from entering the borehole for the trial rotation axis.

6. Surgical Technique *(continued)*

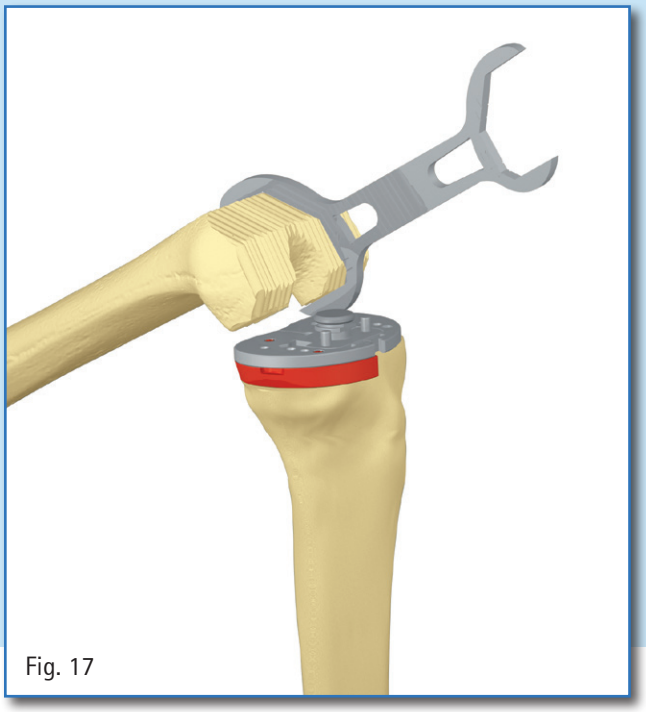


Fig. 17

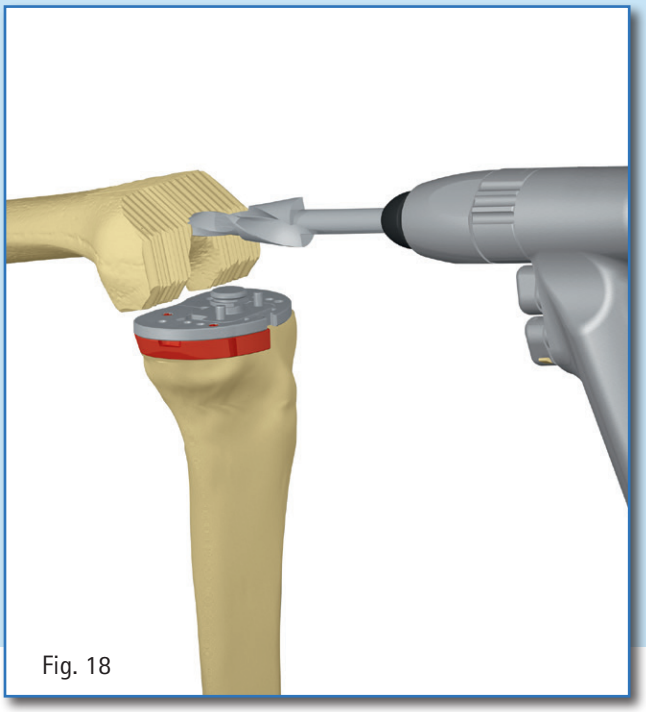


Fig. 18

6.7 Femoral Preparation

Determine the size of the femur with the help of the femoral measuring gauges F1/F2 (NP441R) and F3 (NP442R). The gauges indicate the respective AP and ML dimensions. Additional markings on the instrument indicate which distal and postero-distal femur spacers are available in each case.

Determined the point of entry for the step drill (NP410R) in the distal femur. Drilling is performed in the selected angle, taking into account the femoral curvature and other patient-specific aspects.

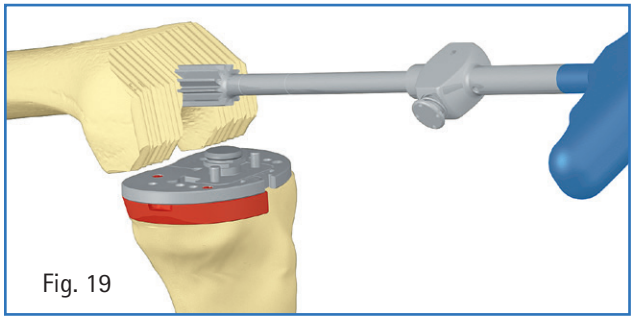


Fig. 19

As with the tibia, alignment for distal femoral resection should, if possible, be changed using a long, thin reamer for precise detection of the axis. The reamers have marks for the different femoral extension stem lengths.

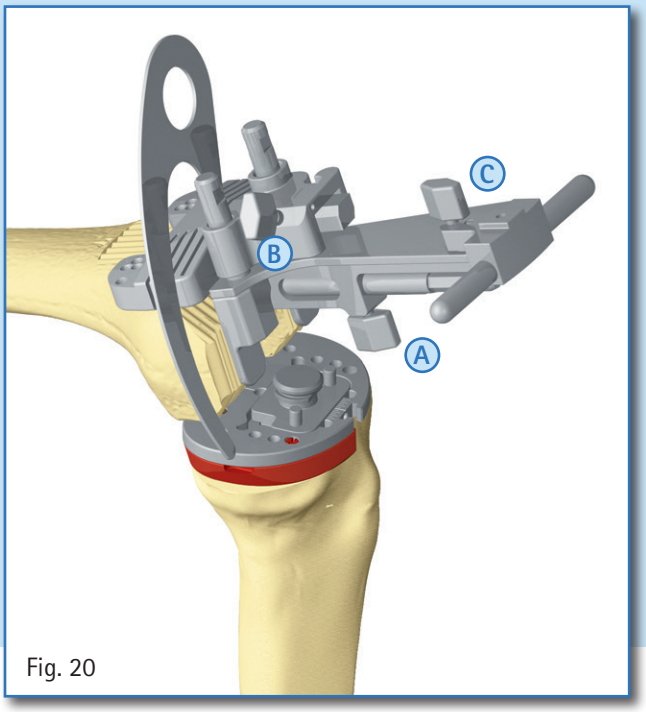


Fig. 20

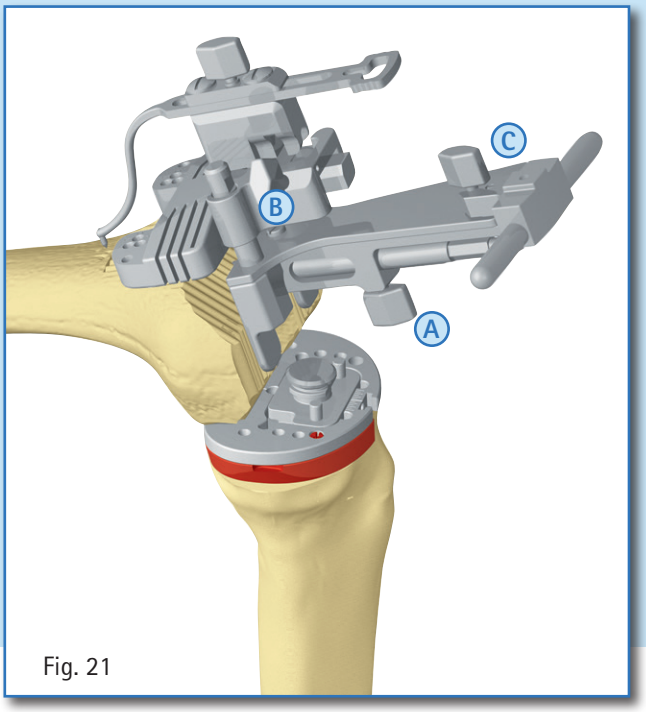


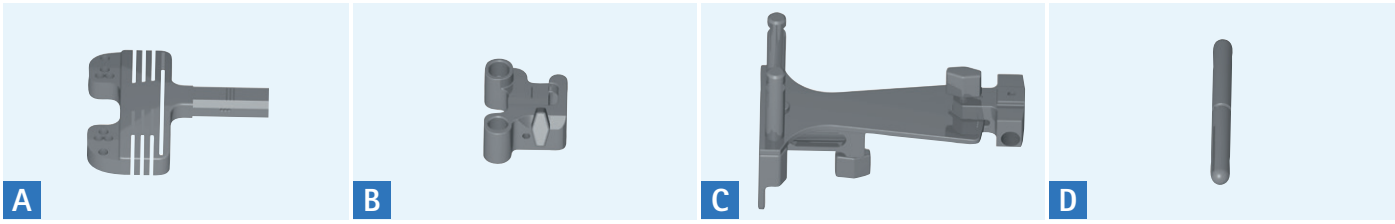
Fig. 21

6.8 Distal Femoral Resection

Fit the alignment system (NQ702R) for the distal femoral cut with inserted handle (NQ474R), with the cutting guide holder (NQ703R), to which the distal femoral cutting guide (NP411R) is in turn attached. This can be locked in place in a neutral position for the respective femur size, or in a more proximal or distal position, and screw (B) is tightened for this purpose. The desired angle between anatomic leg axis and mechanical axis (5° or 7° for Pressfit and 6° for cemented femur extension stems) for the correct-side leg, which is to be operated on (left or right leg) is set and fixed by means of screw (C). Slide the alignment system onto the reamer shaft until the bone is contacted and fix in place via screw (A).

Option 1:
The cuts can be checked by means of the cutting depth gauge (or angel wing) in the cutting slot.

Option 2:
Attach the joint line positioning device (NQ708R) to the continuous cutting slot of the distal femur cutting guide (NP411R). Slide the alignment system onto the reamer shaft until the bone is in contact and fix in place via screw (A). The cutting guide is now shifted until the positioning tip coincides with the anterior mark of the primary femoral implant. If necessary, this mark is used as reference for distal or proximal positioning. This resection position is fixed by means of screw (B). The desired angle between anatomic leg axis and mechanical axis (5° or 7° for pressfit/pressfit and 6° for cemented femur extension stems) for the correct-side leg which is to be operated on (left or right leg) is set and fixed by means of screw (C). The cuts can be checked by means of the cutting depth gauge (or angel wing) in the cutting slot.



Distal femur cut-alignment system assembly: A: Distal cutting block (NP411R), B: Holder (NQ703R), C: Distal alignment system (NQ702R) and D: Handle (NQ474R).

6. Surgical Technique *(continued)*

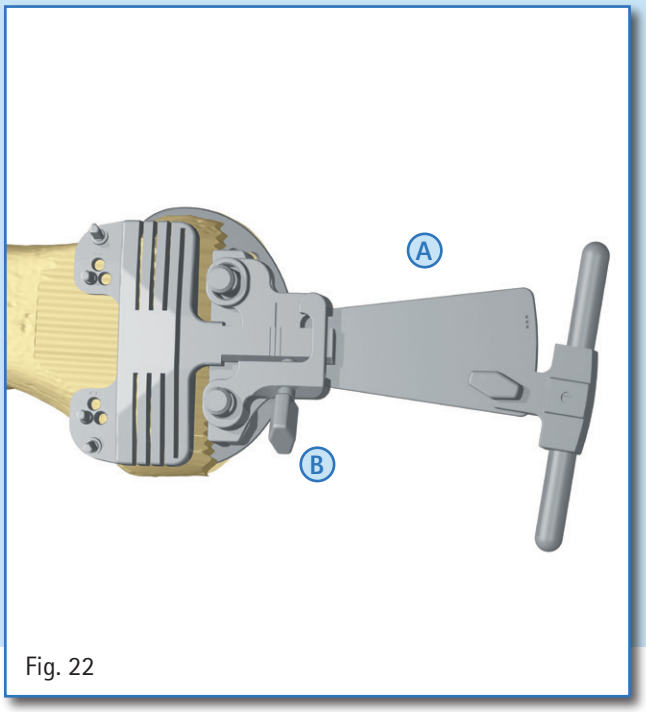


Fig. 22

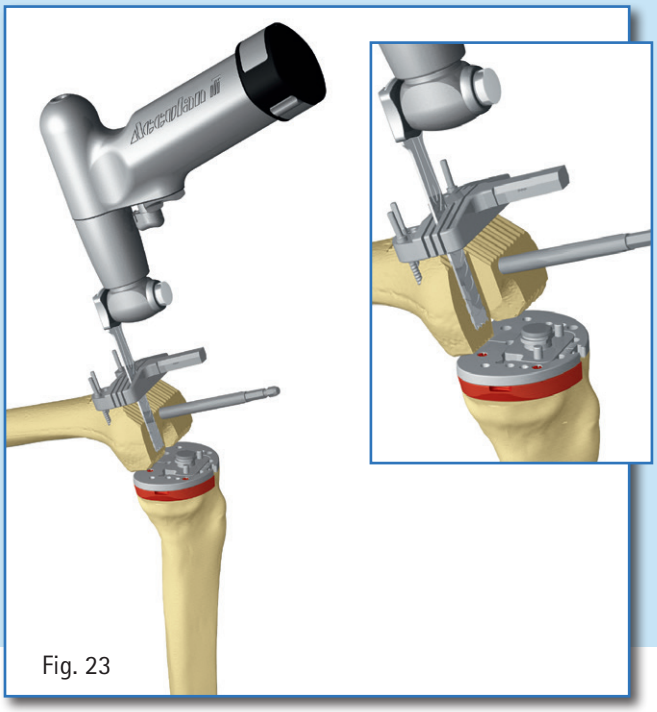
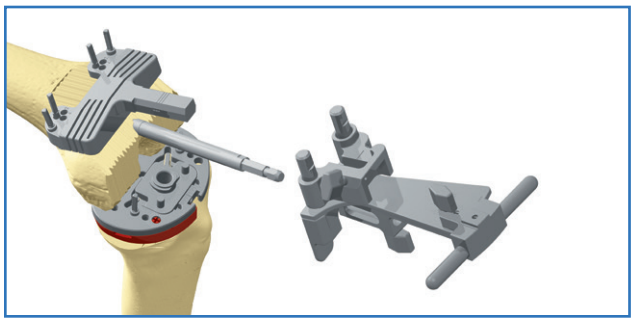


Fig. 23

6.8 Distal Femoral Resection *(continued)*

Attach the cutting guide to the anterior femur by means of two parallel headless pins and one/two convergent headed pins. Remove the cutting depth gauge, the joint line positioning device and the alignment system [undo screw (A) (underneath, hidden from view) and (B)].

The reamer can be left in the femoral canal for the distal cuts.



The distal femoral cut is performed in the selected plane of resection. If required, additional bone resection can be made for the distal or postero-distal femur spacers using the appropriate cutting slot.

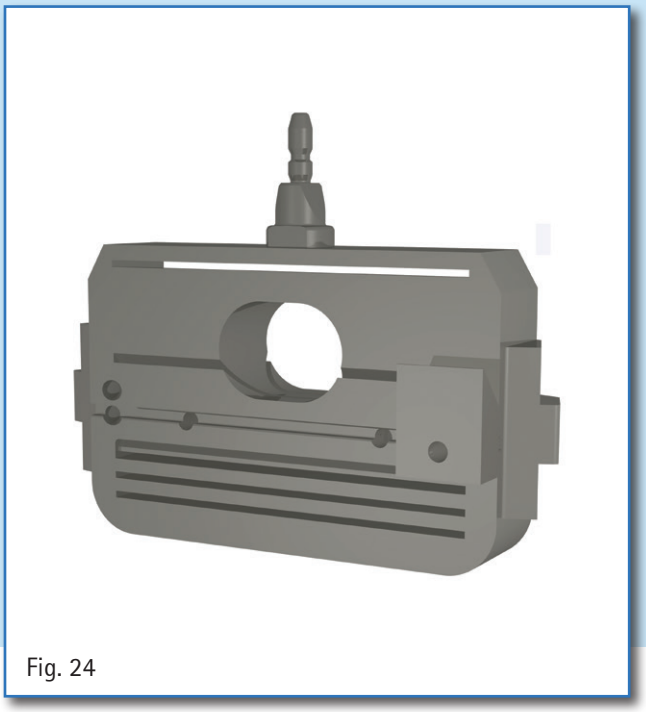


Fig. 24

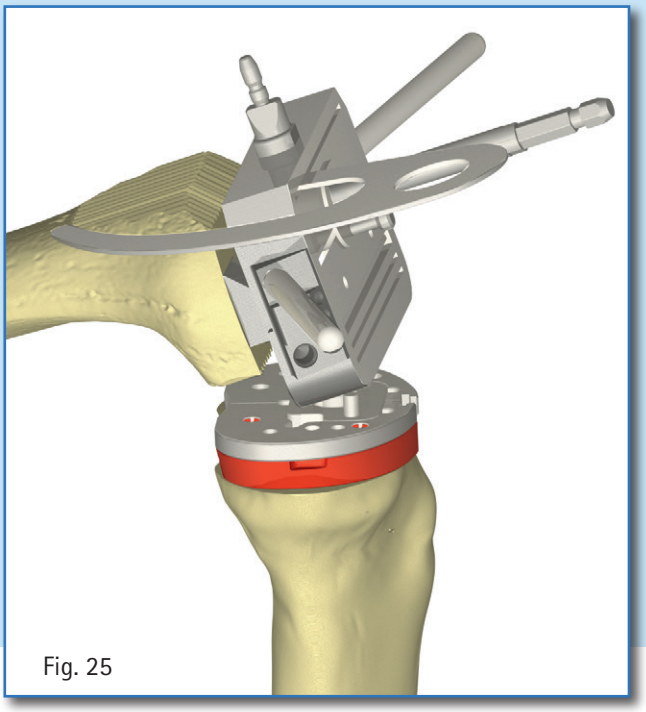


Fig. 25

If resection was performed for distal femoral spacers, distal trial spacers with comparable dimensions must be slid into place on the reverse side of the 4-in-1 cutting guide.

Slide the required 4-in-1 cutting guide (F1 NM731R, F2 NM732R and F3 NM733R) into position on the reamer shaft with the AP orientation sleeve (available in the variants neutral (NE172R) and ± 2 mm (NE173R)), which is fitted in place. In order to avoid anterior undercutting/ notching of the femoral cortex, the cutting depth gauge (or angel wing) is affixed in the anterior cutting slot for checking.

Option:
Two handles (NE730R) can be attached to the cutting guide for better rotational alignment.

6. Surgical Technique *(continued)*

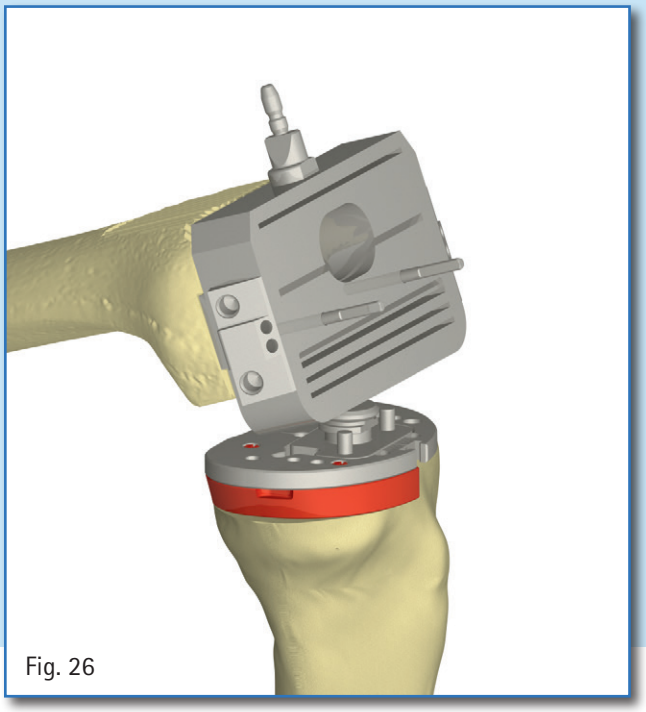


Fig. 26

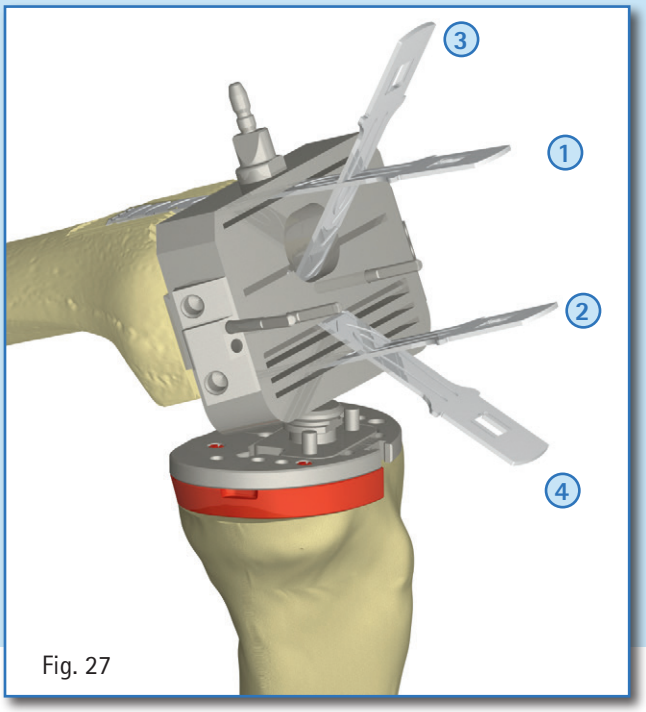


Fig. 27

6.9 Femoral Resection

Attach the cutting guide in the predetermined rotational position via two long headless pins through the two parallel anterior center holes on the guide. Remove the handles, orientation sleeve, cutting depth gauge (or angel wing) and reamer. For large diameters, the cutting guide must be removed and must subsequently be reattached.

Completing the femoral resection:
The four femoral resection cuts are performed in the following sequence:

1. Anterior cut
2. Posterior cut (incl. spacer cut if required)
3. Posterior chamfer cut
4. Anterior chamfer cut

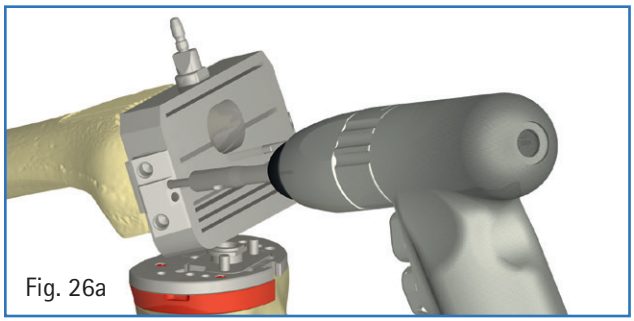


Fig. 26a

Fix the cutting guide in place by one or two long headless pins through the convergent on the sides of the guide holes.

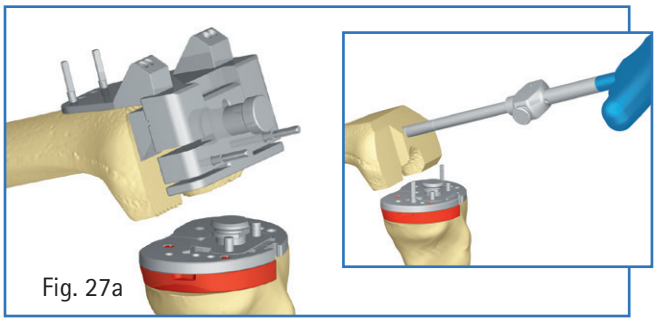


Fig. 27a

If a 12 mm posterior femoral spacer is required, attach the special 12 mm cutting guide (NP431R) to the bone and fix in place with a pin, and then perform resection using the appropriate cutting slot.

Screw the reamer with the appropriate diameter into the medullary canal to the desired depth for final preparation of the medullary space.

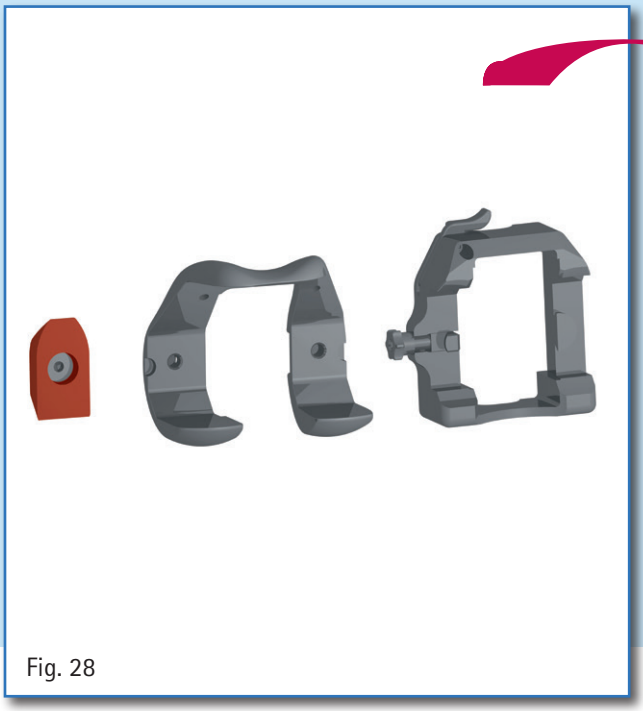


Fig. 28

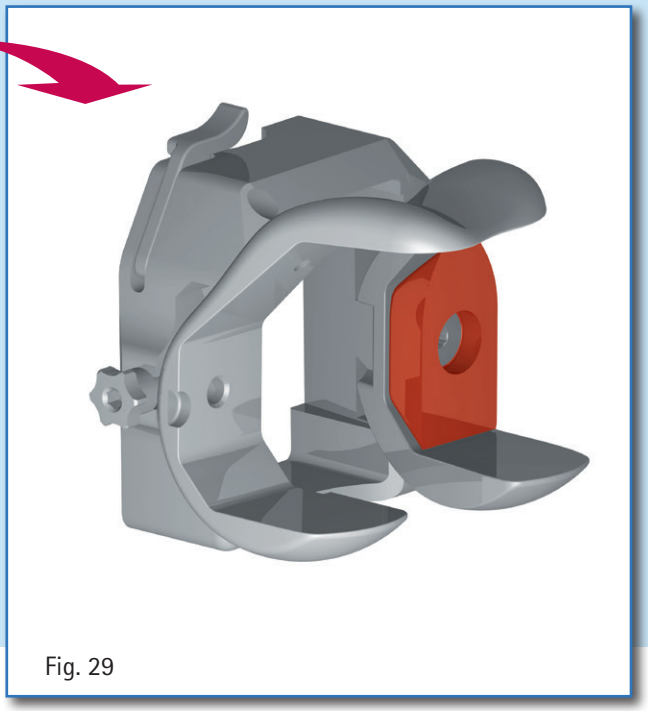
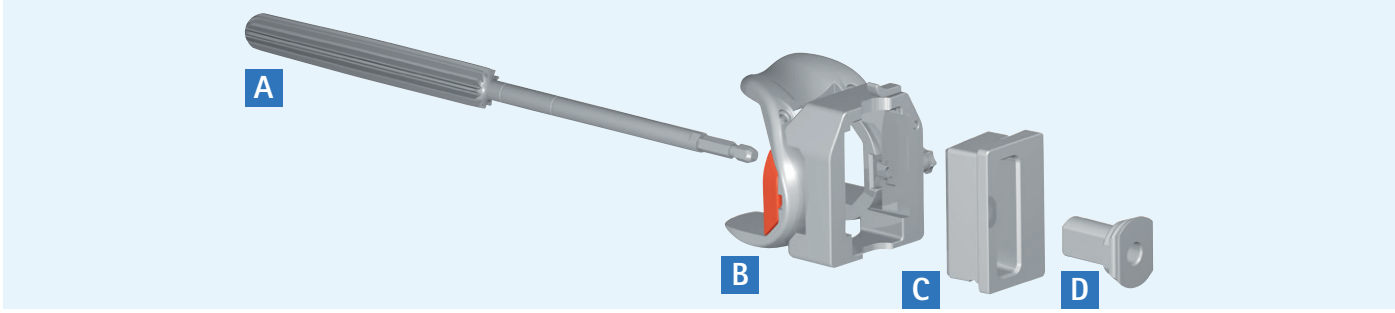


Fig. 29

6.10 Femoral Box Preparation

Screw the required distal or posterior trial spacer(s), if applicable, onto the right or left trial femur as appropriate for the leg undergoing surgery (right: F1-NP407R, F2-NP408R, F3-NP409R; left: F1-NP404R, F2-NP405R, F3-NP406R).

Select the frame for alignment of the trial femur and for femoral box preparation in the required size (F1 NP421R, F2 NP422R, F3 NP423R) and fitt onto the distal part of the trial femur. Fix in place by the screw at the side. If necessary, the screwdriver (NE181R) can also be used for this purpose.



Femoral box alignment assembly: A: Reamer, B: Trial femur assembly, C: Femoral box alignment device and D: Sleeve for femoral box alignment

6. Surgical Technique *(continued)*

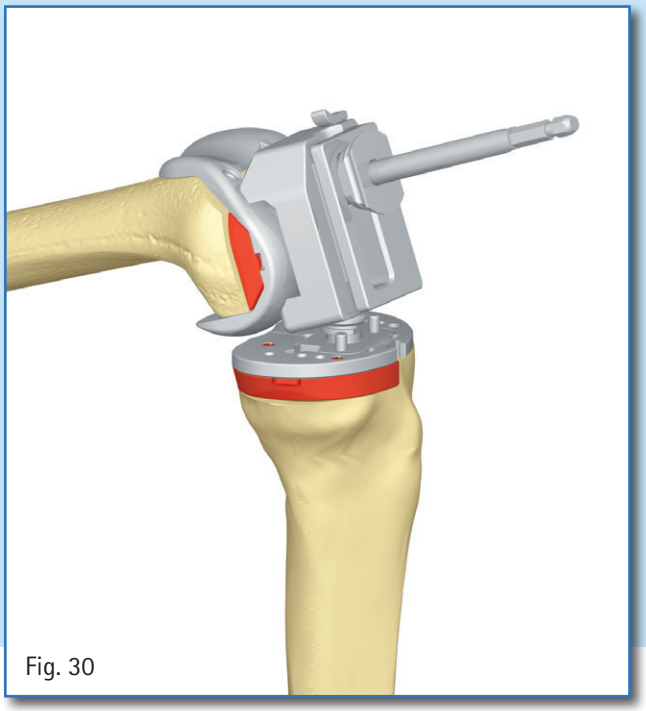


Fig. 30

6.10 Femoral Box Preparation *(continued)*

Insert the femoral box alignment device (F1 NP415R, F2/3 NP416R) into the selected trial femur fitted with distal or posterior trial spacers, if applicable, and on which the frame for femoral box preparation has been screwed in place. Care must be taken to ensure the alignment device has the correct size and the appropriate marking for the left or right leg undergoing surgery (L=left, R=right leg), and the fastener on the frame must be closed. Insert the sleeve for femoral box alignment (L6°/R6° NP417R and L7°R5°/ L5°R7° NP418R) into the femoral box alignment device at the correct angle. Slide this assembly of the femoral box alignment device onto the reamer shaft or drive into position using the planar femoral impactor attachment (NP414) connected to the handle, until in contact with the inner femoral bone surface.

Note: *In order to avoid injury of the dorsal soft tissue structures, it is advisable to detach these beforehand and protect them with a suitable instrument.*

The central drill guide required for size (F1 NP436R, F2/ F3 NP437R) is attached to the frame for femoral box preparation and secured in place for preparation of the femoral box. Milling is then performed with the depth gauge drill (NP435R) up to the stop position.

Next, turn around guide (F1-NP438R F2/F3-NP439R) and insert, is performed and another hole is drilled by rotating the guide for 180°. Remove guide.

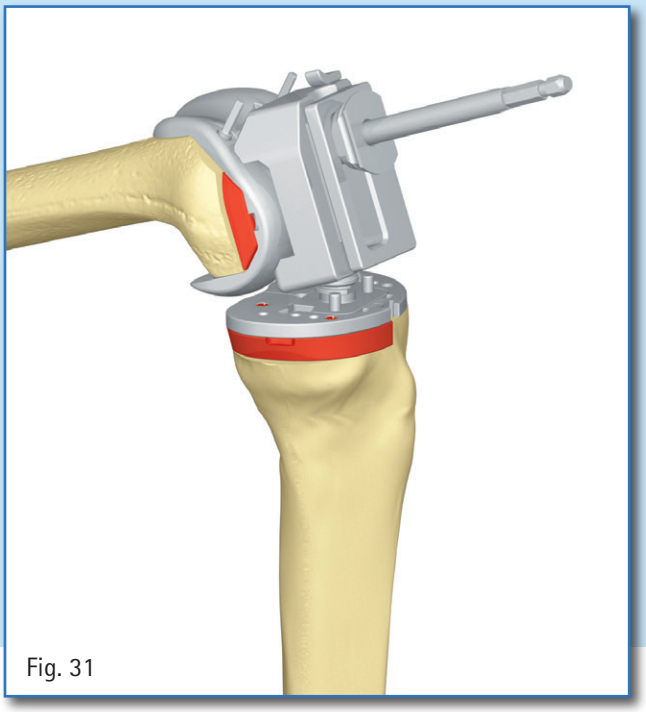


Fig. 31

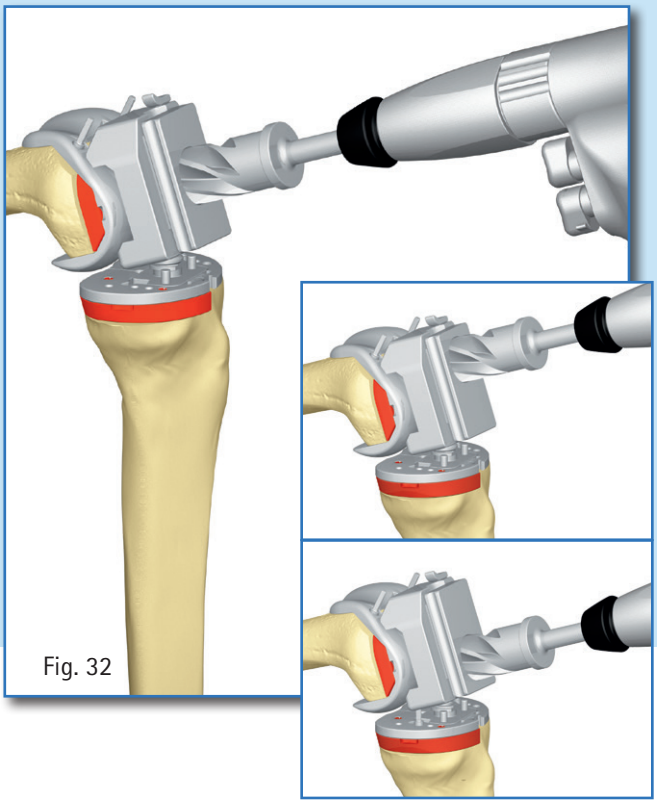


Fig. 32

Fix the trial femur in place with two anterior headed pins. Remove the sleeve, the femoral box alignment device and the reamer.

6. Surgical Technique *(continued)*

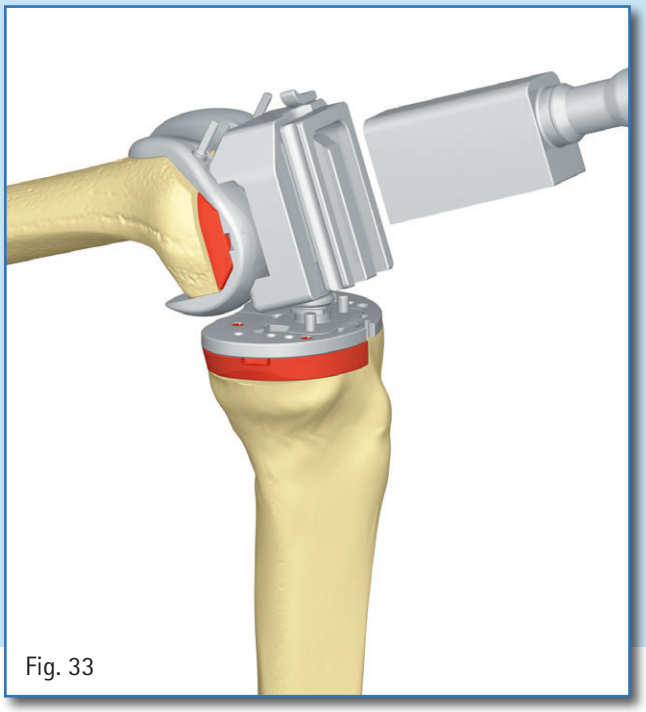


Fig. 33

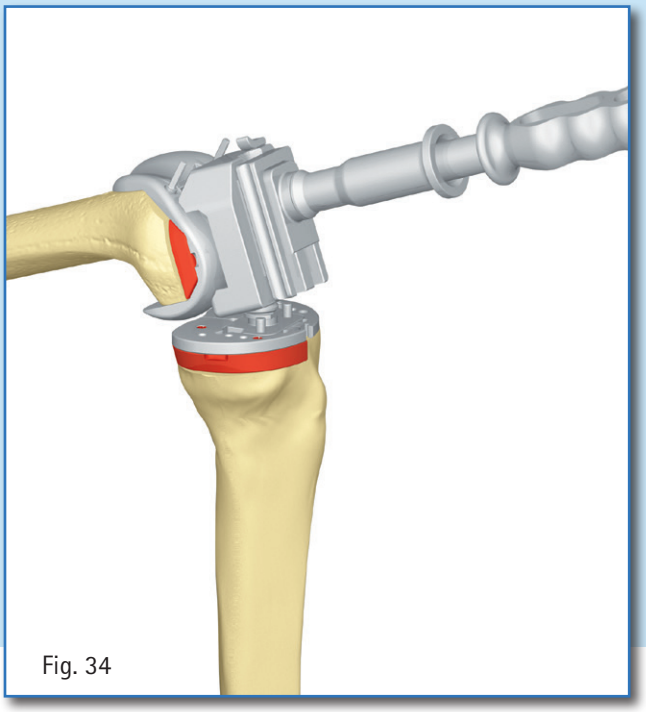


Fig. 34

6.10 Femoral Box Preparation *(continued)*

In order to remove the remaining bone, insert the required size guide (F1-NP433R, F2/F3-NP434R) into the frame for femoral box preparation and secure in place. Connect the U-chisel (NP443R) to the handle (NP495R) until assembly is secure.

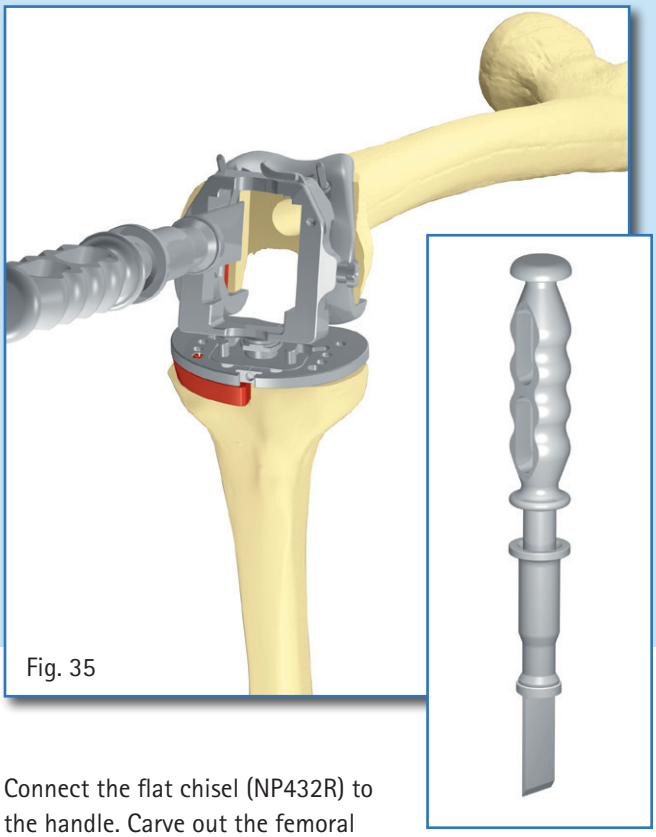


Fig. 35

Connect the flat chisel (NP432R) to the handle. Carve out the femoral box on the medial side up to the stop position with the long side of the blade touching the inner, medial side of the femoral box frame.

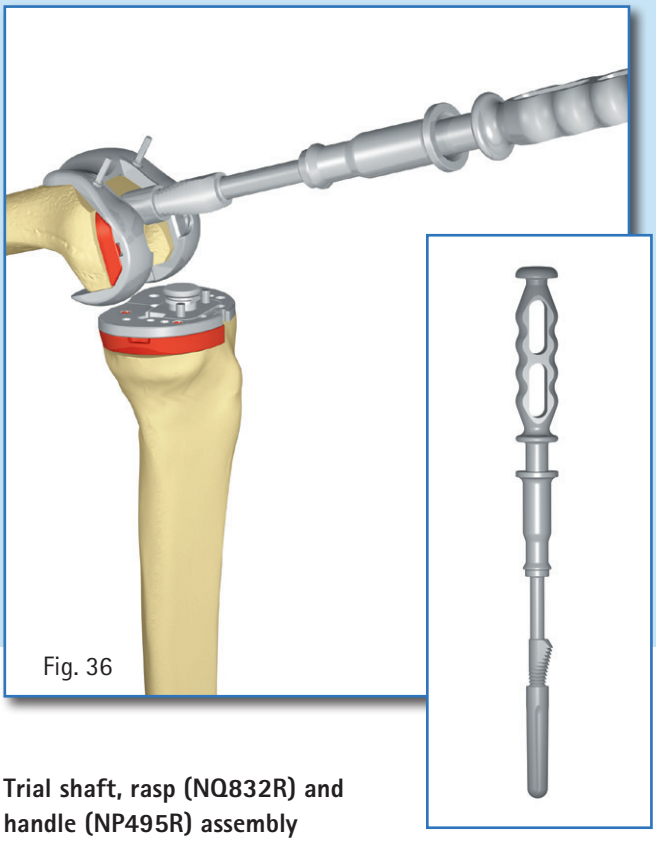


Fig. 36

Trial shaft, rasp (NQ832R) and handle (NP495R) assembly

In order to ensure optimal fit of the femur trial shaft, shape the medial and lateral inner surfaces with the rasp (NQ832R), which is guided by the connected trial shaft. The rasp is driven in twice (rotating it by 180°) up to and including the last wide tooth at the proximal end.

6. Surgical Technique *(continued)*

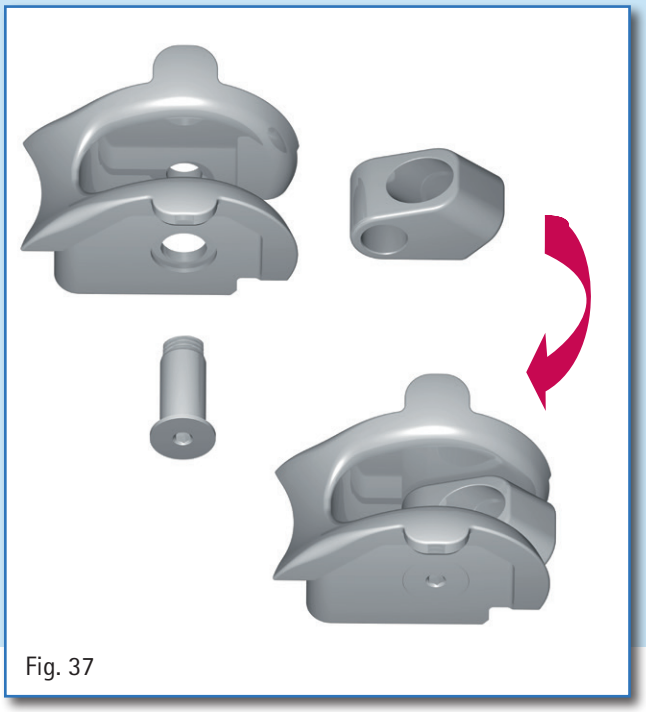


Fig. 37

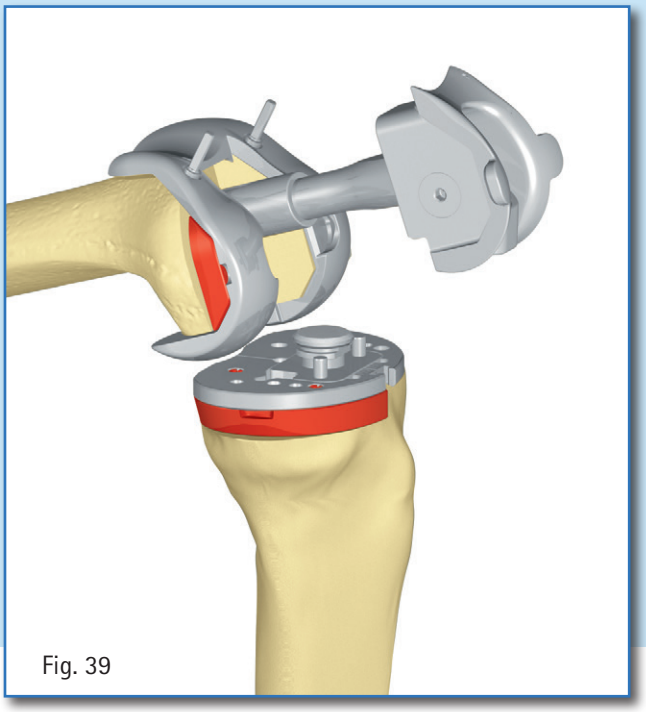


Fig. 39

6.11 Femoral Trial Box Assembly

Insert the appropriate trial hinge ring (F1 NP445R, F2/F3 NP446R) into the femoral trial box with the required size (left or right leg), and screw in place via the trial hinge axis (NP444R).

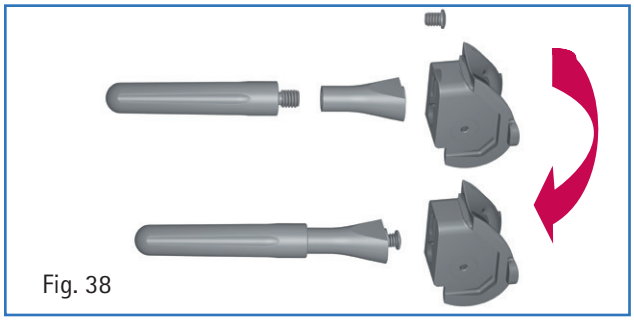


Fig. 38

To complete femoral trial box assembly:
Femoral trial box, extension stem adapter, screw (NS001R) for extension stem adapter (5°/7° cementless) and trial extension stem.

For the cemented extension stem variant (6°), the trial extension stem and extension stem adapter form a unit.

Screw the selected femoral trial extension stem onto the adapter having the correct angle and length. Screw the attachment screw (NS001R) into the adapter for one or two turns of the thread. Insert the extension stem into the proximal guide of the femoral trial box and loosely screw in place from the distal side. There should be some play in the AP direction to allow for self-centering. This trial femoral box assembly is inserted manually into the trial femur.

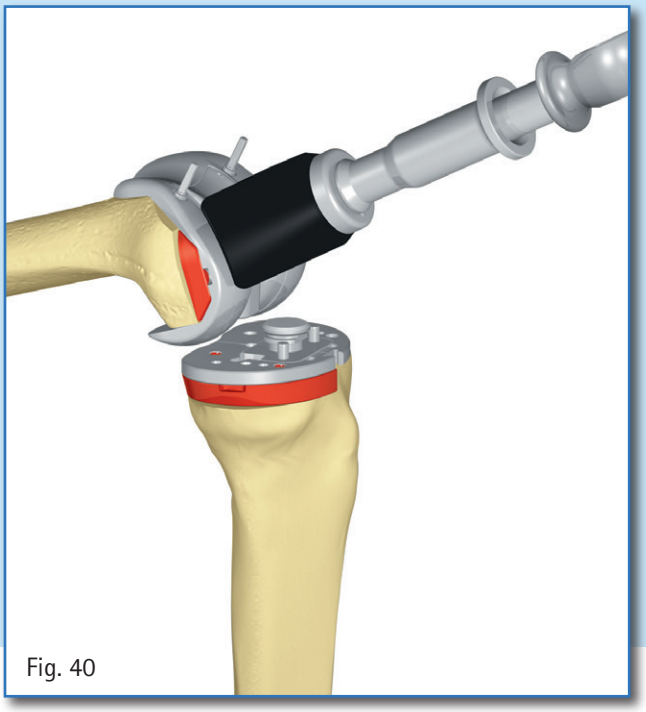


Fig. 40

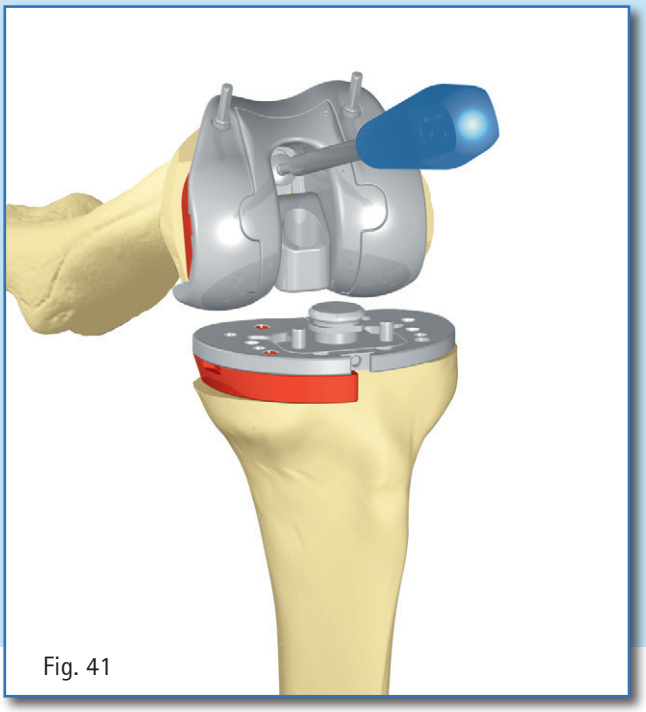


Fig. 41

Impact the configured trial femoral box into the trial femur.

Fix the extension stem, which has now aligned itself in the AP direction, in this defined position by tightening the intercondylar attachment screw using the screwdriver (NE181R).

The two pins in the femoral trial can now be removed.

6. Surgical Technique *(continued)*

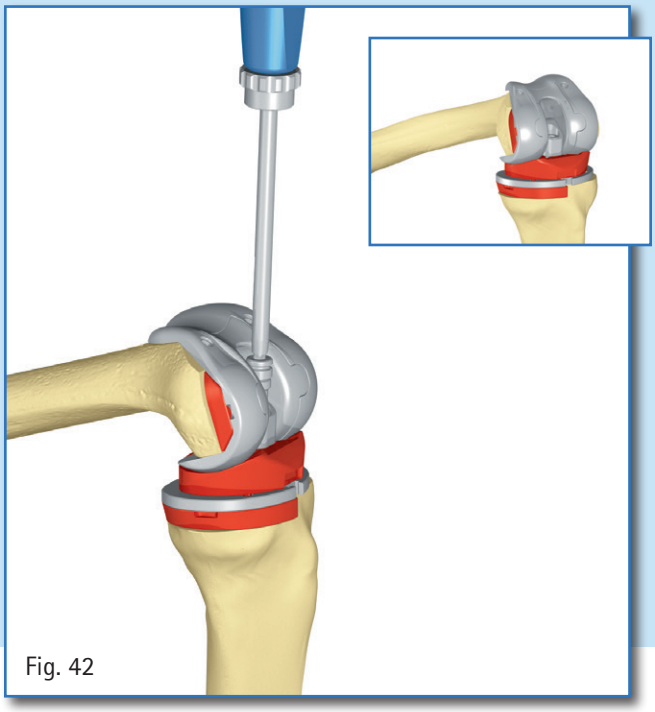


Fig. 42

6.11 Femoral Trial Box Assembly *(continued)*

The predetermined trial insert can now be selected and inserted onto the tibial trial plateau. Remove the covering of the borehole for the rotational axis.

Additional heights from 16 to 24 mm are available, if required, by combination with the 6 mm supplementary plates. Screw the required trial rotational axis into the trial hinge ring using the screwdriver (NP440R). The rotational axis is available in two lengths (short, NP447R, up to 16 mm PE height, or long, NP449R, from 18 mm PE height upwards). Joint stability in flexion and extension can now be tested, and thicker or thinner insert is selected in accordance with the result. It is recommended to do the testing with the patella. When selecting the height of the insert, care should be taken to ensure the system is sufficiently under tension despite the protection from dislocation immanent in the system.

Fig. 42a

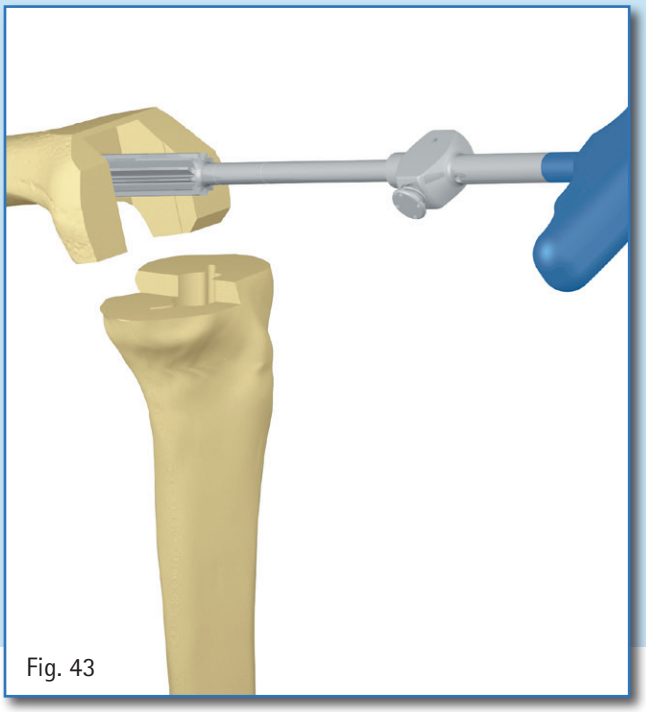


Fig. 43

If a cemented extension stem procedure was selected, a larger diameter must be reamed up to allow for the cement mantle. Alternatively, a smaller extension stem can be used (-2 mm). Reamers with 14, 15, 17, 18 and 20 mm are available.

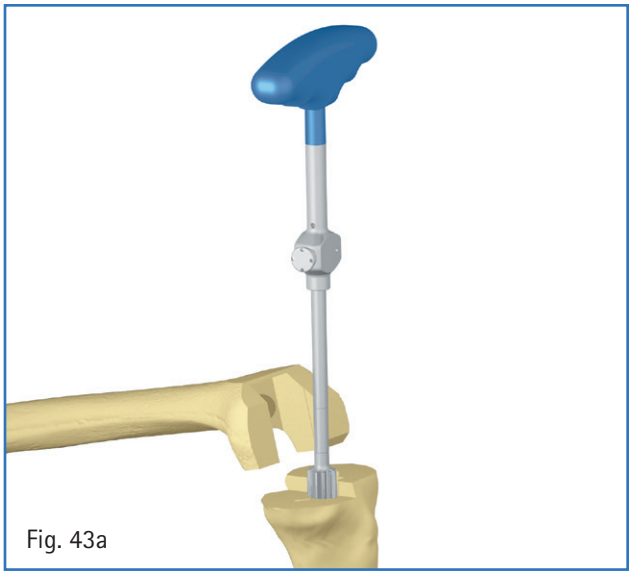


Fig. 43a

6. Surgical Technique *(continued)*

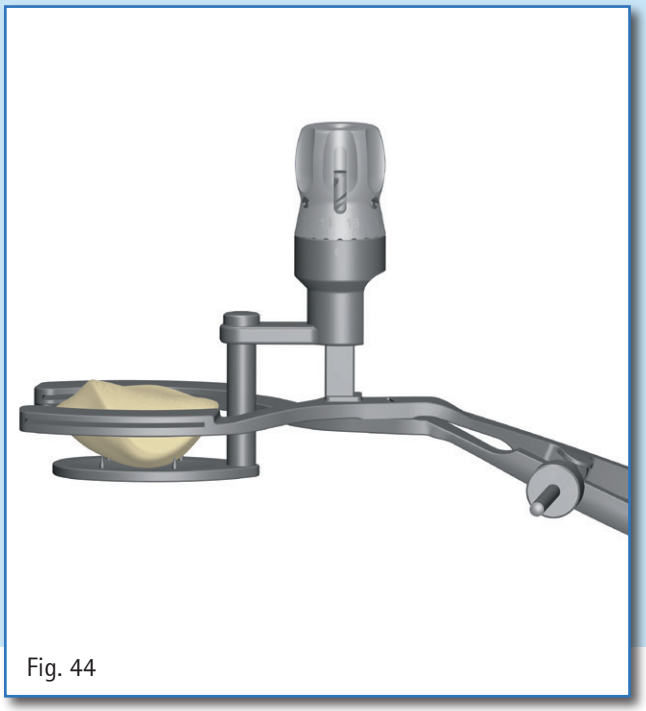


Fig. 44

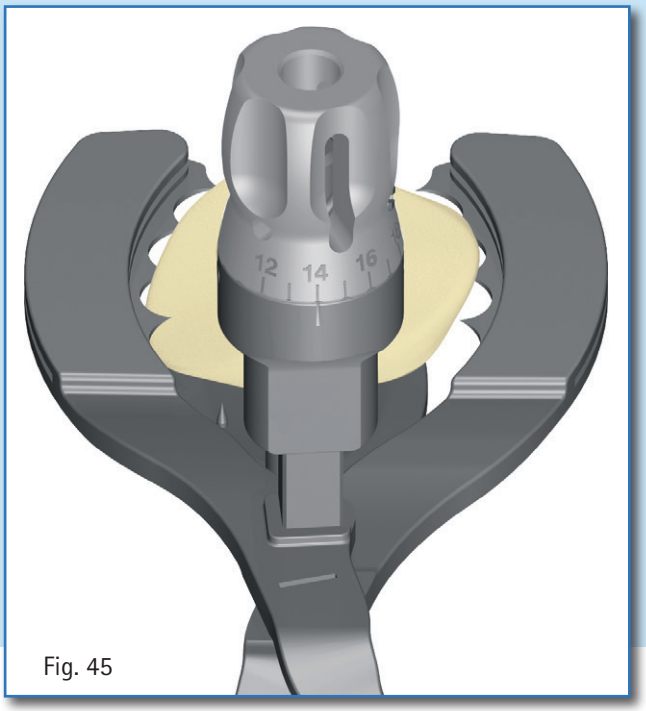


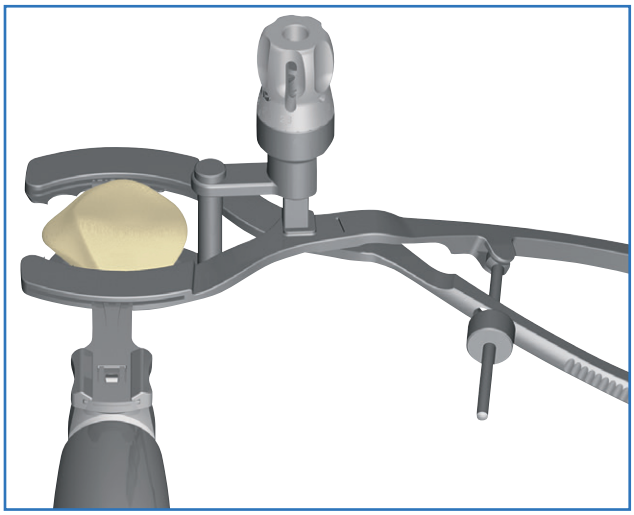
Fig. 45

6.12 Patella Preparation

- The thickness of the patella is measured using the caliper. This thickness should not be exceeded after implantation of the patella implant. Calculate bone resection.

> **Note:** *Patella bone resection should be no less than 12 mm.*

- Clamp the patella and adjust the level of resection by turning the depth wheel to the planned level of remaining patellar bone thickness.
- Perform the resection through the cutting slot with a 1.27 mm thick blade.



A: Caliper AA847R, B: Patella resection clamp NS840R, C: Acculan® saw

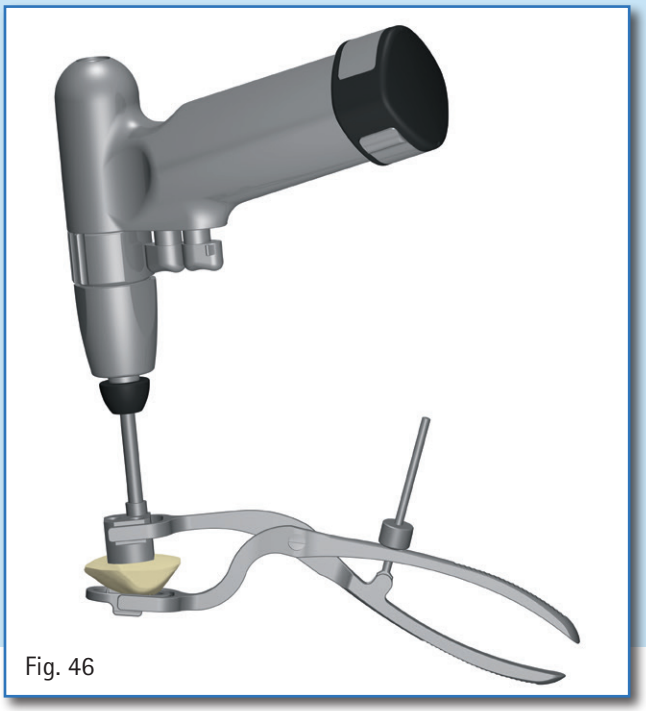


Fig. 46

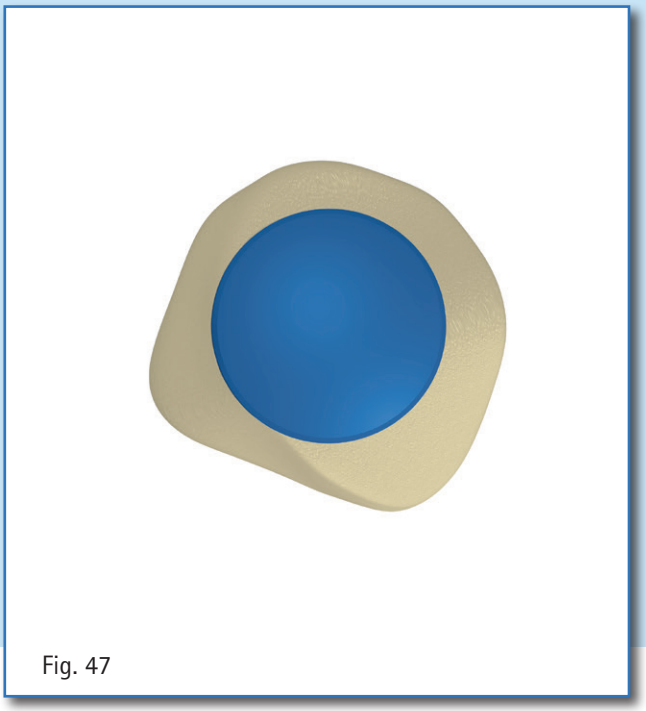
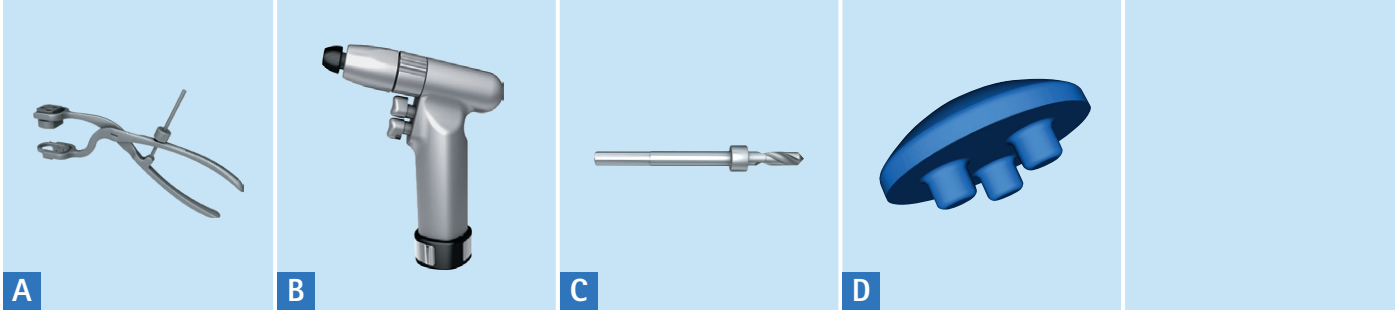


Fig. 47

- Remove the patella resection clamp. Attach the patella drill/impaction clamp to 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.
- Drill the pegs of the implant through the holes with the 6 mm drill until the stop is reached. The size of the patella is established with the corresponding trial patellar implant.



A: Patella drill/impaction clamp NS841R, B: Acculan® drill, C: Drill with stop 6 mm NQ449R, D: Trial patella NQ281-NQ285

6. Surgical Technique *(continued)*

Fig. 48

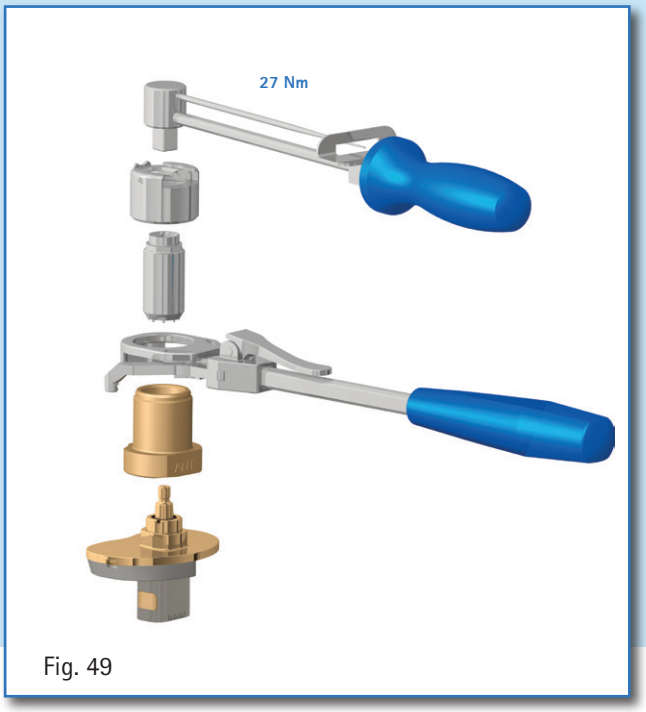


Fig. 49

6.13 Final Implant Assembly

Select the required final implants and prepare based on the result of the trial reduction.

Insert the rotational axis (metal) into the black bearing sleeve (synthetic material). Then insert them into the seating borehole of the tibial plateau. Screw the locking ring into place.

Tighten the locking ring with 27 Nm using the torque wrench (NE184RM) – connected to clamp (NP141R) and the locking ring spanner (F1 NP462RM (only for 10 mm height), F2/F3 NP454R), and over this assembly, the guide (NP144PM) and the tibial plateau holder (NQ839R) as counterholder. This can be tightened with 27 Nm.

Screw the defined tibial extension shaft under the tibial plateau, taking into account the correct medial/ lateral position of the tibial trial extension stem.

Fit the nut (NE185R) onto the torque wrench (NE184RM). Tighten the extension stem with 20 Nm, using the tibial plateau holder (NQ830R) as counterholder.

If required, tibia spacers are screwed underneath the tibial plateau using the screwdriver (NE181R).

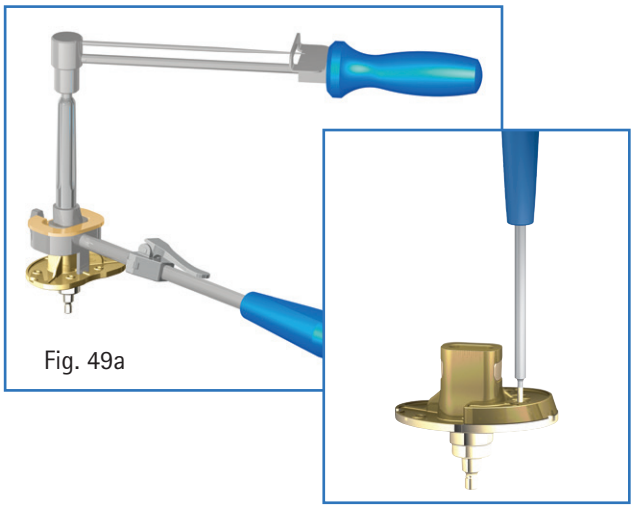


Fig. 49a

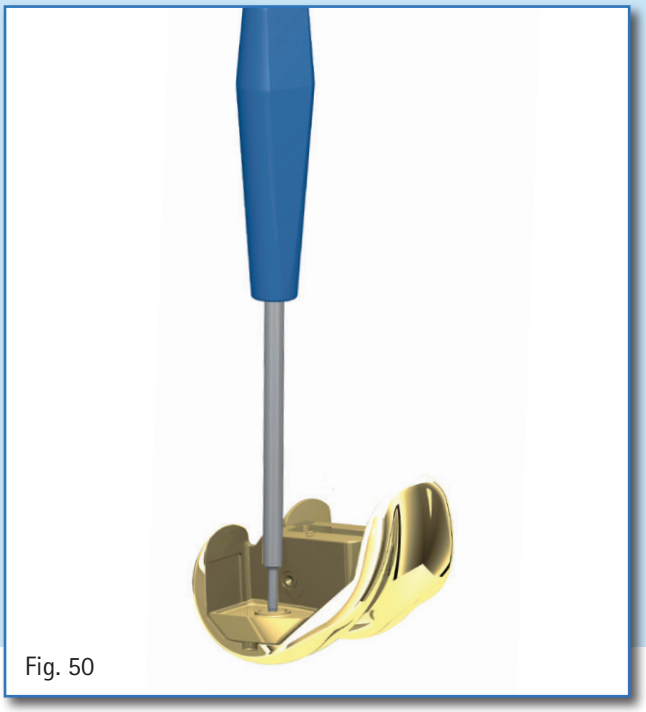


Fig. 50

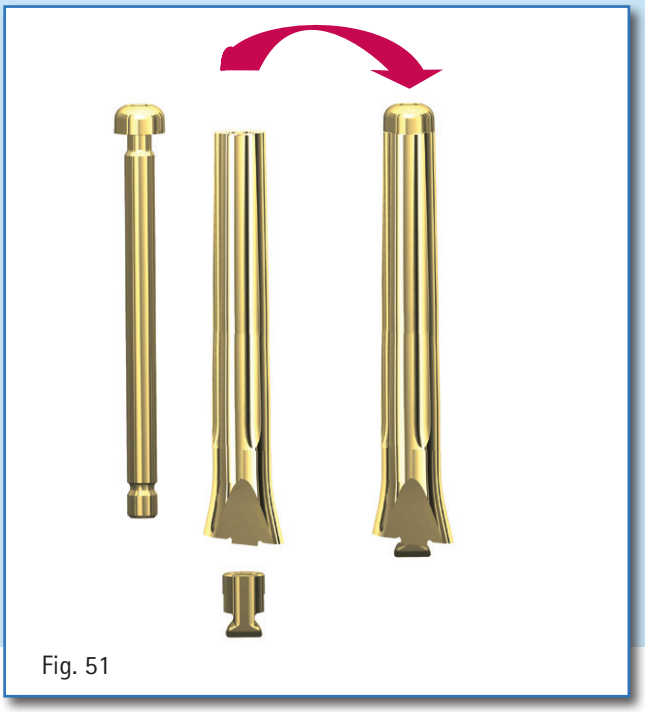


Fig. 51

6.13 Final Implant Assembly *(continued)*

The AP extension stem position of the explanted trial femur serves as reference for assembling the final femur implant.

Option:
Screw the distal or posterior femur spacers, if required, into the femur implant using the screwdriver (NE181R).

Insert the tension screw, which is supplied with the selected femoral extension stem, into the selected femur extension stem and loosely screw in place with the extension stem nut (NR400Z), taking into account the ML extension stem marking and the AP extension stem nut marking.

6. Surgical Technique *(continued)*

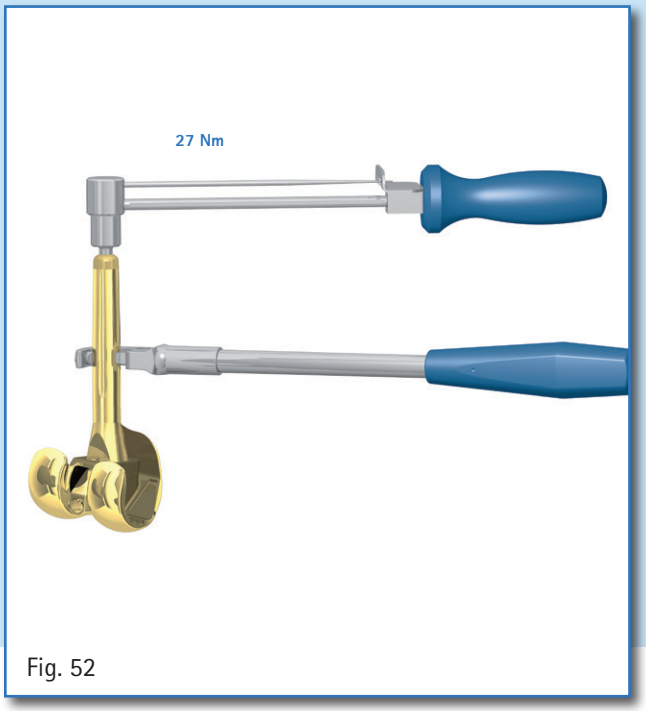


Fig. 52

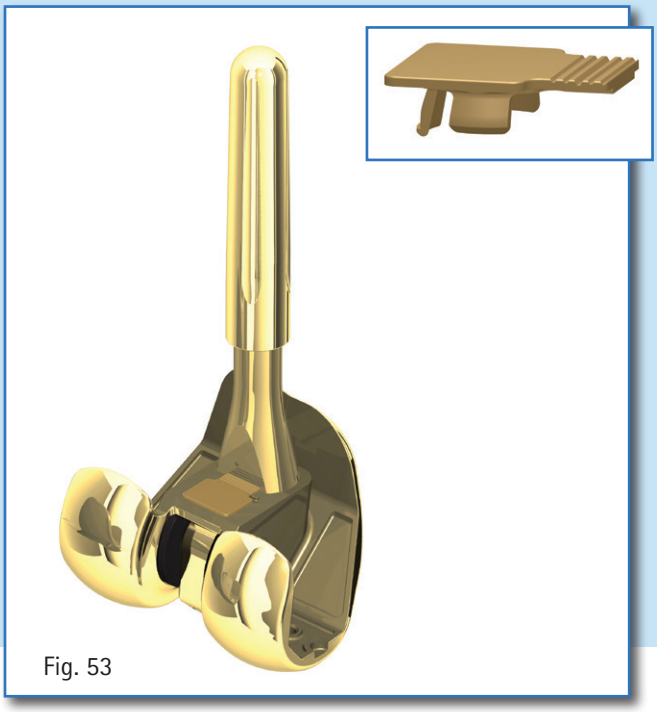


Fig. 53

6.13 Final Implant Assembly *(continued)*

Insert the extension stem into the femoral box and screw tightly in place by hand in the correct AP alignment. Tighten the femoral extension stem, which is held by the extension stem holder (NQ834R), in place with the correct AP position using the 27 Nm torque wrench (NE184RM) with attached nut (NE185R). The extension stem holder (NQ834R) has a holding aperture for the cemented femur extension stem with 12 mm diameter.

Insert the sealing mask, which can be cut to size for the required AP length, into the femur box aperture in order to prevent entry of cement. The mask is in a sterile package included with the femoral implant.

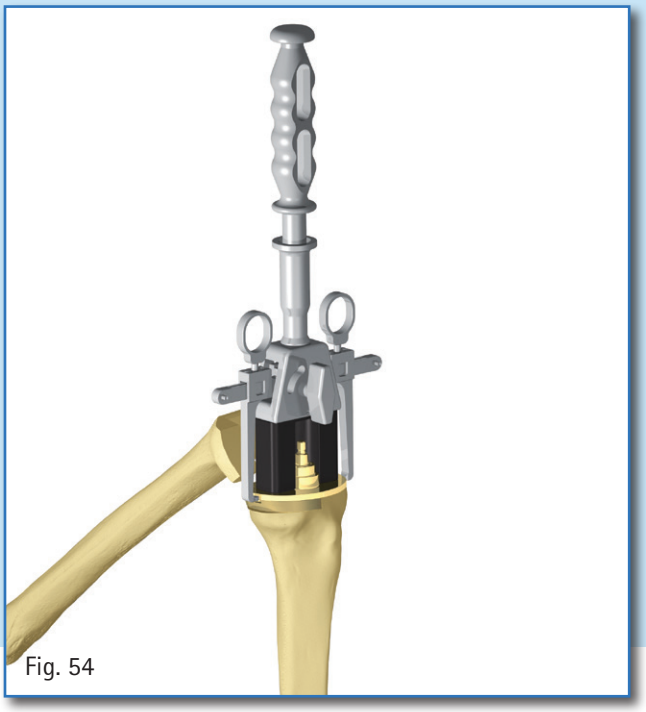


Fig. 54

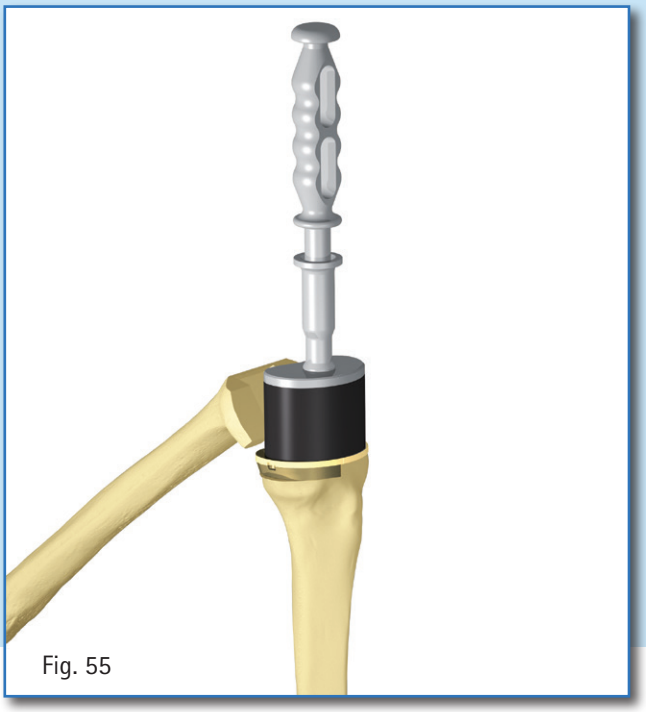


Fig. 55

6.13 Final Implant Assembly *(continued)*

Note: *Tibial and femoral implants must be cemented. The extension stem can be used either with cement or pressfit, depending on the selected variant.*

Implantation sequence:

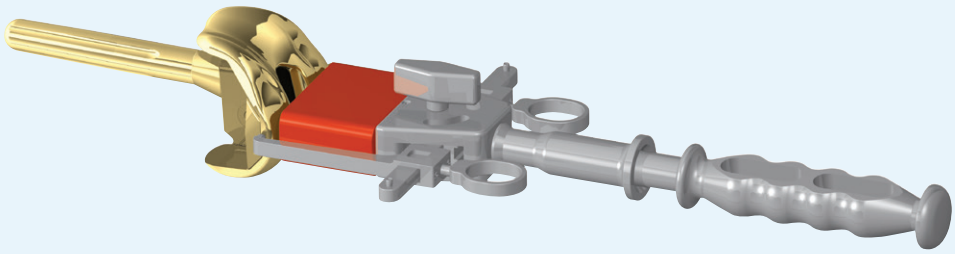
- Tibial plateau
- Femur
- Tibial insert
- Patella

Connect the tibial plateau holder (NQ570R) to the handle and the tibial insert (NQ569). Attach the tibial plateau to this instrument by the L-shaped hooks and secure by tightening the toggle screw. Then drive perpendicularly into the bone in the correct rotational position.

Option:

Connect the tibial impactor (NP468) to the handle. Insert the tibial plateau by hand in the correct rotational position and then drive perpendicularly into the bone.

Insert the femoral insert in the required size (F1 NQ566, F2 NQ567, F3 NQ568) into the femoral holder (NQ570R), and clamp handle. Open the two holding fingers onto the femur and then push fingers back together again to close. Engage the holding clamp and the two (medial and lateral) gaps in the femur and fix in this position by tightening the toggle screw.



6. Surgical Technique *(continued)*

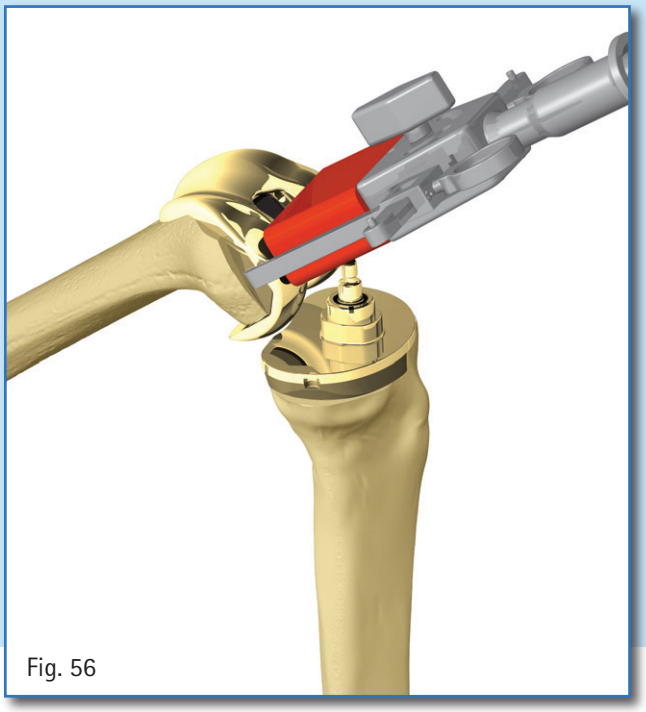


Fig. 56

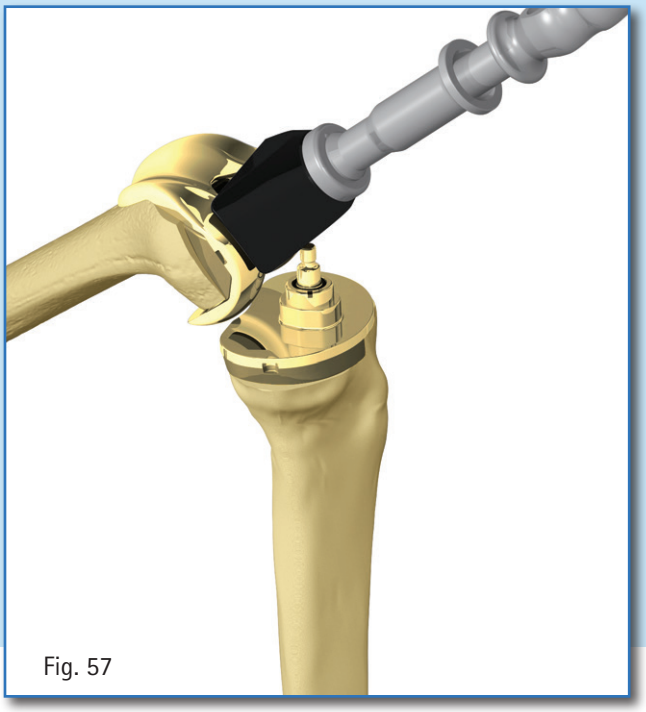


Fig. 57

6.13 Final Implant Assembly *(continued)*

Implant the femoral component using the implant holder. This step can be performed with the PE tibial insert already in place.

Option:
Fully guide the femur into the correct position using the impactor (NQ459) (concave).

All cement residue must be removed carefully in order to avoid third body wear. The rotational axis must be free of cement residue in order to avoid contact corrosion. It is recommended to allow the cement to harden (see notes) in extension with the PE gliding surface fitted and hinge ring placed over the rotational axis. The selected extension spacing/tension is reached via this procedure, and the femur implant centers itself on the joint line.

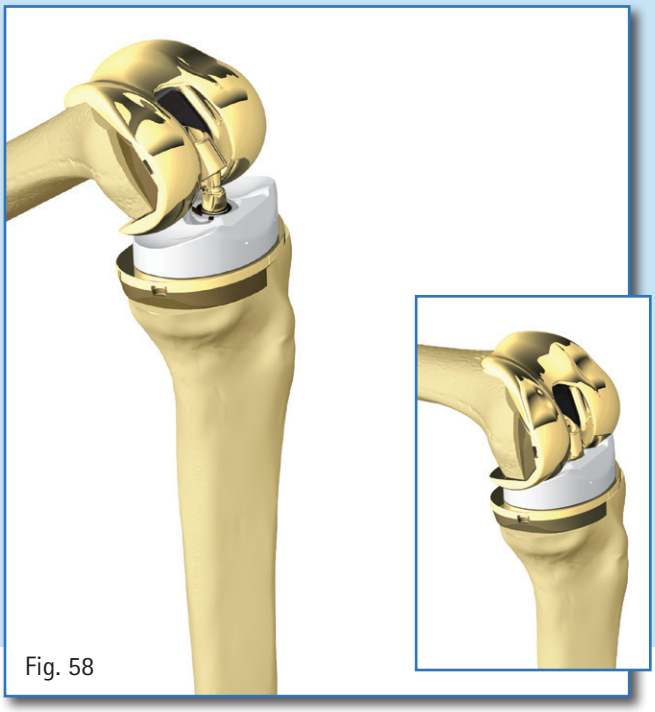


Fig. 58

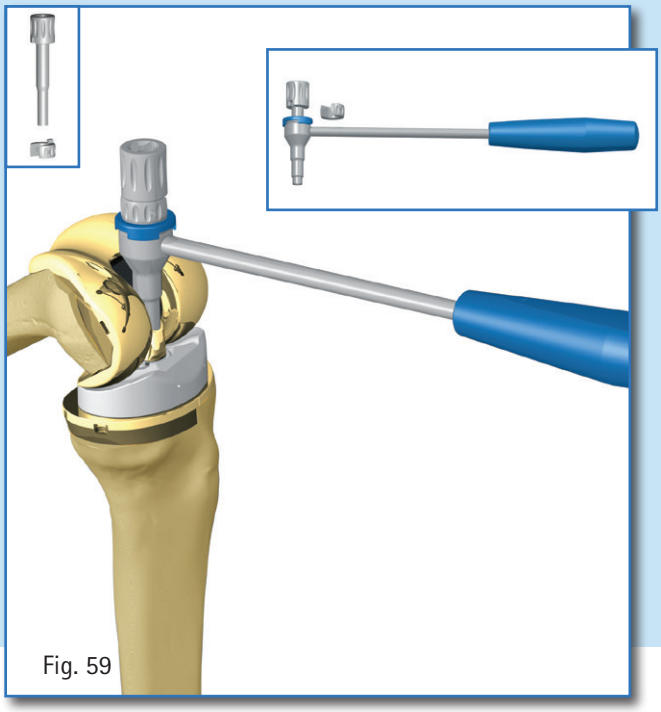


Fig. 59

6.13 Final Implant Assembly *(continued)*

Note: *When using cemented extension stems, cement residue can be left in the dorsal area. To remove all cement, the pre-coupled hinge mechanism must be disconnected and the PE gliding surface needs to be removed.*

Note: *Use a trial insert and recheck joint motion and stability after the cement has cured.*

Note: *When placing the final cemented implants, it is recommended that, after inserting the polyethylene gliding surface into the tibia baseplate, the bone cement should be allowed to fully harden before inserting the fixation screw.*

Place the tibial insert back and again place the hinge ring over the rotational axis. The axis is now centered in the hinge ring. The knee joint should be in flexion. Next, insert the adapter for cone (NP420R) into the counterholder (NP419R). Screw the adapter onto the rotational axis by hand. Then slide the counterholder on towards the tibia plateau. Insert the spacer piece into the free space between both instruments.

6. Surgical Technique *(continued)*

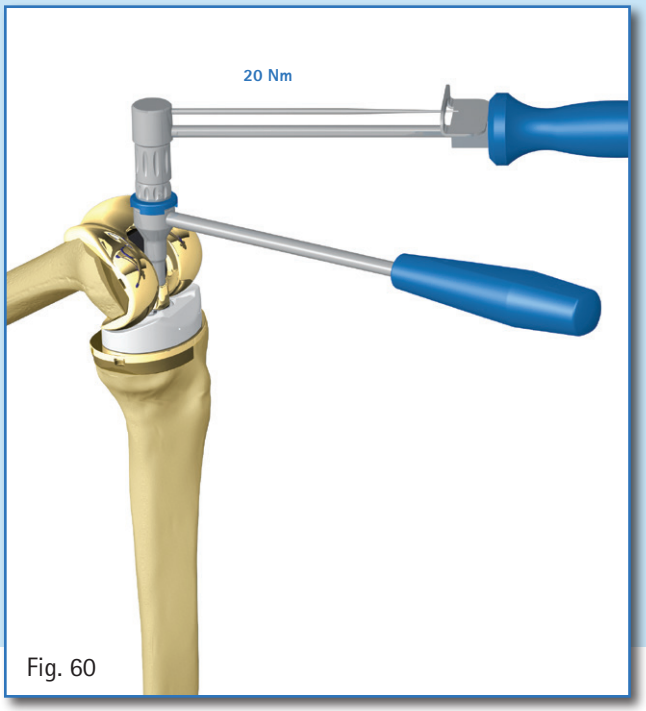


Fig. 60

Fig. 61

6.13 Final Implant Assembly *(continued)*

Attach the cone the torque wrench (NE184RM) with 20 Nm in a clockwise direction.

Since the thread has a low gradient, several revolutions are necessary.

Then remove adapter for joining the cone by turning counterclockwise.

Insert the securing nut, which is supplied with the femoral implant, into the holder (NP455R) and secure by shifting the locking ring downward, threading by hand.

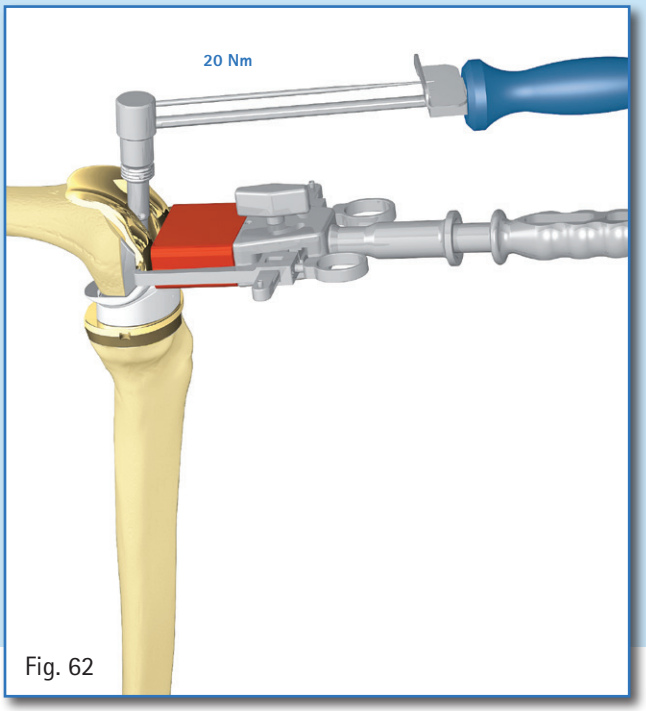


Fig. 62

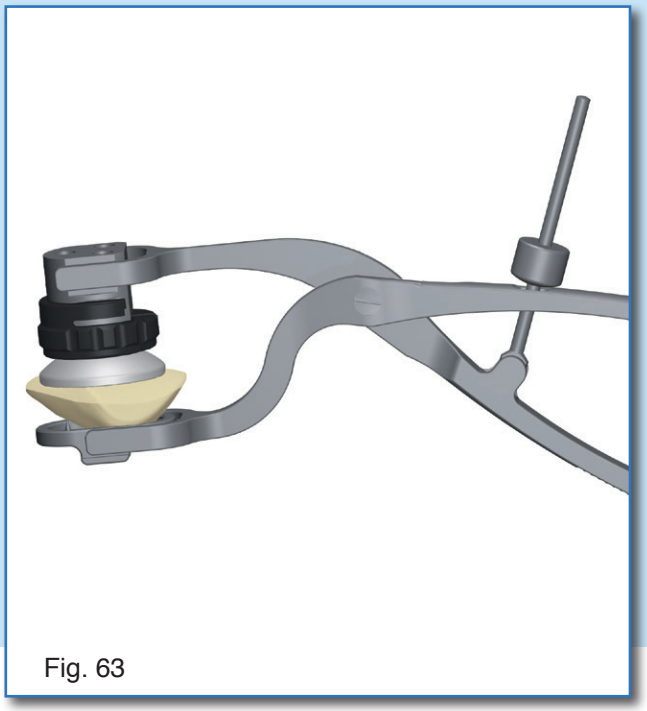


Fig. 63

6.13 Final Implant Assembly *(continued)*

Attach the femoral insert to the holder (NQ570R), connect to the handle and attach to the femur as counterholder.

Tighten the securing nut with 20 Nm using the torque wrench.

Implant the patella using the press-on adapter, which is inserted in the patella preparation forceps.

Note: *All cement residue must be removed carefully in order to avoid third body wear.*

7. Explantation Instructions

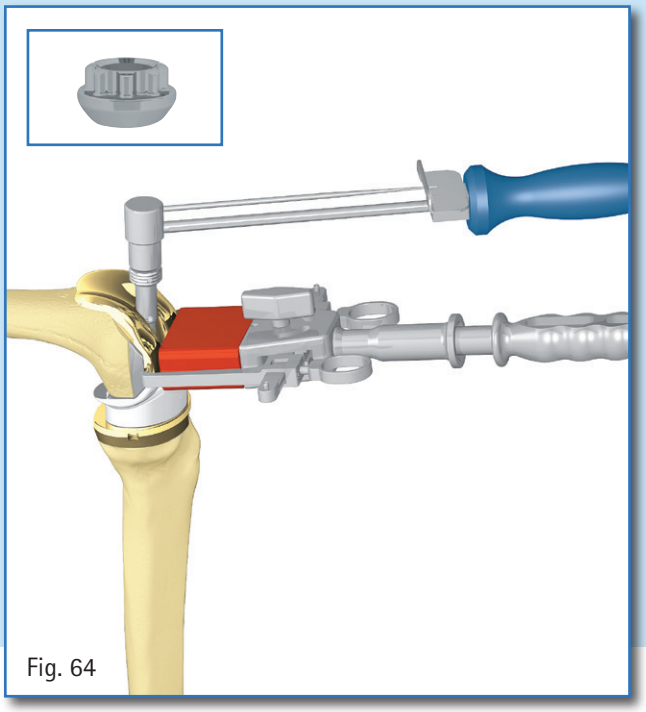


Fig. 64

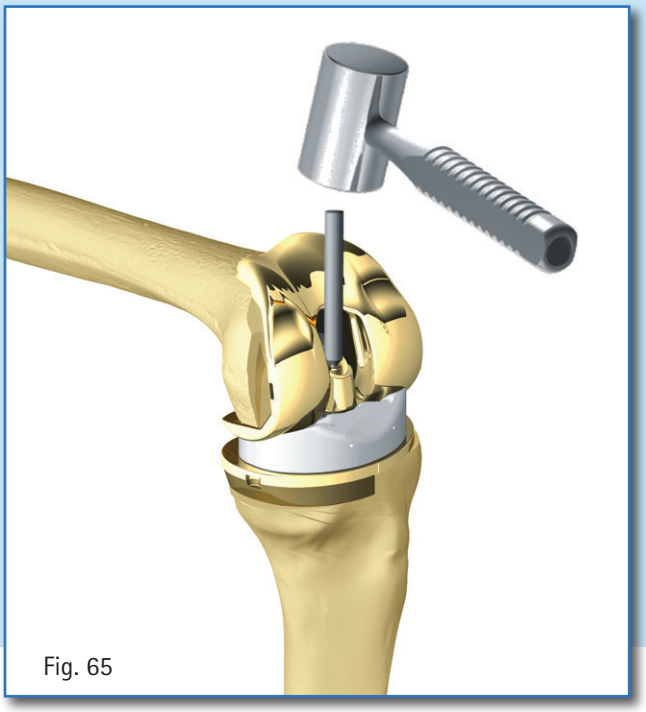


Fig. 65

7.1 Femoral and Tibial Plateau Decoupling

Remove the femoral securing nut using the torque wrench (NE184RM) with inserted holder (NP455R) and turn counterclockwise.

When using the femoral counterholder, connect the handle (NP495R) to the holder (NQ570R) with inserted femoral insert F1 (NQ566), F2 (NQ567), F3 (NQ568).

The rotational axis may be loosened from the hinge ring with an impulse shock in the distal direction. Use a suitable punch with tip (not included with EnduRo instruments).

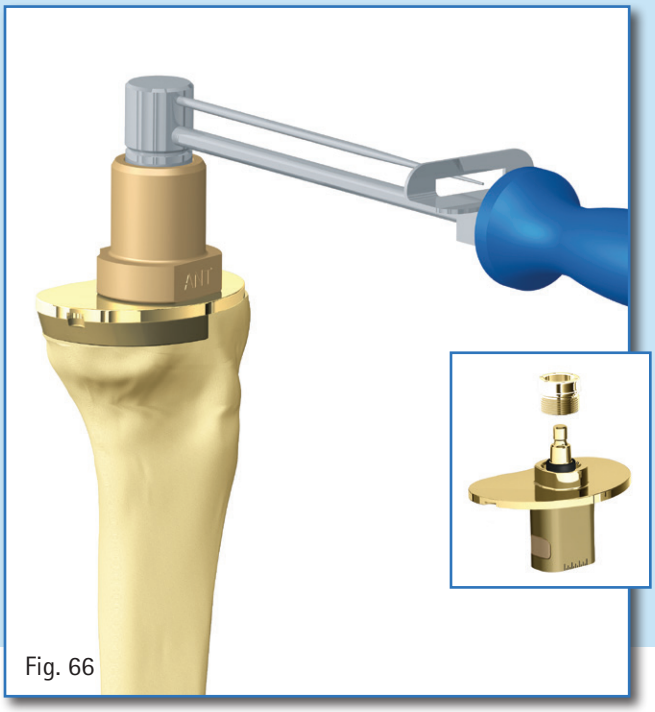


Fig. 66

Fig. 67

7.2 Tibial Insert Exchange

Detach old tibial insert. Loosen the locking ring using torque wrench spanner and guide and turn counterclockwise. Detach locking ring. Remove old parts inside tibia plateau.

Note: *Hold tibia by hand as the counterholder cannot be used with implanted tibia plateau.*

Select new insert which fits to femur size. Open package and use all four sterile parts inside.

The old rotational axis could have a cone or thread defect. The locking ring could be defective, which would lead to loosening.

The new components must be inserted in the tibia plateau and tightened with 27 Nm. Hold tibia by hand.

7. Explantation Instructions *(continued)*

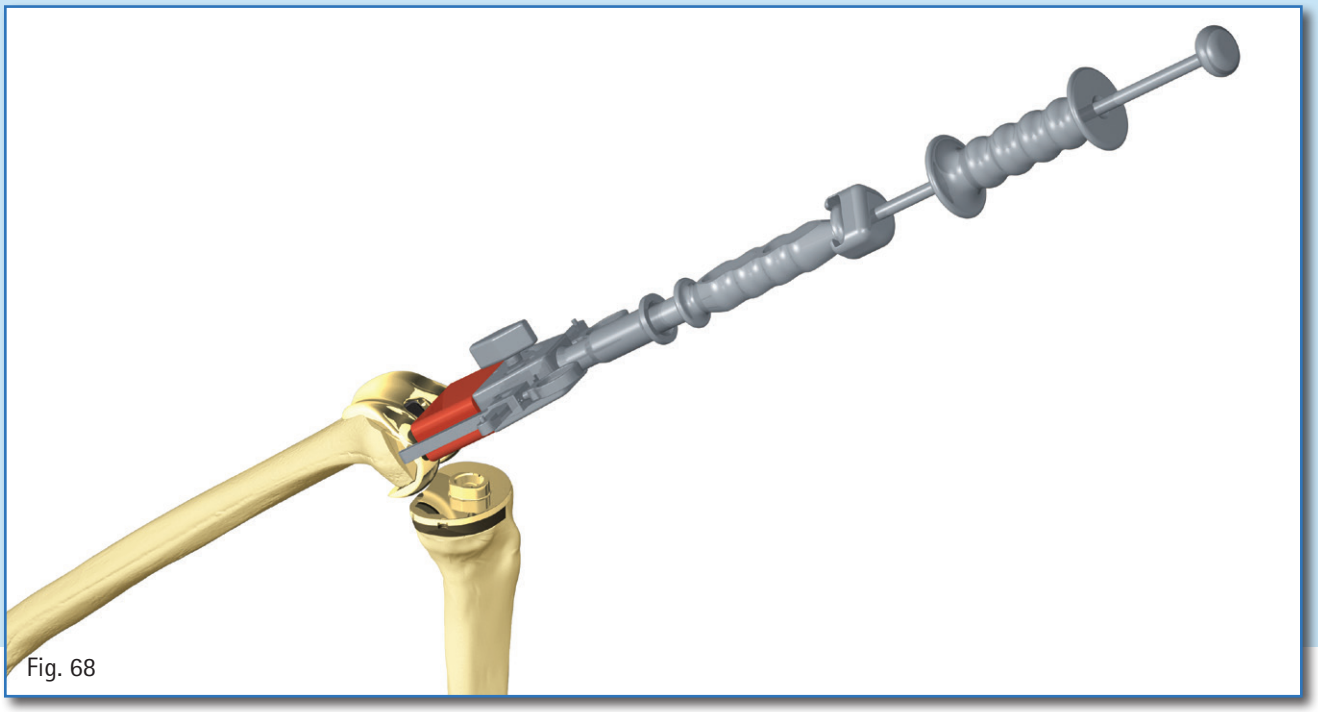


Fig. 68

7.3 Femoral Exchange

Separate femur from tibial plateau as described in section "Femoral and Tibia Plateau Decoupling" (page 42).

Detach old tibial insert. Loosen locking ring counter-clockwise by using torque wrench spanner and guide described in section "Tibial Insert Exchange" (page 43). Detach locking ring. Remove old parts inside tibia plateau.

The handle (NP495R) connected to holder (NQ570R) with inserted femoral insert is attached to the femur. Afterwards, secure extractor (NP684R) to the handle and use to remove the femur by sliding handle piece distal.

Prepare new femoral implant. Select new insert which fits to femur size. Open package and use all four sterile parts inside the packaging, as old parts could be defective. The new components must be inserted in the tibia plateau and tightened with 27 Nm.

Note: *Hold tibia by hand as the counterholder cannot be used with implanted tibia plateau.*
Apply bone cement, implant and joining cone as described in the surgical technique.

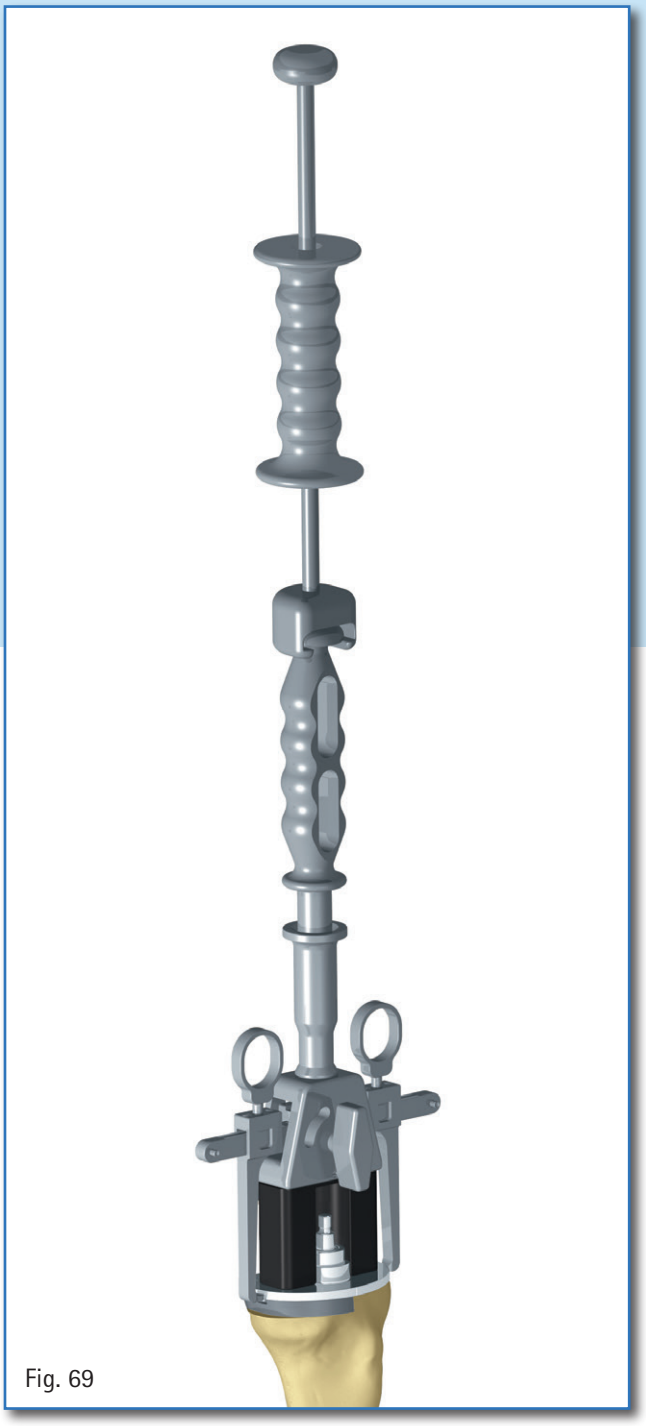


Fig. 69

7.4 Tibial Exchange

Separate femur from tibial plateau as described in section "Femoral and Tibia Plateau Decoupling" (page 42).

Detach old tibial insert. Loosen locking ring counter-clockwise by using torque wrench spanner and guide described in section "Tibial Insert Exchange" (page 42). Detach locking ring. Remove old parts inside tibia plateau.

Loosen old tibia plateau (e. g. by chisel.) The medial and lateral recess may need to be cleaned from cemen.

Connect the tibia plateau holder (NQ570R) to the handle (NP495R) with inserted tibia insert (NQ569). Attach this assembly to the tibial plateau by the L-shaped hooks and secure by tightening the toggle screw. Afterwards, latch the extractor (NP684R) to handle and use to remove the tibial plateau by sliding handle piece distal.

Cement the implant and joining cone as described in the surgical technique.

EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

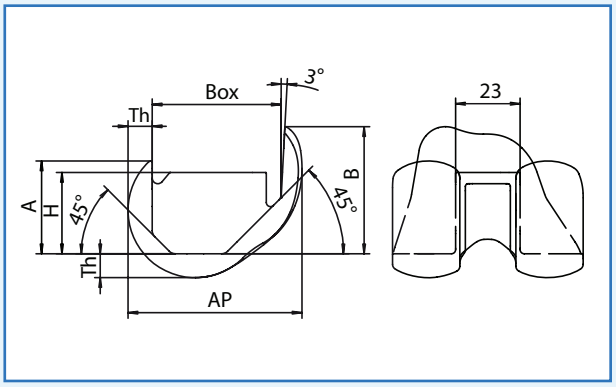
8. Implant Overview

8.1 EnduRo Implant Dimensions and Design

Important characteristics of the EnduRo femoral – femur extension stems and femoral spacer implants

- Three sizes (Size F3/F5/F7), left/right
- Width of femur box: 23 mm
- Hyperextension stops at 3° for all sizes

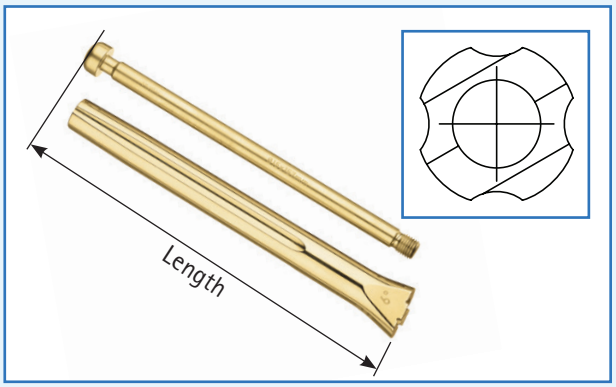
Size	ML	AP	Box	H	Trochlear depth	Th
F1	60.0	54.0	40.0	26.5	4.0	7.0
F2	68.0	62.1	46.7	29.0	5.0	8.5
F3	76.0	70.0	52.0	31.5	5.5	10.0



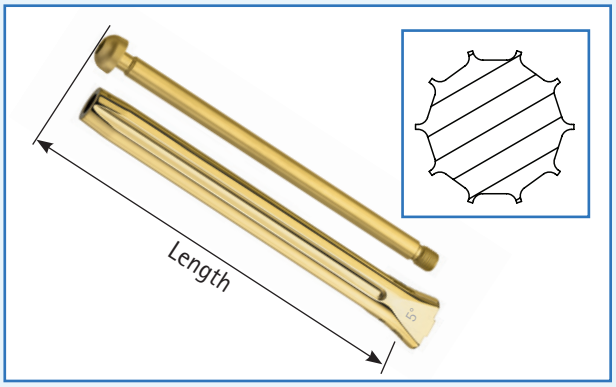
Femur / Tibia Compatibility Chart

Size	F1	F2	F3	F4	F5	F6	F7	F8
T0								
T1								
T2								
T3								
T4								
T5								

Ideal combination for optimum performance
Possible, but not recommended
Not compatible



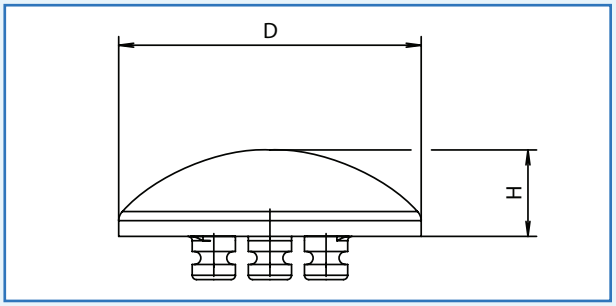
- Cemented: 6°
- Length: 77, 157 mm
- Diameter: 12, 15, 18 mm
- Cylindrical and polished
- Four longitudinal grooves to reduce the risk of embolism



- Pressfit: 5°/7°
- Length: 117, 177 mm
- Diameter: 12 – 20 mm (steps of 1 mm)
- Slightly tapered
- 10 longitudinal grooves (Wagner profile)

Patella Dimensions

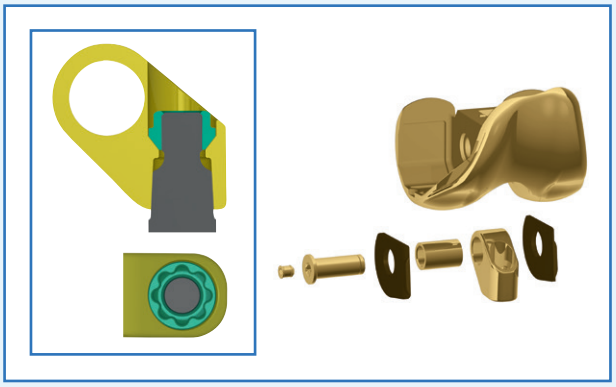
Size	Diameter	Height
P1	26	7
P2	29	8
P3	32	9
P4	35	10
P5	38	11



8.1 EnduRo Implant Dimensions and Design *(continued)*

- Distal spacers: heights 4, 8 and 12 mm
- Posterior femur spacers: heights 4, 8 and 12 mm (for details, see matrix of implants)
- Fixed in place via a screw in the distal part
- Cement pockets: 1 mm deep

- The details of the axis and cone mechanism



EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

8. Implant Overview *(continued)*

8.1 EnduRo Implant Dimensions and Design *(continued)*

- Compatibility of rotation axis elements

In case of unsterile or damaged rotation axis, bearing sleeve or nut, you`ll find spare parts for proper treatment in the displayed matrix.

	Replaceable by axis/nut or PEEK bearing sleeve of tibial insert gliding surface:		
Axis/parts to swap	F1	F2	F3
F1 10 mm	-	-	-
F1 12 mm	-	-	-
F1 14 mm	-	10 mm	-
F1 16 mm	-	12 mm	10 mm
F1 18 mm	-	14 mm	12 mm
F1 20 mm	-	16 mm	14 mm
F1 22 mm	-	18 mm	16 mm
F1 24 mm	-	20 mm	18 mm

	Replaceable by axis/nut or PEEK bearing sleeve of tibial insert gliding surface:		
Axis/parts to swap	F1	F2	F3
F2 10 mm	14 mm	-	-
F2 12 mm	16 mm	-	10 mm
F2 14 mm	18 mm	-	12 mm
F2 16 mm	20 mm	-	14 mm
F2 18 mm	22 mm	-	16 mm
F2 20 mm	24 mm	-	18 mm
F2 22 mm	-	-	20 mm
F2 24 mm	-	-	22 mm

	Replaceable by axis/nut or PEEK bearing sleeve of tibial insert gliding surface:		
Axis/parts to swap	F1	F2	F3
F3 10 mm	16 mm	12 mm	-
F3 12 mm	18 mm	14 mm	-
F3 14 mm	20 mm	16 mm	-
F3 16 mm	22 mm	18 mm	-
F3 18 mm	24 mm	20 mm	-
F3 20 mm	-	22 mm	-
F3 22 mm	-	24 mm	-
F3 24 mm	-	-	-

Example 1:

- Unsterile or damage to the PEEK, PE F1 10 mm, axis or tibial nut:

  According to the chart, there is a "-". The "-" means that there are NO parts from any other PE that can be used. As there are no options, you would have to use a completely different PE-height with all the corresponding parts.

Example 2:

- Unsterile or damage to the PEEK, PE F1 10 mm, axis or tibial nut:

  According to the chart, the F1 14 mm row is a red row; then you can see the possibility of using the PEEK of F2 10 mm which is also a row red.

Example 3:

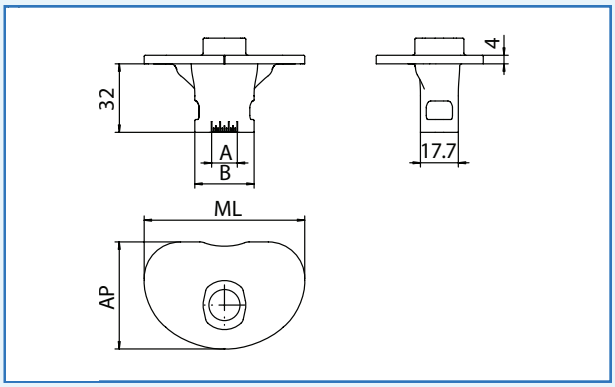
- Unsterile or damage to the PEEK, PE F3 12 mm, axis or tibial nut:

  According to the chart, the PE F3 12 mm is an orange row; then you can see the possibility of using the PEEK of F1 18 mm or F2 14 mm.

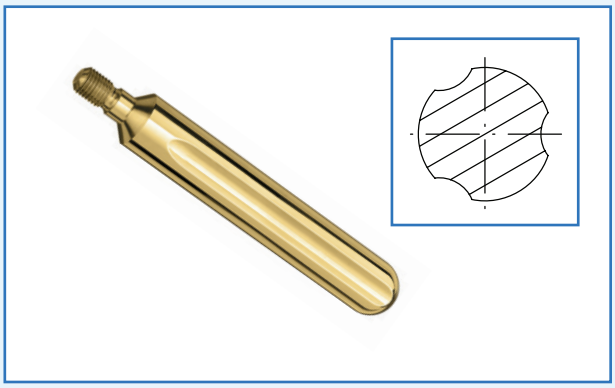
Important characteristics of the EnduRo™ tibia – tibia extension stems and tibia spacer implants

- Three sizes
- Seating for tibial extension stems
- Offset ± 6 mm (for size T1 ± 4 mm)
- Symmetric plateau design
- Cemented

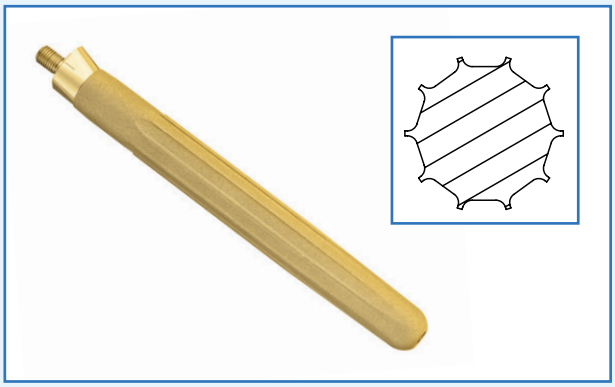
Size	ML	AP	AP/ML	B
T1	67	44	2/3	23.7
T2	75	50	2/3	27.7
T3	83	56	2/3	27.7



- Cemented
- Length: 52, 92 mm
- Diameter: 12, 15, 18 mm
- Cylindrical and polished
- With asymmetric "collar" for increased stability
- Three fluted grooves to reduce the risk of embolism



- Pressfit
- Length: 92, 172 mm
- Diameter: 11 – 20 mm (steps of 1 mm)
- Slightly tapered
- With asymmetric "collar" for increased stability
- 10 fluted grooves (Wagner profile)



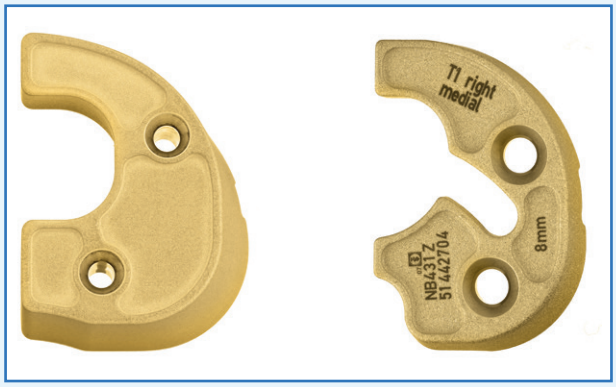
EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

8. Implant Overview *(continued)*

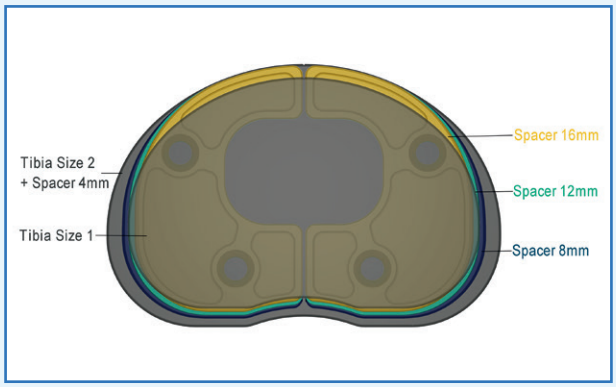
8.1 EnduRo Implant Dimensions and Design *(continued)*

- Spacers: heights 4, 8, 12 and 16 mm
- Screwed in from underneath tibia base plate
- Anatomic medial or lateral design
- Cement pockets: 1 mm deep



EnduRo tibia spacer (dimensions in mm)

		Tibia 1	Tibia 2	Tibia 3
	Original ML	67	75	83
with 2 tibial spacers	Original AP	44	50	56
with 2 tibial spacers	4 mm ML	67	75	83
with 2 tibial spacers	4 mm AP	44	50	56
with 2 tibial spacers	8 mm ML	61	69	77
with 2 tibial spacers	8 mm AP	42	48	54
with 2 tibial spacers	12 mm ML	58.5	66.5	74.5
with 2 tibial spacers	12 mm AP	41.5	47.5	53.5
with 2 tibial spacers	16 mm ML	55.5	63.5	71.5
with 2 tibial spacers	16 mm AP	40.5	46.5	52.5



Combination options

	F1	F2	F3
T1	OK	OK	–
T2	OK	OK	OK
T3	–	OK	OK

– not compatible

27 Nm for femoral extension stems, tibial locking ring	20 Nm tibial extension stem, femoral securing ring

PE size = femur size

8.2 Implant Ordering Details

ST0480 EnduRo™ AS Revision Implant Bank Femur	
NB014Z	Femur F1, left
NB015Z	Femur F2, left
NB016Z	Femur F3, left
NB017Z	Femur F1, right
NB018Z	Femur F2, right
NB019Z	Femur F3, right

Femoral spacer, distal	
NR861Z	Femur spacer, distal, F1, 4mm
NR864Z	Femur spacer, distal, F2, 4 mm
NR867Z	Femur spacer, distal, F3, 4 mm
NR862Z	Femur spacer, distal, F1, 8 mm
NR865Z	Femur spacer, distal, F2, 8 mm
NR868Z	Femur spacer, distal, F3, 8 mm
NR863Z	Femur spacer, distal, F1, 12 mm
NR866Z	Femur spacer, distal, F2, 12 mm
NR869Z	Femur spacer, distal, F3, 12 mm

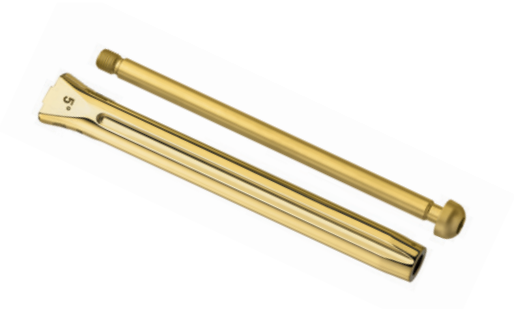
Femoral spacer, postero/distal, with screw	
NR366Z	Femur spacer, post./dist., F1, 4 x 4 mm
NR376Z	Femur spacer, post./dist., F2, 4 x 4 mm
NR386Z	Femur spacer, post./dist., F3, 4 x 4 mm
NR367Z	Femur spacer, post./dist., F1, 4 x 8 mm
NR377Z	Femur spacer, post./dist., F2, 4 x 8 mm
NR387Z	Femur spacer, post./dist., F3, 4 x 8 mm
NR396Z	Femur spacer, post./dist., F1, 4 x 12 mm
NR590Z	Femur spacer, post./dist., F2, 4 x 12 mm
NR595Z	Femur spacer, post./dist., F3, 4 x 12 mm
NR368Z	Femur spacer, post./dist., F1, 8 x 4 mm
NR378Z	Femur spacer, post./dist., F2, 8 x 4 mm
NR388Z	Femur spacer, post./dist., F3, 8 x 4 mm
NR369Z	Femur spacer, post./dist., F1, 8 x 8 mm
NR379Z	Femur spacer, post./dist., F2, 8 x 8 mm
NR389Z	Femur spacer, post./dist., F3, 8 x 8 mm
NR397Z	Femur spacer, post./dist., F1, 8 x 12 mm
NR591Z	Femur spacer, post./dist., F2, 8 x 12 mm
NR596Z	Femur spacer, post./dist., F3, 8 x 12 mm
NR592Z	Femur spacer, post./dist., F2, 12 x 4 mm
NR597Z	Femur spacer, post./dist., F3, 12 x 4 mm
NR593Z	Femur spacer, post./dist., F2, 12 x 8 mm
NR598Z	Femur spacer, post./dist., F3, 12 x 8 mm
NR594Z	Femur spacer, post./dist., F2, 12 x 12 mm
NR599Z	Femur spacer, post./dist., F3, 12 x 12 mm

8. Implant Overview *(continued)*

8.2 Implant Ordering Details *(continued)*

Femoral extension stems, cemented, 6°	
NR291Z	Femur stem, 6°, 12 x 77 mm, cemented
NR294Z	Femur stem, 6°, 12 x 157 mm, cemented
NR292Z	Femur stem, 6°, 15 x 77 mm, cemented
NR295Z	Femur stem, 6°, 15 x 157 mm, cemented
NR293Z	Femur stem, 6°, 18 x 77 mm, cemented
NR296Z	Femur stem, 6°, 18 x 157 mm, cemented

Femuoralextension stem nut	
NR400Z	Femur extension stem nut, neutral



Femoral extension stems, Pressfit, 5°	
NR402Z	Femur stem, 5°, 12 x 117 mm, Pressfit
NR432Z	Femur stem, 5°, 12 x 177 mm, Pressfit
NR403Z	Femur stem, 5°, 13 x 117 mm, Pressfit
NR433Z	Femur stem, 5°, 13 x 177 mm, Pressfit
NR404Z	Femur stem, 5°, 14 x 117 mm, Pressfit
NR434Z	Femur stem, 5°, 14 x 177 mm, Pressfit
NR405Z	Femur stem, 5°, 15 x 117 mm, Pressfit
NR435Z	Femur stem, 5°, 15 x 177 mm, Pressfit
NR406Z	Femur stem, 5°, 16 x 117 mm, Pressfit
NR436Z	Femur stem, 5°, 16 x 177 mm, Pressfit
NR407Z	Femur stem, 5°, 17 x 117 mm, Pressfit
NR437Z	Femur stem, 5°, 17 x 177 mm, Pressfit
NR408Z	Femur stem, 5°, 18 x 117 mm, Pressfit
NR438Z	Femur stem, 5°, 18 x 177 mm, Pressfit
NR409Z	Femur stem, 5°, 19 x 117 mm, Pressfit
NR439Z	Femur stem, 5°, 19 x 177 mm, Pressfit
NR410Z	Femur stem, 5°, 20 x 117 mm, Pressfit
NR440Z	Femur stem, 5°, 20 x 177 mm, Pressfit

Femoral extension stems, Pressfit, 7°	
NR502Z	Femur stem, 7°, 12 x 117 mm, Pressfit
NR532Z	Femur stem, 7°, 12 x 177 mm, Pressfit
NR503Z	Femur stem, 7°, 13 x 117 mm, Pressfit
NR533Z	Femur stem, 7°, 13 x 177 mm, Pressfit
NR504Z	Femur stem, 7°, 14 x 117 mm, Pressfit
NR534Z	Femur stem, 7°, 14 x 177 mm, Pressfit
NR505Z	Femur stem, 7°, 15 x 117 mm, Pressfit
NR535Z	Femur stem, 7°, 15 x 177 mm, Pressfit
NR506Z	Femur stem, 7°, 16 x 117 mm, Pressfit
NR536Z	Femur stem, 7°, 16 x 177 mm, Pressfit
NR507Z	Femur stem, 7°, 17 x 117 mm, Pressfit
NR537Z	Femur stem, 7°, 17 x 177 mm, Pressfit
NR508Z	Femur stem, 7°, 18 x 117 mm, Pressfit
NR538Z	Femur stem, 7°, 18 x 177 mm, Pressfit
NR509Z	Femur stem, 7°, 19 x 117 mm, Pressfit
NR539Z	Femur stem, 7°, 19 x 177 mm, Pressfit
NR510Z	Femur stem, 7°, 20 x 117 mm, Pressfit
NR540Z	Femur stem, 7°, 20 x 177 mm, Pressfit

Tibial plateau, cemented	
NB011Z	Tibia T1
NB012Z	Tibia T2
NB013Z	Tibia T3

Tibial spacer, cemented, with screws	
NB035Z	Tibia spacer, RL/LM, T1, 4 mm
NB036Z	Tibia spacer, RL/LM, T1, 8 mm
NB037Z	Tibia spacer, RL/LM, T1, 12 mm
NB038Z	Tibia spacer, RL/LM, T1, 16 mm
NB055Z	Tibia spacer, RL/LM, T2, 4 mm
NB056Z	Tibia spacer, RL/LM, T2, 8 mm
NB057Z	Tibia spacer, RL/LM, T2, 12 mm
NB058Z	Tibia spacer, RL/LM, T2, 16 mm
NB075Z	Tibia spacer, RL/LM, T3, 4 mm
NB076Z	Tibia spacer, RL/LM, T3, 8 mm
NB077Z	Tibia spacer, RL/LM, T3, 12 mm
NB078Z	Tibia spacer, RL/LM, T3, 16 mm
NB025Z	Tibia spacer, RM/LL, T1, 4 mm
NB026Z	Tibia spacer, RM/LL, T1, 8 mm
NB027Z	Tibia spacer, RM/LL, T1, 12 mm
NB028Z	Tibia spacer, RM/LL, T1, 16 mm
NB045Z	Tibia spacer, RM/LL, T2, 4 mm
NB046Z	Tibia spacer, RM/LL, T2, 8 mm
NB047Z	Tibia spacer, RM/LL, T2, 12 mm
NB048Z	Tibia spacer, RM/LL, T2, 16 mm
NB065Z	Tibia spacer, RM/LL, T3, 4 mm
NB066Z	Tibia spacer, RM/LL, T3, 8 mm
NB067Z	Tibia spacer, RM/LL, T3, 12 mm
NB068Z	Tibia spacer, RM/LL, T3, 16 mm

PE gliding surfaces with bearing sleeve, rotation axis and locking ring			
NR870Z	Gliding surface, F1, 10 mm	NR883Z	Gliding surface, F2, 16 mm
NR871Z	Gliding surface, F1, 12 mm	NR884Z	Gliding surface, F2, 18 mm
NR872Z	Gliding surface, F1, 14 mm	NR890Z	Gliding surface, F3, 10 mm
NR873Z	Gliding surface, F1, 16 mm	NR891Z	Gliding surface, F3, 12 mm
NR874Z	Gliding surface, F1, 18 mm	NR892Z	Gliding surface, F3, 14 mm
NR880Z	Gliding surface, F2, 10 mm	NR893Z	Gliding surface, F3, 16 mm
NR881Z	Gliding surface, F2, 12 mm	NR894Z	Gliding surface, F3, 18 mm
NR882Z	Gliding surface, F2, 14 mm		

8. Implant Overview *(continued)*

8.2 Implant Ordering Details *(continued)*

Tibial extension stems, cemented	
NR191Z	Tibia stem, 12 x 52 mm, cemented
NR194Z	Tibia stem, 12 x 92 mm, cemented
NR192Z	Tibia stem, 15 x 52 mm, cemented
NR195Z	Tibia stem, 15 x 92 mm, cemented
NR193Z	Tibia stem, 18 x 52 mm, cemented
NR196Z	Tibia stem, 18 x 92 mm, cemented

Tibial extension stems, Pressfit	
NR171Z	Tibia stem, 11 x 92 mm, Pressfit
NR491Z	Tibia stem, 11 x 172 mm, Pressfit
NR172Z	Tibia stem, 12 x 92 mm, Pressfit
NR492Z	Tibia stem, 12 x 172 mm, Pressfit
NR173Z	Tibia stem, 13 x 92 mm, Pressfit
NR493Z	Tibia stem, 13 x 172 mm, Pressfit
NR174Z	Tibia stem, 14 x 92 mm, Pressfit
NR494Z	Tibia stem, 14 x 172 mm, Pressfit
NR175Z	Tibia stem, 15 x 92 mm, Pressfit
NR495Z	Tibia stem, 15 x 172 mm, Pressfit
NR176Z	Tibia stem, 16 x 92 mm, Pressfit
NR496Z	Tibia stem, 16 x 172 mm, Pressfit
NR177Z	Tibia stem, 17 x 92 mm, Pressfit
NR497Z	Tibia stem, 17 x 172 mm, Pressfit
NR178Z	Tibia stem, 18 x 92 mm, Pressfit
NR498Z	Tibia stem, 18 x 172 mm, Pressfit
NR179Z	Tibia stem, 19 x 92 mm, Pressfit
NR499Z	Tibia stem, 19 x 172 mm, Pressfit
NR180Z	Tibia stem, 20 x 92 mm, Pressfit
NR500Z	Tibia stem, 20 x 172 mm, Pressfit

Patella 3-Peg	
NX041	VEGA System® Patella Size P1, 26 x 7 mm
NX042	VEGA System Patella Size P2, 29 x 8 mm
NX043	VEGA System Patella Size P3, 32 x 9 mm
NX044	VEGA System Patella Size P4, 35 x 10 mm
NX045	VEGA System Patella Size P5, 38 x 11 mm

8.3 Implant Material Overview

The EnduRo™ AS metal components are encompassed/fully coated with the Advanced Surface Technology made from Zirconium Nitride (ZrN) through a physical vapor deposition process.

Implant:	Base Material:	Description
Femoral	CoCrMo (casting alloy)	Cobalt-chromium-molybdenum casting alloy according to ISO 5832-4
Femoral hinge axis	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Securing nut	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Femoral spacer	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Screws for fermoral spacer	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Femoral extension stem Pressfit	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Femoral extension stem cemented	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
AP offset nut for femoral extension stems	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Tibial plateau	CoCrMo (casting alloy)	Cobalt-chromium-molybdenum casting alloy according to ISO 5832-4
Nut for tibial offset stems (in tibia plateau)	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Tibial spacer	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Screws for tibial spacer	Ti6AL4V (wrought alloy)	Wrought titanium 6-aluminium 4-vanadium alloy according to ISO 5832-3
Tibial extension stem Pressfit	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Tibial extension stem cemented	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Rotation axis	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12
Locking ring	CoCrMo (wrought alloy)	Wrought cobalt-chromium-molybdenum alloy according to ISO 5832-12

Implant:	Base Material:	Description
Cover for femoral box	PEEK-Optima® (LT1)	Medical Grade Polyetheretherketone (provided by Invibio)
Cover plug for femoral hinge axis	UHMWPE	Ultra-high molecular weight polyethylene according to ISO 5834-2
Bearing elements inside femur	PEEK-Optima® (LT1CA30)	Medical Grade Carbon Fiber-Reinforced Polyetheretherketone (Invibio)
Mask for tibial component	PEEK-Optima® (LT1)	Medical Grade Polyetheretherketone (provided by Invibio)
Gliding surface	UHMWPE	Ultra-high molecular weight polyethylene according to ISO 5834-2
X-Ray marker pin	Ti6AL4V (wrought alloy)	Wrought titanium 6-aluminium 4-vanadium alloy according to ISO 5832-3
X-Ray marker ball	Tantal (unalloyed)	Unalloyed tantalum for surg. implant applications acoording to ISO 13782
Bushing for rotation axis	PEEK-Optima® (LT1CA30)	Medical Grade Carbon Fiber-Reinforced Polyetheretherketone (Invibio)

PEEK-OPTIMA is a registered trademark of Invibio Limited.

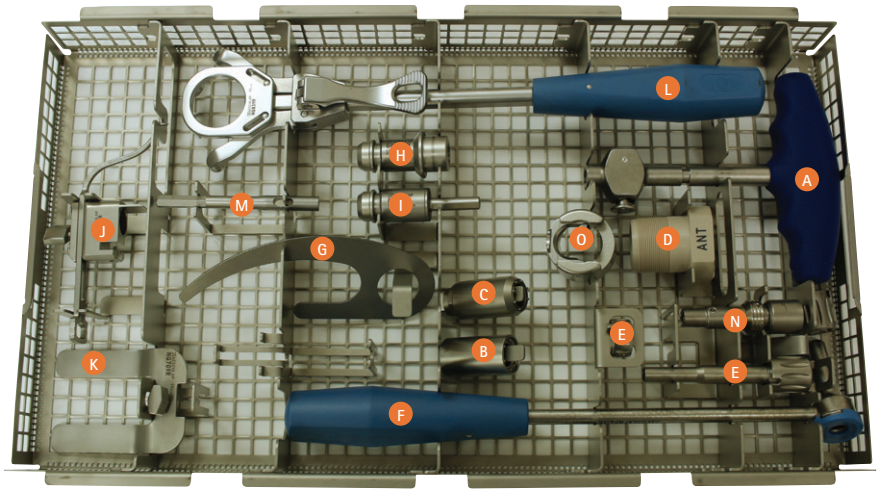
EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

ST1025

9. Instrument Overview

9.1 Instrument Ordering Details

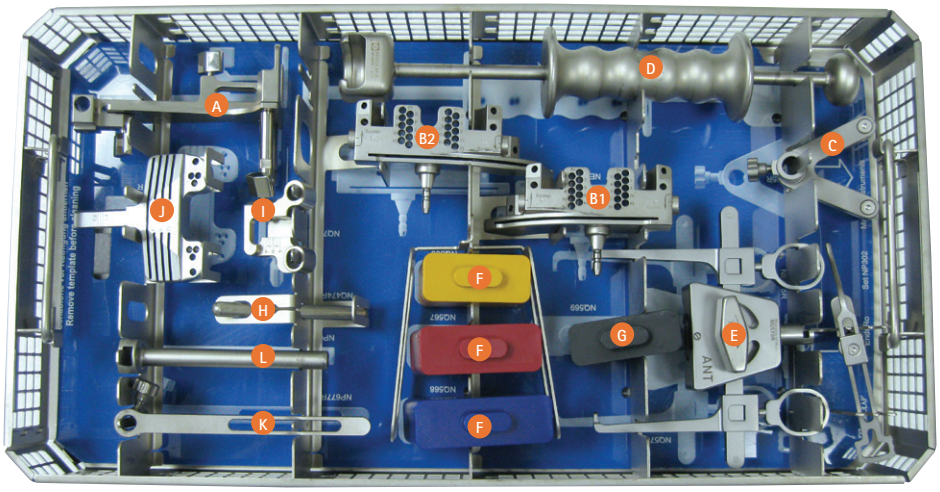


NP301 – General Instruments – Top Tray *(Inlay)*

Index	Qty.	Item No.	Description	Index	Qty.	Item No.	Description
A	1	NE361	Modular T Handle	I	1	GB414R	Hexagonal Chuck (Targon) with Triangular Shank
B	1	NE454	EnduRo Key Tibial Locking Ring	J	1	NQ708R	Jointline Positioner
C	1	NE462RM	EnduRo Special Key Locking Ring F1 10 mm and 12 mm	K	1	NQ709R	Dist. Femur Contact Plate
D	1	NP144PM	EnduRo Guide F/Key F/Tibial Locking Ring	L	1	NQ839R	EnduRo Tibial Stem Holding Key
E	1	NP420R	Adapter for Cone Assembly *(2 pieces)*	M	1	NP613R	Pin Driver Attachment
F	1	NP419R	Brace for Cone Assembly	N	1	NP455R	Holder / Impactor for Locking Nut
G	1	NM350R	Cutting Check Blade (Angel Wing)	O	1	NP141R	EnduRo Hold Down Clamp F/Guide for NP144PM
H	1	GB413R	Acculan® II Hexagonal Chuck (Targon)				

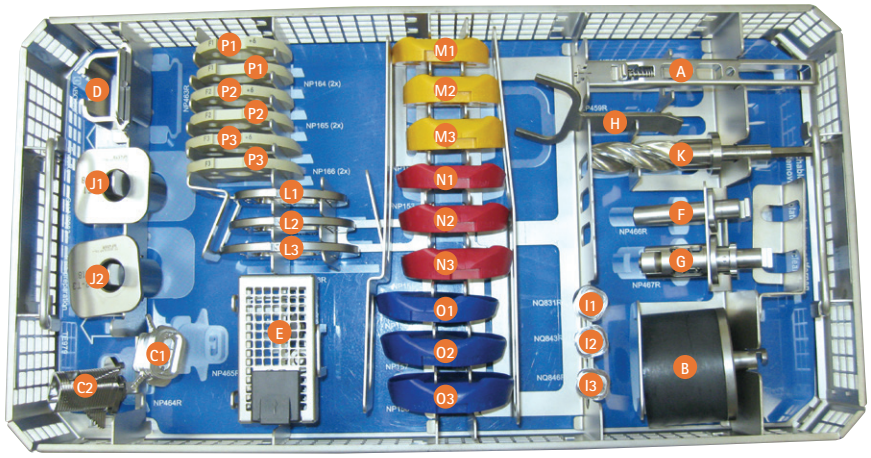
NP301 – General Instruments – Bottom Tray

Index	Qty.	Item No.	Description	Index	Qty.	Item No.	Description
A	2	NP495R	Impactor/Extractor Handle	J	1	NE184RM	Torque Wrench
B	1	NP471R	Alignment Rod Long	K	4	NP585R	Threaded Pin Headed 3.2x30 mm
C	1	NP410R	EnduRo Drill 10 mm	L	2	NP586R	Threaded Headless Pin 3.2 x 50 mm
D	1	FL556R	Stille Osteotome Fine Curved 20/205 mm	M	2	NP587R	Threaded Fixation Pin 3.2 x 75 mm
E	1	NE331R	Alignment Rod Short with Extension Adapter *(hidden)*	N	6	NP583R	Threaded Pin Headless 3.2 x 63 mm
F	1	NE181R	PS Screw Driver SW 3.0	O	2	NP584R	Threaded Pin w/o Head 3.2 x 88 mm
G	1	NQ643R	Columbus® Revision Cranked Wrench Key		1	TE977	Graphic Template for NP311R
H	1	NQ834R	EnduRo Femur Stem Holding Key		1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
I1-2	1	NP024R-025R	EnduRo Tibia Chisel RL/LM				



NP302 – Manual Instruments

Index	Qty.	Item No.	Description
A	1	NQ702R	Columbus® Revision Distal Fem. Alignment System
B1-2	1 ea.	NE196R-97R	EnduRo™ Tibia Revision Cutting Guide Right, Cutting Guide Left
C	1	NE195R	Adapter for Tibial Revision Cutting Guide
D	1	NP684R	Slap Hammer
E	1	NQ570R	EnduRo Implant Holding/Insertion Instrument
F1-3	1 ea.	NQ566-558	EnduRo Insert for Femur F1-F3 for NQ570R
G	1	NQ569	EnduRo Insert for Tibia for NQ570R
H	1	NQ474R	Columbus Handle for Femoral Alignment System
I	1	NQ703R	Columbus Revision Distal Femoral Cutting Guide Support
J	1	NP411R	EnduRo Distal Femoral Cutting Guide
K	1	NP677R	Search Evo Rev Connector
L	1	NP678R	Search Evo Rev Connection Block
M	1	NE425R	Tibial Cutting Guide Stylus Without Notch
N	1	TE978	Graphic Template for NP312R (NP302)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NP312R	EnduRo Tray Manual Instruments



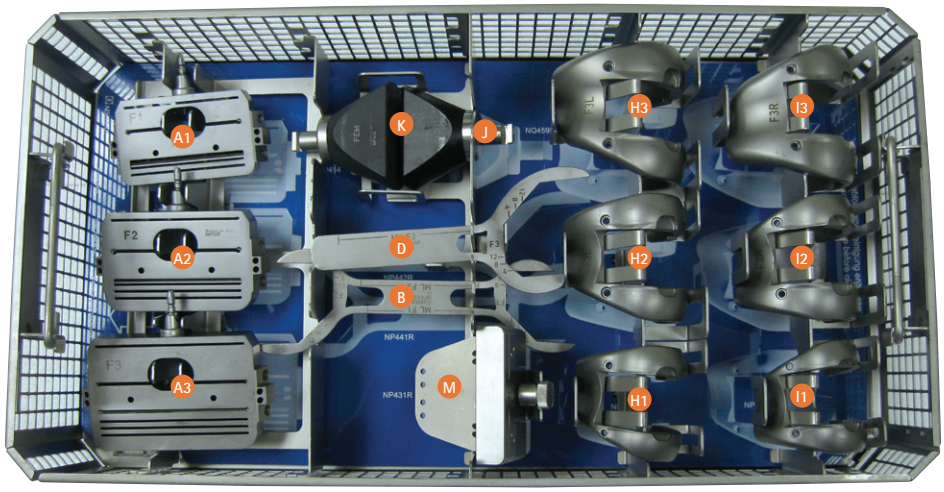
NP303 – Tibia Preparation

Index	Qty.	Item No.	Description
A	1	NE510R	e.motion Removable Handle
B	1	NP468	EnduRo Tibial Plateau Impactor
C1-2	1 ea.	NP464R-465R	EnduRo Tibial Broach T1, T2/T3
D	1	NP463R	EnduRo Tibial Broach Guide
E	2 ea.	NP479R	EnduRo Cover for Tibial Broach
F	1	NP466R	EnduRo M-L Tibial Positioner
G	1	NP467R	EnduRo Adapter for Tibial Broach
H	1	NP459R	EnduRo Locking Key for Broach Guide
I1-3	1 ea.	NQ831R, 843R, 846R	EnduRo Rasp Trial Tibial Stem Up To D20 mm, Up To D17 mm, Up To D14 mm
J1-2	1 ea.	NP457R-458R	EnduRo Milling Guide Tibial Stem Preparation T1, T2/T3
K	1	NP456R	EnduRo Milling Cutter D18 mm for Tibial Stem Prep
L1-3	1 ea.	NP451R-453R	EnduRo Tibia Trial/Preparation Plat. T1, T2, T3"
M1-3	1 ea.	NP150-152	EnduRo Trial Meniscal Component F1 10 mm, 12 mm, 14 mm
N1-3	1 ea.	NP153-155	EnduRo Trial Meniscal Component F2 10 mm, 12 mm, 14 mm
O1-3	1 ea.	NP156-158	EnduRo Trial Meniscal Component F3 10 mm, 12 mm, 14 mm
P1-3	2 ea.	NP164-166	EnduRo Complement Plate Meniscal Comp. 6 mm F1, F2, F3
	1	TE979	Graphic Template for NP313R (NP303)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NP313R	EnduRo Tray Tibia Preparation

EnduRo™ AS

Rotating Hinge Knee Endoprosthesis Surgical Technique

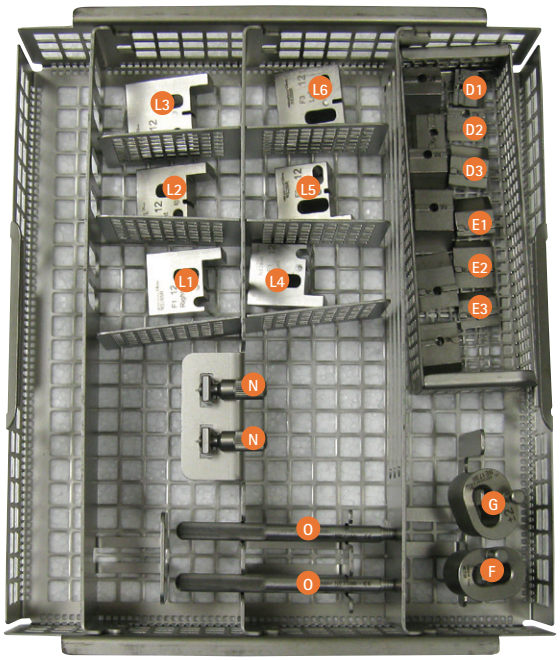
9.1 Instrument Ordering Details *(continued)*

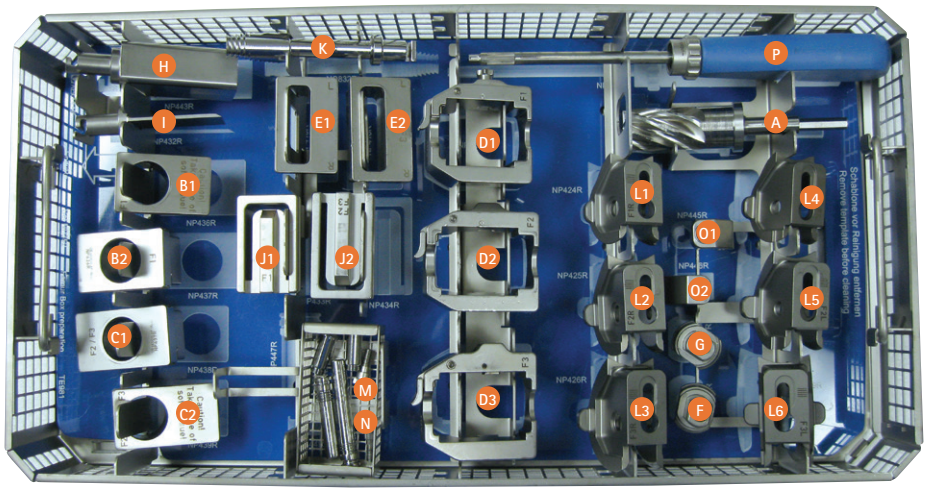


NP304 – Femur Preparation

Index	Qty.	Item No.	Description
A1-3	1 ea.	NM731R-733R	EnduRo 4-In-1 Femoral Cutting Guide F1, F2, F3
B	1	NP441R	EnduRo Femur Size Gauge F1/F2
C	1	NP442R	EnduRo Femur Size Gauge F3
D1-3	2 ea.	NM734R-736R	EnduRo Spacer 4 mm for Femoral Cutting Guide F1, F2, F3
E1-3	2 ea.	NM737R-739R	EnduRo Spacer 8 mm for Femoral Cutting Guide F1, F2, F3
F	1	NE172R	AP Orientation Sleeve Femur Extension Stem Neutral
G	1	NE173R	AP Orientation Sleeve Femur Extension Stem Excentr.
H1-3	1	NP404R-406R	EnduRo Trial Femur Left F1L-F3L
I1-3	1	NP407R-409R	EnduRo Trial Femur Right F1R-F3R
J	1	NQ459	Columbus® Femoral Component Impactor Large
K	1	NP414	EnduRo Femoral Component Impactor Plane
L1-6	1 ea.	NS264R-269R	EnduRo Spacer 12 mm/Fem. Cutting Guide F1R, F2R, F3R, F1L, F2L, F3L
M	1	NP431R	EnduRo Additional Instrument Post. 12 mm Res. F2/F3
N	2	NE731R	PS/Revision Fixation Strap for Cutting Guide
O	2	NE730R	PS/Revision Handle for Cutting Guide APC
	1	TE980	Graphic Template for NP314R (NP304)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NP314R	EnduRo Tray Femur Preparation
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NP314R	EnduRo Tray Femur Preparation

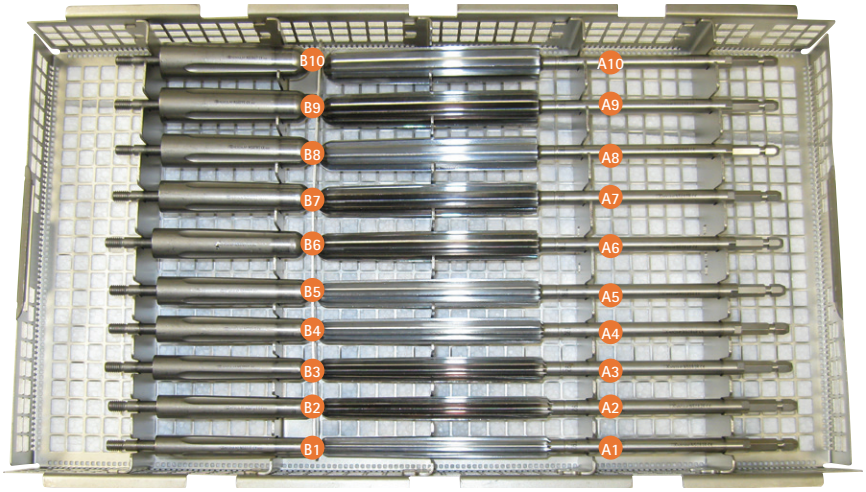
NP304 – Femur Prepartion – Inlay Tray





NP352 – Femur Box Preparation

Index	Qty.	Item No.	Description
A	1	NP435R	EnduRo™ Milling Cutter with Stop D24 mm
B1-2	1	NP436R-437R	EnduRo Milling Guide for Box Prep. F1, F2/F3
C1-2	1	NP438R-439R	EnduRo Rotating Edge Hole Guide/Box F1, F2/F3
D1-3	1	NP421R-423R	EnduRo Frame for Femoral Box Preparation F1, F2, F3
E1-2	1	NP415R-416R	EnduRo Femur Box Alignment F1, F2/F3
F	1	NP417R	EnduRo Sleeve for Femoral Box Alignment Neutral
G	1	NP418R	EnduRo Sleeve for Femoral Box Alignment +/-1°
H	1	NP443R	EnduRo U-Shaped Punch
I	1	NP432R	EnduRo Chisel
J1-2	1	NP433R-434R	EnduRo Chisel Guide for Box Preparation F1, F2/F3
K	1	NQ832R	Columbus® Revision Rasp for Femur Extension Stem
L1-6	1	NP424R-429R	EnduRo Removable Trial Femur Box F1l, F2l, F3l, F1R, F2R, F3R
M	1	NP444R	EnduRo Trial Hinge Axis
N1-2	1	NP447R, 449R	EnduRo Trial Rotation Axis Short, Long
O1-2	1	NP445R-446R	EnduRo Trial Hinge Ring F1/F2, F3
P	1	NP440R	EnduRo Extractor for Trial Rotation Axes
	1	TE981	Graphic Template for NP315R (NP352)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NP315R	EnduRo Tray Femoral Box Preparation



NS134 – Tibia Stem Preparation Pressfit

Index	Qty.	Item No.	Description
A1-10	1 ea.	NS081R-090R	EnduRo Reamer Short Pressfit Stem Preparation D11, D12, D13, D14, D15, D16, D17, D18, D19, D20
B1- 10	1 ea.	NS071T-080T	EnduRo Trial Tibia Stem Pressfit 92 mm D11, D12, D13, D14, D15, D16, D17, D18, D19, D20
E	1	NS081R	EnduRo Reamer D11 Short Pressfit Stem Preparation

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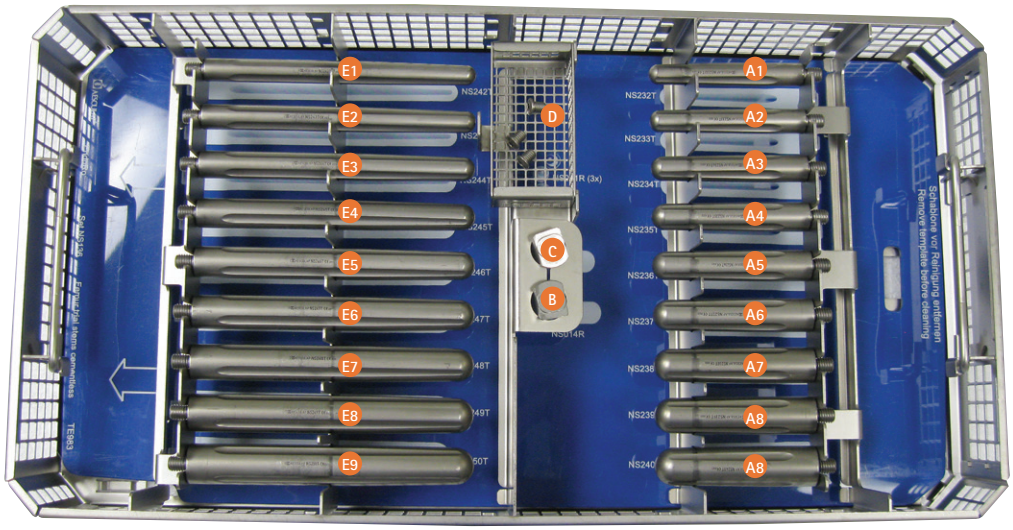
9.1 Instrument Ordering Details *(continued)*

NS134 – Tibia Stem Preparation Pressfit – Bottom Tray

Index	Qty.	Item No.	Description
A1-10	1 ea.	NS061R-070R	EnduRo Reamer Long Pressfit Stem Preparation D11, D12, D13, D14, D15, D16, D17, D18, D19, D20
B1-10	1 ea.	NS051T-060T	EnduRo Trial Tibia Stem Pressfit 172 mm D11, D12, D13, D14, D15, D16, D17, D18, D19, D20

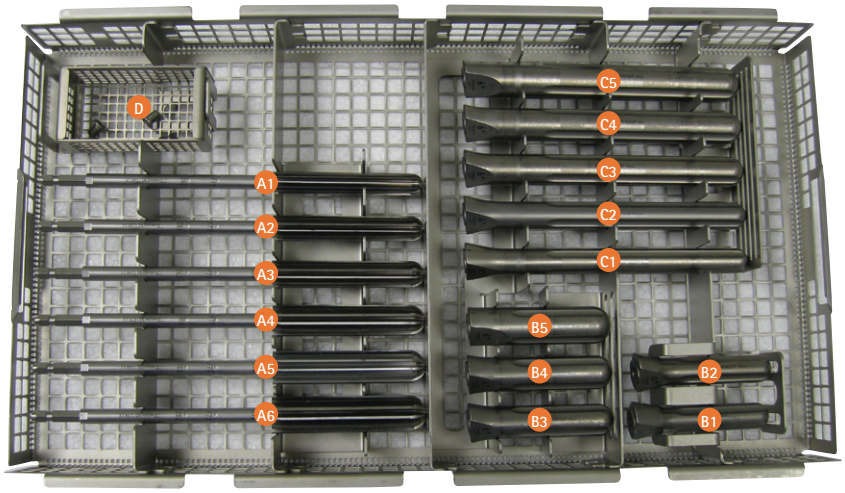
Index	Qty.	Item No.	Description
	1	TE982	Graphic Template for NS135R (NS134)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NS135R	EnduRo Tray Tibia Stem Preparation Pressfit



NS136 – Femur Stem Preparation Pressfit

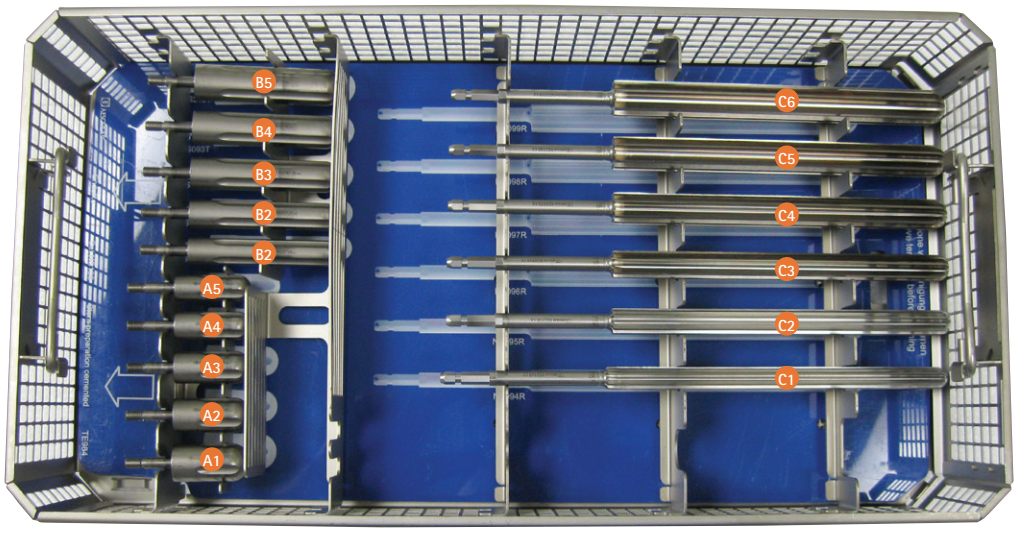
Index	Qty.	Item No.	Description
A1-A9	1 ea.	NS232T-240T	EnduRo Trial Femur Stem Pressfit - 117 mm D12, D13, D14, D15, D16, D17, D18, D19, D20
B	1	NS008R	Adapter Trial Femoral Stem 5° Ntr. 37 mm Pressfit
C	1	NS014R	Adapter Trial Femoral Stem 7° Ntr. 37 mm Pressfit
D	3	NS001R	Columbus® Rev Trial Stem Screw SW3.0

Index	Qty.	Item No.	Description
E1-9	1 ea.	NS242T-250T	EnduRo Trial Femur Stem Pressfit 177 mm D12, D13, D14, D15, D16, D17, D18, D19, D20
	1	TE983	Graphic Template for NS137R (NS136)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NS137R	EnduRo Tray Femur Stem Preparation Pressfit



NS138 - Femur Stem Preparation Cemented - Top Tray

Index	Qty.	Item No.	Description
A1-6	1 ea.	NS104R-109R	EnduRo™ Reamer Short Cemented Stem Preparation D12, D14, D15, D17, D18, D20
B1- 5	1 ea.	NS220T-224T	EnduRo Trial Femur Stem Cemented 77 mm D14, D15, D17, D18, D20,
C1 -5	1 ea.	NS225T-229T	EnduRo Trial Femur Stem Cemented D14x157, D15x157, D17x157, D18x157, D20x157
D	3	NS001R	Columbus® Rev Trial Stem Screw SW3.0



NS138 - Femur Stem Preparation Cemented - Bottom Tray

Index	Qty.	Item No.	Description
A1-5	1 ea.	NS214T-216T, NS102T-103T	EnduRo Trial Tibia Stem Cemented 52 mm D14, D17, D18, D20
B1-5	1 ea.	NS217T-219T, NS092T-093T	EnduRo Trial Tibia Stem Cemented 92 mm D14, D15, D17, D18, D20
C1-6	1 ea.	NS094R-099R	EnduRo Reamer Long D12, D14, D15, D17, D18, D20
	1	TE984	Graphic Template for Ns139r (Ns138)
	1	JH217R	1/1 Size Wide Perforated Basket Lid 489x257 mm
	1	NS139R	EnduRo Tray Stem Preparation Cemented

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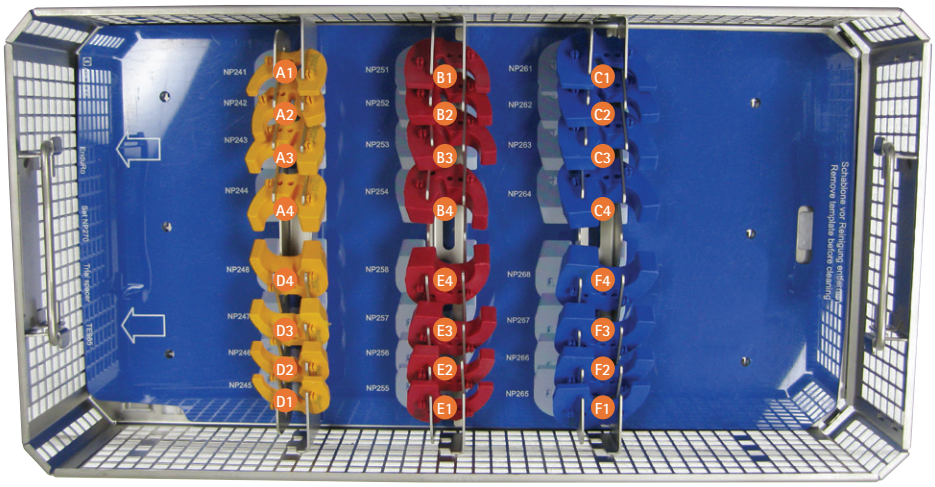
9.1 Instrument Ordering Details *(continued)*

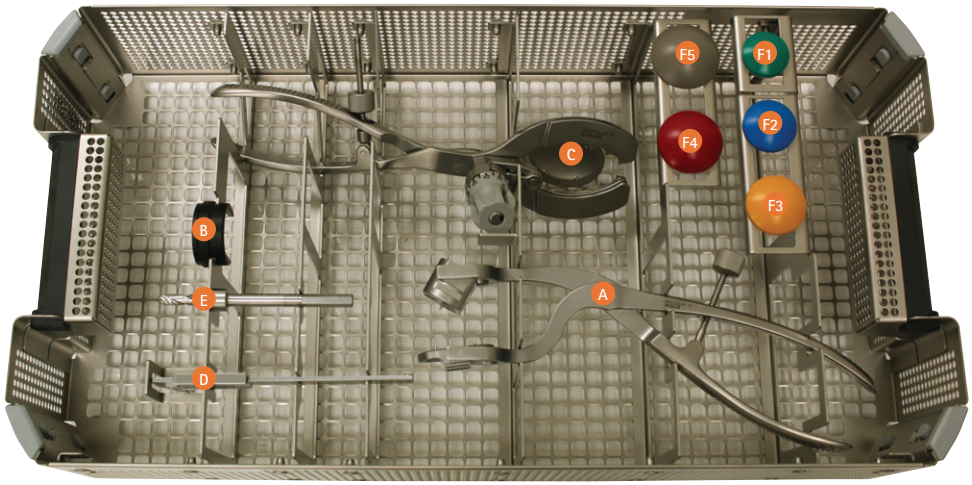
NP270 – Trial Spacers Hemi Wedge – Top Tray

Index	Qty.	Item No.	Description
F1	2 ea.	NP480- 483	EnduRo Trial Femur Spacer Post./Distal F1 4x4, 4x8, 8x4, 8x8 mm
F1	2 ea.	NE226-227	EnduRo Trial Femur Spacer Post/Distal F1 4x12 mm 8x1 mm
F1	2 ea.	NP472, 745, NP492	EnduRo Trial Femur Spacer Distal F1 4 mm, 8 mm, 12 mm
F2	2 ea.	NP485-487	EnduRo Trial Femur Spacer Post./Distal F2 4x4, 4x8, 8x4, 8x8 mm
F2	2 ea.	NE229-233	EnduRo Trial Femur Spacer Post/Distal F2 4x12, 8x12, 12x4, 12x8
F2	2 ea.	NP473, 476, 493	EnduRo Trial Femur Spacer Distal F2 4 mm, 8 mm, 12 mm
F3	2 ea.	NP488-491	EnduRo Trial Femur Spacer Post./Distal F3 4x4, 4x8, 8x4, 8x8 mm
F3	2 ea.	NE234-239	EnduRo Trial Femur Spacer Post/Distal F3 4x12, 8x12, 12x4, 12x8
F3	2 ea.	NP474, 477, 494	EnduRo Trial Femur Spacer Distal F3 4 mm, 8 mm, 12 mm



NP270 – Trial Spacers Hemi Wedges – Bottom Tray

Index	Qty.	Item No.	Description
A1-4	1 ea.	NP241-244	EnduRo Trial Tibial Hemi-Wedge T1 RM/LL- 4 mm, 8 mm, 12 mm, 16 mm
B1-4	1 ea.	NP251-254	EnduRo Trial Tibial Hemi-Wedge T2 RM/LL- 4 mm, 8 mm, 12 mm, 16 mm
C1-4	1 ea.	NP261-264	EnduRo Trial Tibial Hemi-Wedge T3 RM/LL- 4 mm, 8 mm, 12 mm, 16 mm
D1-4	1 ea.	NP245-248	EnduRo Trial Hemi-Wedge T1 RL/LM 4 mm, 8 mm, 12 mm, 16 mm
E1-4	1 ea.	NP255-258	EnduRo Trial Hemi-Wedge T2 RL/LM 4 mm, 8 mm, 12 mm, 16 mm
F1-4	1 ea.	NP265-268	EnduRo Trial Hemi-Wedge T3 RL/LM 4 mm, 8 mm, 12 mm, 16 mm



NS709 – Patella Preparation

Index	Qty.	Item No.	Description
A	1	NS841R	Patella Drill/Impaction Clamp
B	1	NS842	Inlay for NS841R
C	1	NS840R	Patella Resection Clamp
D	1	AA847R	Caliper
E	1	NQ449R	Drill with Stop h6 x 28 mm
F1-5	1 ea.	NQ281-286	Trial Patella 3 Pegs P1, P2, P3, P4, P5
	1	TF049	Graphic Template for Patella Preparation

Aesculap Implant Systems, LLC | 3773 Corporate Parkway | Center Valley, PA | 18034
Phone 866-229-3002 | Fax 610-984-9096 | www.aesculapimplantsystems.com

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