Surgical Technique
"Intramedullary Application"

smith&nephew

RT-PLUS◇

Modular Rotating Hinged



PLUS SOLUTION
KNEE FAMILY

RT-PLUS◇ Modular

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Nota Bene

The technique description herein is made available to the healthcare professional to illustrate the authors' suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the patient.



Introduction

With the rising number of implantations we are increasingly being confronted by cases which are difficult to treat and which require the use of special prosthetic systems using a higher degree of coupling. The RT-PLUS◇ Modular prosthesis has been designed to take this development into account.

It is a constrained rotating knee, the development of which drew upon knowledge and experience gained from state-of-the-art knee joint prosthesis.

The RT-PLUS Modular knee system is the modular version of RT-PLUS and it represents a valuable addition to bicondylar surface replacement.

The functional design allows extremely sparing resections. The joint components features anatomical geometry, as it's also used today for bicondylar surface replacement cases.

The femoral and tibial components have the same stem coupling and are anchored in the bone by stems made of Ti_6Al_4V for cementless application and in CoCrMo for cemented application. To compensate various femoral and/or tibial bone defects, there are CoCrMo augmentation blocks available.

Special attention was also paid to the development of a user-friendly instrument set. This ensures that the prosthesis is implanted securely and precisely.

Concept/Description

The RT-PLUS◇ Modular is a constrained rotating knee prosthesis for cemented implantation.

The prosthesis allows an internal/external rotation of approx. 10° each. This is locked by the tibial-insert when extended. Due to the peg design, the prosthesis has the capability of elongation, i.e., for distraction between the femoral and the tibial components. In an extreme flexed position, the femoral component can lift off the tibial-insert, which reduces the sagittal leverage forces that have an effect on the prosthesis stem in this load situation.

The implant allows sparing resections. The cut compatibility with the tricompartmental prosthesis TC-PLUS◇ permits if necessary an intraoperative switchover from the resurfacing to the constrained rotating knee.

The femoral and tibial components of RT-PLUS Modular are identical to those of RT-PLUS, with the exception of the additional option to connect stems and augmentation blocks. The tibial inserts are the same. As a result, the femoral and tibial components in both these systems are entirely cross-compatible. All the stems of RT-PLUS Modular can be combined with the femoral and tibial components of RT-PLUS Modular to suit requirements.

The implants are available in five sizes (corresponding to RT-PLUS sizes 2, 4, 6, 8 and 10). Apart from size 2, the sizes can be combined with the next size up or down.

Note

RT-PLUS Modular requires condylar support for the femoral/tibial components. The forces have to be absorbed by the condyles as well as by the stems.

Femoral component



The femoral component is manufactured from CoCrMo alloy and is asymmetrical.

The patellar groove is deeply hollowed out and presents an anatomical oblique outline. This feature offers improved patellar tracking and leverage on the knee extensor apparatus.

The joint mechanism is contained in a narrow box, the width of which is comparable to that of a “posterior stabilized” implant. This allows sparing bone resection, which reduces the risk of femoral condyle fracture.

The rotation peg of 40 mm length provides adequate security against dislocation, but the components can nevertheless be easily coupled. Because of the design of the condyles, physiological “rollback” of 9 mm is possible, which improves the flexion capability of the joint.

The joint mechanism has been designed in such way that all metal components (peg and joint axis) interface with UHMW polyethylene to absorb the stress forces therefore preventing premature wear.

A modular stem connection allows the use of different stems to stabilize the femoral component.

To compensate femoral bone defects, distal and/or posterior femoral augmentation blocks can be fixed to the femoral component.

The femoral component is available in sizes 2, 4, 6, 8 and 10.

Please see the available sizes in the implant table (from page 54 ff).

Patellar component



The all-poly (UHMW polyethylene) patellar component has a symmetrical biconcave surface for better tracking.

Tibial insert



The simple and securely anchored tibial insert is manufactured from UHMW polyethylene and is available in three different heights of 8 mm, 11 mm and 14 mm, in order to restore the joint height independent to the degree of tibial bone substance loss.

The special design of the polyethylene insert enables an easy coupling of the prosthesis, for which only minimal distraction is required.

The minimum effective PE thickness in the load zone is 8 mm. The selected manufacturing method, the design (condyles) and the high-quality material combine to form the proven wear-resistance of the insert.

The tibial inserts are identical to those in the RT-PLUS◇ portfolio.

Tibial component



The symmetrical tibial component is manufactured from CoCrMo alloy.

In order to prevent polyethylene wear inside the tibial component, the base plate is polished on the inside and the insert is completely enclosed along its entire circumference.

A modular stem connection allows the use of different stems, which serve to stabilize the tibial component.

To compensate tibial bone defects, proximal tibial blocks can be fixed on the tibial component.

The tibial component is available in sizes 2, 4, 6, 8 and 10.

Femoral and tibial blocks



The femoral and tibial blocks are manufactured from CoCrMo alloy.

In order to compensate different femoral and/or tibial bone defects, there are distal femoral blocks available in heights of 5 mm, 10 mm and 15 mm, posterior femoral blocks in heights of 5 mm and 10 mm and proximal tibial blocks in heights of 5 mm, 10 mm and 15 mm.

The same femoral blocks are used for the medial as for the lateral condyle of the femoral component. The same tibial blocks, except height of 15 mm, are used for the medial as for the lateral condyle of the tibial component.

The blocks have to be assembled to the femoral and tibial components with screws and can then be cemented on the tibia, respectively on the femur.

Cemented stem



The femoral and tibial components can be intramedullary anchored in the bone by cemented conical stems, made of forged CoCrMo alloy.

Available in lengths 95 mm, 120 mm and 160 mm.

Cementless stems



The femoral and tibial components can also be stabilized into the bone by using non cemented cylindrical stems, made of extruded Ti_6Al_4V alloy. These stems are not suitable for primary anchorage; therefore, they are not designed for osseointegration.

A wide stems range enables an optimum adaptation to different indications. They are available in various diameters (Ø 10, Ø 12, Ø 14, Ø 16, Ø 18 and Ø 20 mm) and lengths (95 mm, 120 mm, 160 mm and 200 mm) in order to ensure optimum anchorage, even with a variety of femoral or tibial geometries.

Please see the available sizes in the implant table (from page 54 ff).

Indications

The principal preoperative planning factor is the correct diagnosis. It has to be determined whether the bone and stability situation require the implantation of a constrained prosthesis.

The main indications for implantation of RT-PLUS◇ Modular are:

- High-grade joint destruction with considerable loss of function and requirement for additional stabilization with longer stems and reconstruction of bone defects
- Severe joint instability that predictably cannot be corrected by suitable bone reconstruction (bone grafts) or soft-tissue intervention
- Marked contractures and axial displacements of more than 15°–20°
- Failure after surface replacement (e.g., infection, loosening) – revision of a primary prosthesis
- Trauma – induced femoral or tibial fractures
- Due to the design, it is possible to switch with relatively little effort, even intraoperatively, from the TC-PLUS◇ knee system to the RT-PLUS◇ Modular knee system, since the resections and prosthesis sizes are matching

Contraindications

Contraindications are:

- Acute or chronic, local or systemic infections (or in the case of a corresponding anamnesis)
- Severe muscle, nerve or vascular diseases that endanger the affected extremity
- Lacking bone substance or inadequate bone quality that endangers a stable seating of the prosthesis
- Severe adiposity
- All concomitant diseases that may endanger the function of the implant. These include in particular extreme insufficiency of the knee extensor mechanism, which can lead to excessive joint distortion; or severe adiposity, which can lead to a dorsal impingement, which may uncouple the components. In these cases it may be advisable to use a coupled hinge or a tumour prosthesis
- Patient hypersensitivities or allergies to the materials used
- Strenuous physical activity (e.g., competitive sports, hard physical work)

See also instructions on the package insert.

Case Study

Preoperative situation



Patient with severe joint instability (varus gonarthrosis) as well as medial joint destruction.

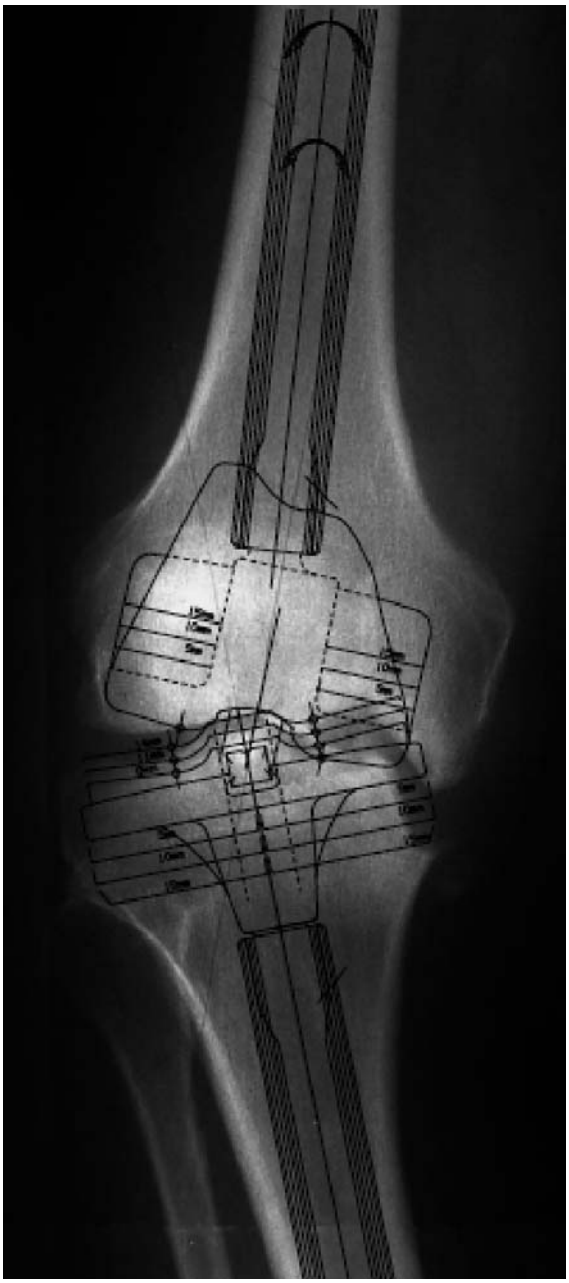
Postoperative result



Immediately postoperative; functional and pain-free reconstruction with RT-PLUS◇ Modular knee.

Preoperative Planning

A full-leg X-ray with the patient in the standing position is recommended for preoperative-planning purposes. If this is not possible, an X-ray of the thigh, including the femoral head, should be taken. The X-ray images of the knee joint at three levels should be available for planning the surgery. A tangential patellar exposure, a frontal and a sagittal to the leg axis exposure must be taken.



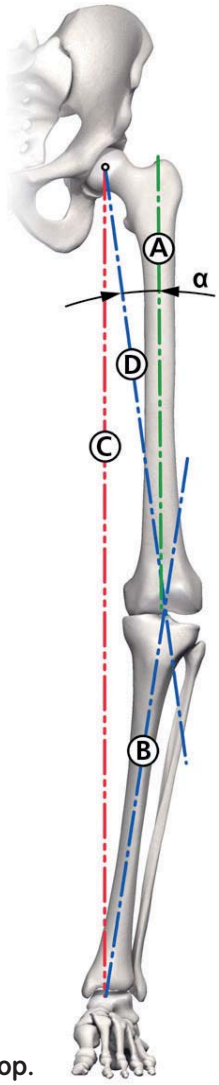
For preoperative planning there are X-ray templates available: with scale of 1.15:1 Lit. No. 1135 and with scale of 1:1 Lit. No. 1584 (see page 74). The lateral view of the condyles is decisive. If these are no longer completely intact, it is possible to switch to the condylar width. In cases of doubt, the smaller implant should be selected to prevent the prosthesis components from protruding. In normal cases, the size determination and the correct positioning of the prosthesis are controlled intraoperatively with relevant instruments, and planning may also be possible on the unrestored opposite side leg.

Note

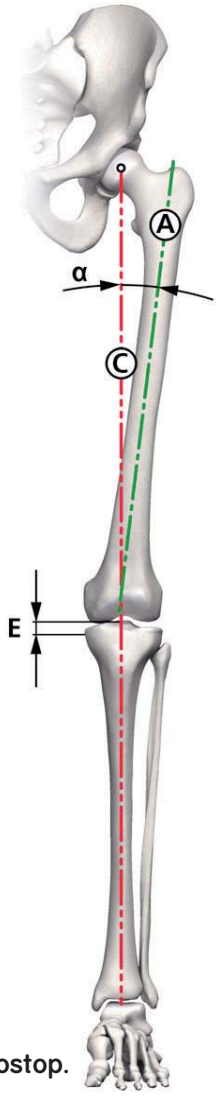
The femoral and tibial component sizes can all be combined with the next size up or down (see product overview on page 76 ff). This does not apply to combinations of sizes 2 and 4.

Large deviations of the femoral-neck angle as well as severe deformities of femur and tibia (e.g., posttraumatic axial deformities) must be taken into consideration during surgical planning.

In rare cases of deformities away from the knee joint that negatively influence the mechanical leg axis, additional corrective osteotomies may be indicated.



Preop.



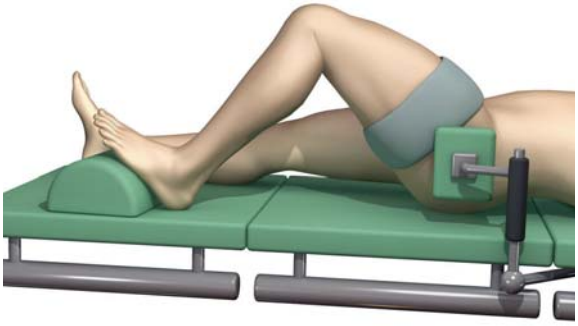
Postop.

The following procedure is recommended for the anterior-posterior whole leg imaging process:

1. The femoral axis A (anatomical axis) is drawn onto the radiograph.
2. A line is drawn from the femoral head to the center of the knee (mechanical axis D) on the radiograph.
3. The angle measured between the anatomical and the mechanical axis = angle α determines the valgus angle.
4. The tibial axis B is drawn in and the tibial resection plane E is determined to avoid excessive resection, especially where there are defects.
5. The component sizes and resection depths are determined preoperatively using the X-ray templates (Lit. No. 1135 or 1584) in A/P and the lateral planes.
6. The mechanical leg axis C should merge with lines D and B after correction.

A Anatomical femoral axis
B Anatomical tibial axis
C Mechanical leg axis
D Mechanical femoral axis
E Tibial resection depth (mm)
α Valgus angle

Positioning of the patient for the surgery



Surgery is performed whilst the patient is supine.

It is recommended that the blood supply be partially blocked with the use of a tourniquet. But this is not absolutely necessary.

The leg must be covered, so as to allow movement, and secured to the operating table in such a way that the knee joint is brought into a stable 90° flexion position. Most of the surgical steps are performed in this position.

Surgical procedure



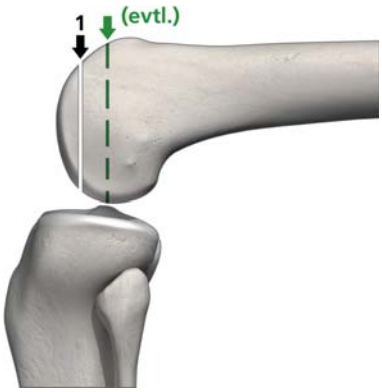
The skin incision can be a midline incision or a parapatellar incision.

If there are scars from skin incisions made during previous surgery, it is advisable to use them for access in order to reduce the risk of cutaneous blood flow disorders. Medial arthrotomy is recommended, or an approach adapted to the pathological situation.

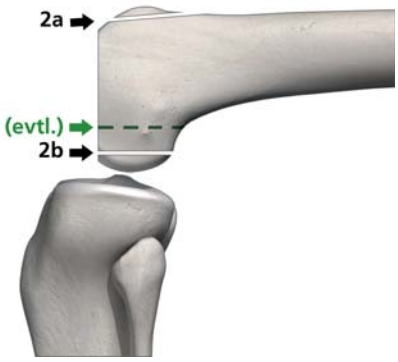
After the usual preparation (meniscus resection, removal of osteophytes and synovectomy if necessary), the cruciate ligaments are sectioned and if necessary, the collateral ligaments are removed close to the bone.

Overview of the Resections Sequences for Primary Application

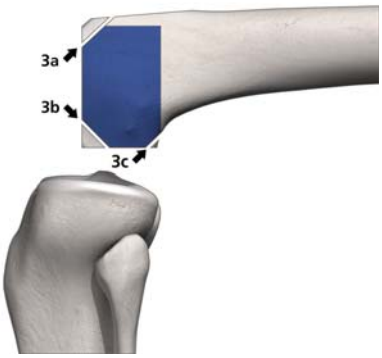
It is important that the flexion and extension gaps are identical.



1. Distal femoral resection and optional distal augment resection.



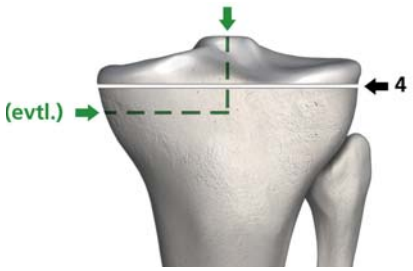
2. A/P femoral resections and optional posterior augment resection.



3. Chamfer resections and cutting out of the box. Remove residual posterior condyles if present.

Note

To avoid the risk of a condyle fracture, we recommend to prepare the box after tibial preparation.



4. Tibial resection and optional augment resection.



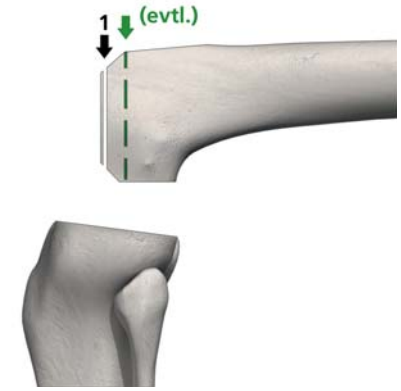
5. Patellar resection (optional).

Important

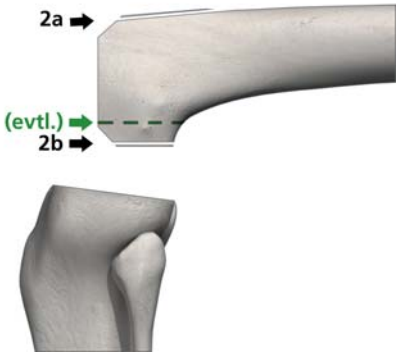
Only 1.0 mm saw blades must be used for all bone resections! See Lit. No. 1403 for corresponding connection.

Overview of the Resections Sequences for Revision Application

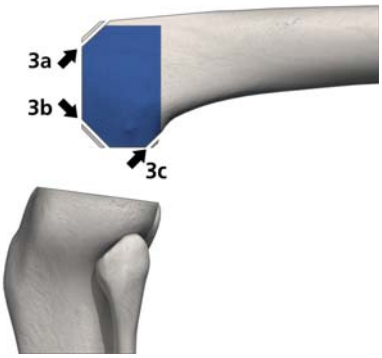
The bone resections are refreshed after extraction of the primary implants.



1. Distal femoral resection and optional distal augment resection.



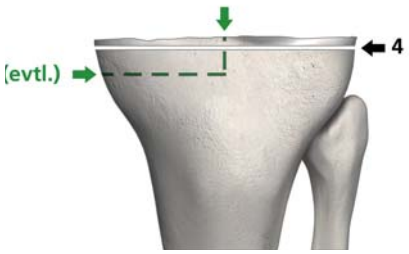
2. A/P femoral resections and optional posterior augment resection.



3. Chamfer resections and cutting out of the box. Remove residual posterior condyles if present.

   Note

   To avoid the risk of a condyle fracture, we recommend to prepare the box after tibial preparation.



4. Tibial resection and optional augment resection.



5. Patellar resection (optional).

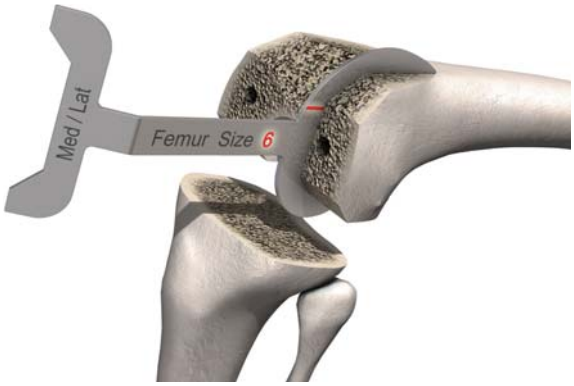
Access: Please refer to the relevant surgical textbooks for the initial access to the knee.

Note

In addition to the bone resections, it is important to correct any ligament imbalance by appropriate soft-tissue procedures. If necessary, a general release should be performed on the side of the contracture prior to the bone resections.

The leg is flexed and any osteophytes on the femur and tibia should be removed. This provides good exposure of the knee joint, which facilitates size determination.

Femoral size determination



By using the femoral sizer (2, 4, 6, 8 or 10) the size is determined, sagittaly according to the inside/outside contours as well as ventrally according to the anterior/posterior resections and the medial/lateral contours.

Note

The line in the sagittal view of the femoral sizer shows the position of the femoral IM canal, i.e., the position of the stem.

Femur opening





The adjustable IM femoral drill guide is set to the planned size of the femoral components (size marking 2, 4, 6, 8 or 10) and inserted under the quadriceps into the center of the femur. The distal stop should be on the medial condyle. Make sure that the gauge is flat on the anterior femoral cortical bone in the direction of the femoral axis.

Open the femoral IM canal with the Ø 8 mm IM drill.

Important

To ensure an optimal position of the femoral drill guide on the condyles, gently tap the M/L area, not the drill guide section of the instrument.



The Ø 8 mm IM rod is carefully inserted using the modular handle to approximately the isthmus of the femoral IM canal and removed again. It is important to work carefully to prevent excess pressure in the IM canal.

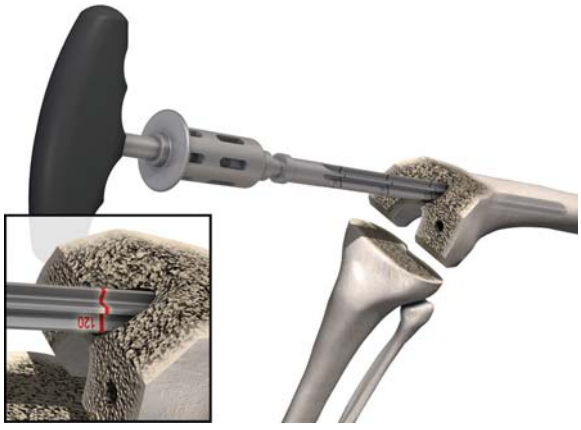


The femoral IM canal is opened further with the Ø 8/14 mm stepped drill. Note that the drill is positioned at the entry point of the femoral IM canal, previously determinated by the IM drill. The drill direction is along the femoral axis. Drill as far as the stop.

Note

The femoral IM canal, which determines the implants stem position, must be opened carefully (reference for the femoral position) to prevent the development of a relative extension position (risk of notching) or flexion position (projecting patella).

Preparing the femoral anchorage



Reamers are used carefully and in progressive stages (starting with Ø 10) to ream to the required stem diameter and depth.

Notes

Reamers are available in diameter Ø 10, Ø 12, Ø 14, Ø 16, Ø 18 and Ø 20. The depth indicator is on the reamer: observe the laser markings (95, 120, 160 and 200).

When using cemented stems, the Ø 12 mm reamer is used to drill to the desired depth and the corresponding cementless trial stem is used. The optional cemented trial stems are only used with the trial components (not with the instruments)!

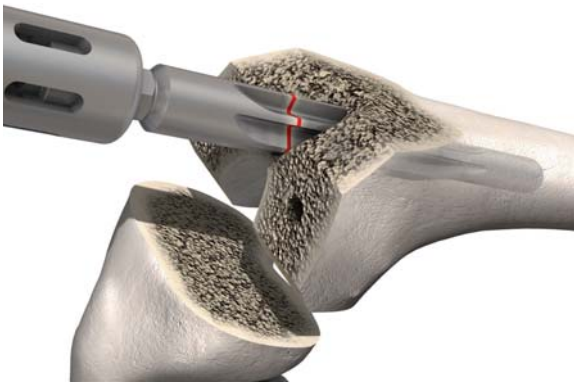
The 200 mm length is only available in the cementless version.

Controlling the stem position



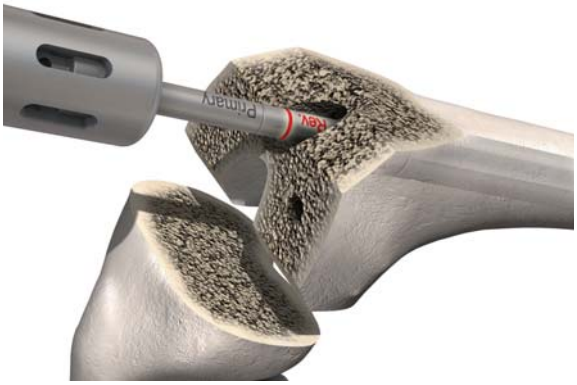
An extramedullary reamer alignment guide, which is attached to the reamer, can be used to check the position of the stem in axial alignment and depth (the end of the reamer alignment guide corresponds to the tip of the reamer).

Preparing the femoral stem connection



If it is reamed only to diameters Ø 10, Ø 12 or Ø 14, the stem connection recess has to be reamed with the Ø 10/16 mm stepped reamer until the laser marking (corresponding to the resection level).

IM positioning and control with trial stems



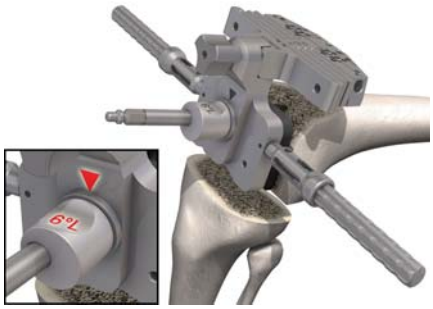
The chosen trial stem is attached to the extension for trial stem (Ø 8 mm) and with the modular handle carefully inserted into the femoral IM canal so the line marked with PRIMARY respectively REV. is approximately level to the distal bone resection. The modular handle is now removed. It is important to avoid putting excessive pressure in the femoral IM canal.

Note

With too short IM guidance, the alignment may be incorrect (varus/valgus, extension/flexion).



Locating the distal femoral cutting block



The 6° femoral bushing corresponds to the angle α determined in the preoperative planning. The femoral bushing is inserted into the femoral suspension device, so that depending on which side is the operation, the mark L for left knee or R for right knee is visible on the arrow ▼.

Note

Make sure that the femoral bushing is inserted in the correct (L or R) position. Adjustment and correction occurs with removing, rotating by 180° and reinserting the femoral bushing.

The femoral/tibial revision cutting block is screwed to the femoral suspension device and positioned over the trial stem extension (Ø 8 mm). The handles can be attached.

Note

In revision cases, the 7 mm distal revision spacer for femoral condyle is attached to the femoral suspension device (black plastic component in picture). This substitutes the missing distal bone substance. The resulting resection remains still 2 mm.



Align the device with regard to rotation. Note that the removable handles are parallel to the epicondylar axis.

After preliminary drilling with the Ø 3.2 mm drill, from distal the femoral suspension device is fixed with a bone pin (75 mm long).

After preliminary drilling with the Ø 3.2 mm drill, the femoral/tibial revision cutting block is fixed with two bone pins (75 mm long) through the holes marked 0. This position resects 9 mm from the distal femur, which corresponds to the distal thickness of the femoral prosthesis without femoral blocks.

Important

For preventing any conflict with the trial stem, the most lateral 0 pin hole of the femoral / tibial revision cutting block is preferred.

The bone pin on the femoral suspension device is removed with a pin extractor. After loosening the fixation screw, the trial stem with extension (Ø 8 mm) is removed using the modular handle.

The suspension device is now removed.

Notes

The resection depth can be adjusted proximally and distally in 2 mm increments (±4 mm).

The side handles can be removed from the femoral suspension device and attached on the femoral/tibial revision cutting block.

Distal femoral resection



The femoral/tibial revision cutting block is slid onto the bone. The distal femoral resection is then performed using a 1 mm saw blade through the 0 saw slot (closed slot with facet).

Note

For locking the femoral/tibial revision cutting block, an additional pin can be inserted into the oblique holes market with AUX. After resection, the pin can be removed.

When using distal femoral augmentation blocks, the resection is performed through the open saw slots. Augmentation blocks of 5 mm, 10 mm and 15 mm are available.

Note

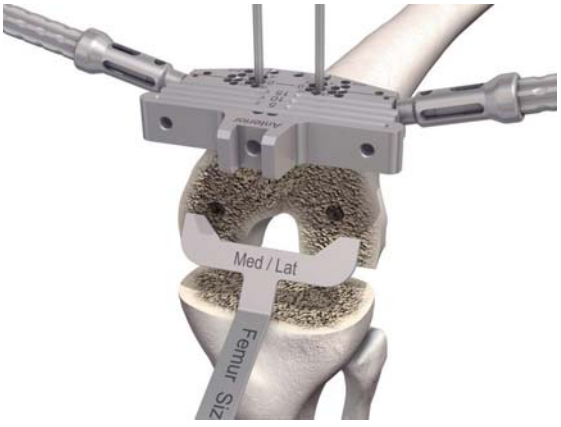
If there is an extension deficit, it is recommended to move the distal resection 2–4 mm proximally to adjust the extension gap. For hypermobile patients, a 2 mm smaller distal femoral resection is recommended.

The distal resection is the reference for the following steps and has to be checked for accuracy.

Important

The femoral/tibial revision cutting block does not have to be removed yet because it will be used later.

Controlling the femoral size



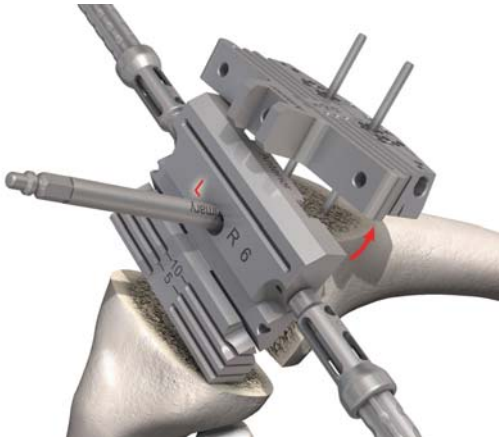
The femoral size is again controlled and definitively determined.

Note

During medial/lateral measurement, take the external width of the sizer as reference.

The side handles can be removed from the femoral/tibial revision cutting block and attached on the femoral A/P femoral cutting block revision.

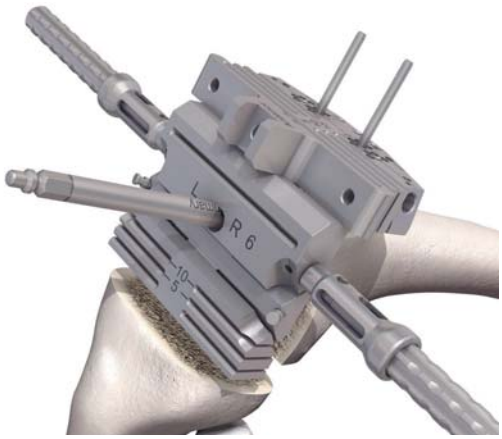
Locating the A/P femoral cutting block



The chosen trial stem is attached to the extension for trial stem (Ø 8 mm) and inserted into the femoral IM canal. The A/P femoral cutting block revision is placed on top.

Note

When using distal femoral augmentation blocks, the corresponding blocks must be fixed on the A/P femoral cutting block revision. Respect the thickness (5 mm, 10 mm or 15 mm) and size (2, 4 or 6, 8, 10).



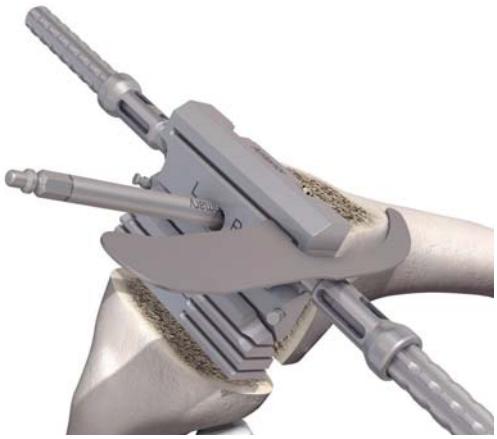
The rotation of the A/P femoral cutting block revision is adjusted by applying anteriorly the femoral/tibial revision cutting block.

Note

If the rotation of the A/P femoral cutting block revision has to be readjusted, the rotation is set visually in relation to the epicondylar axis with aid of the side attached handles.

After preliminary drilling with the Ø 3.2 mm drill, the A/P femoral cutting block revision is fixed with two bone pins (38 mm with head) through the lateral 45° oblique holes.

Checking the resections



With the resection stylus, the anterior and posterior resection plane and height are checked.

A/P and chamfer resections



The anterior femoral resection is made through the closed saw slot with the 1 mm saw blade (anterior slot with facet).



The posterior femoral resection is made through the two open posterior saw slots (slots with facet).

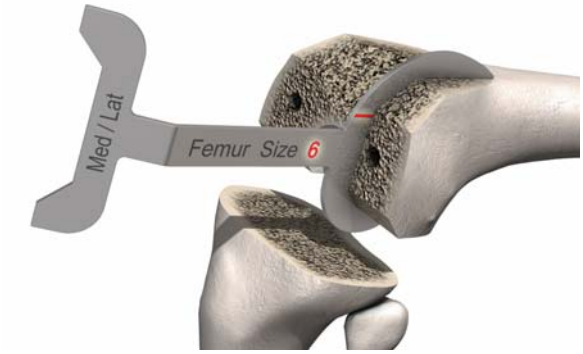
When using posterior femoral augmentation blocks, the resection is made through the open 5 mm and 10 mm saw slots.



The femoral chamfer resections are made through the corresponding slots (slots with facet).



Preparing the femoral box (IM)



Note

In order to improve support for the Hohman, we recommend preparing the femoral box after tibial preparation.

Important

This application is performed when bone tissue is not available to ensure good instrument support (especially in the anterior bone area and after explantation of a prosthesis). In case of good distal and anterior bone support, the EM femoral box preparation is preferred (see page 29).

The A/P femoral cutting block revision is removed and the femoral resections can be checked.



Slide the trial stem already used with the trial stem extension (Ø 8 mm) into the femoral IM canal again using the modular handle and now detach the modular handle.

Slide the box saw guide IM positioning device (size 2 or sizes 4–10) onto the extension up to the distal cut with the box saw guide positioner (observe size). It is important for the box saw guide to be flush with the cut surfaces.

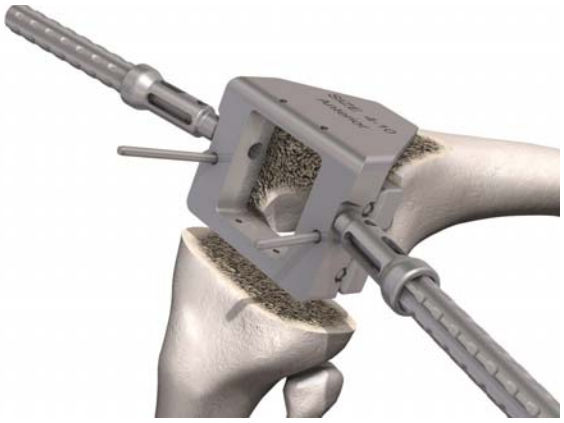
Note

When using distal femoral blocks, mount the appropriate blocks on the femoral cutting block. Observe the appropriate thickness (5 mm, 10 mm or 15 mm).

The side handles can be attached to the box saw guide positioning device.

Note

If required (absent anterior bone tissue) adjust rotation with the aid of the side handles, reference to the femoral epicondyle.



Fix the box saw guide IM positioning device with pins with head (38 mm) through the distal holes.

Together with the trial stem and the trial stem extension, withdraw the box saw guide positioner using the trial stem handle, which is attached to the trial stem extension.



The IM box saw guide (guide for size 2 and sizes 4–10) can be slid in the positioning device.

Perform the cuts with a special 13 mm wide saw blade, which is introduced up to the RT 45 mark.

Note

Protect vessels and nerves in the popliteal fossa.

Remove all the pins, the IM box saw guide and the positioning device.



Excavate the femoral box with a thin, straight osteotome and a luer along the outer limits marked and prepared with the saw blade (with the osteotome, the two lateral box cuts are carefully posteriorely extended).

From anterior into the IM canal hole, the narrow saw blade (or an osteotome) is introduced for cutting the posterior cortical box bone.



Important

To protect the important posterior soft tissues, a Hohman is placed centered onto the posterior condyle.

Cut off the upper bone edge to provide space for the rounding from the patellar shield to the box wall.





Note

Helpfully a "cross" can be prepared with the saw for removing the femoral box. The remaining triangle bone is finally removed by using a luer.



Check box position and box depth and finalize with the box rasp (rasps for size 2 and for sizes 4–10).

Important

Introduce the box rasp only in the longitudinal direction; do not jam or tilt it because this can cause breakage of the femoral condyle.

Controlling the femoral resections and anchorage



The femoral trial is screwed with the trial stem (corresponding to the last reamer) and inserted with the impactor.

Note

When using distal and/or posterior femoral augmentation blocks, corresponding femoral trial blocks (5 mm, 10 mm or 15 mm) are available, which are fixed laterally on the femoral trial.

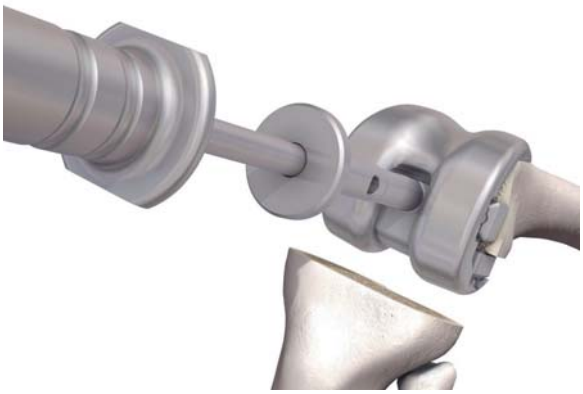
Removing the dorsal condyle residue



Important

This must be checked in all cases!

After having completed the femoral resections, use the curved osteotome to remove all osteophytes as well as protruding posterior condyles. At this point, a posterior contracture can also be released. This will improve flexion and prevent possible damage to the polyethylene insert by these bony projections.



Notes

The femoral trial is used as reference for resection of the bone with the curved osteotome.

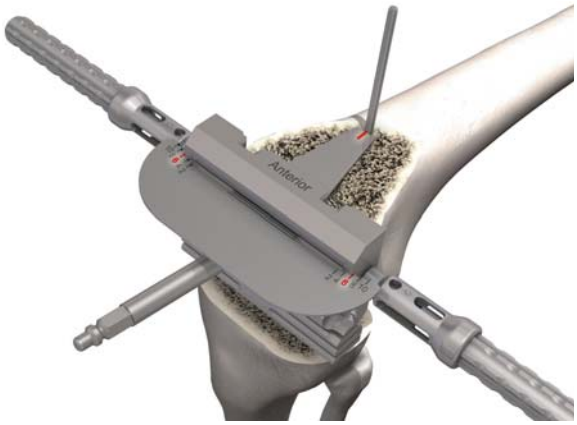
The femoral trial can be removed by using the slap hammer. If necessary, it can be left in place to protect the femoral condyle during tibial preparation.

It is recommended to leave the femoral trial component assembled with stem and eventually augmentation blocks to be used as reference, respectively as comparison component when assembling the definitive implant.

EM Femoral Box Preparation Option

If bone tissue is distally and anteriorly available to ensure good instrument support, the “EM femoral box processing” version can be proceeded (this version is faster and easier in handling).

EM preparation of the femoral box



Note

In order to improve support for the Hohman, we recommend preparing the femoral box after tibial preparation.

Important

For this application, anterior bone substance has to be available!

To position medio-laterally the femoral box saw guide, respectively the femoral component, use the centering template, which is inserted through the anterior saw slot of the A/P femoral revision cutting block in regard to the femoral size, to make a mark (e.g., with an electrocauter or a pin) on the anterior cortical bone.



On the anterior cortical bone marking, the femoral box saw guide (guides for size 2 and sizes 4–10) is aligned and fixed with bone pins.

It is important that the box saw guide is flush with the resections.

Note

When using distal femoral augmentation blocks the corresponding blocks must be fixed on the box saw guide. Respect the thickness (5 mm, 10 mm or 15 mm).

The side handles can be attached on the box saw guide.



The resections are performed using a special 13 mm wide saw blade.
The saw blade is inserted up to the RT 45 mark.

Note

Protect the vessels and nerves in the popliteal fossa.



In the case of the guide for sizes 4–10, make the anterior box cut in the saw slot of the respective size.

Following, the box saw guide is removed.

The next cuts can be found on page 24 ff.

The leg is flexed and any remaining osteophytes and the intercondylar eminence are removed.

Tibia opening



Open the tibial IM canal with the Ø 8/14 mm stepped drill.

Position the hole centrally M/L and one third from anterior.

Preparing the tibial anchorage



Reamers are used carefully and in progressive stages (starting with Ø 10) to ream to the required stem diameter and depth.

Notes

Reamers are available in diameter Ø 10, Ø 12, Ø 14, Ø 16, Ø 18 and Ø 20. The depth indicator is on the reamer: observe the laser markings (95, 120, 160 and 200).

When using cemented stems, the Ø 12 mm reamer is used to drill to the desired depth and the corresponding cementless trial stem is used. Cemented stems are available in 95 mm, 120 mm and 160 mm lengths. The optional cemented trial stems are only used with the trial components (not with the instruments)!

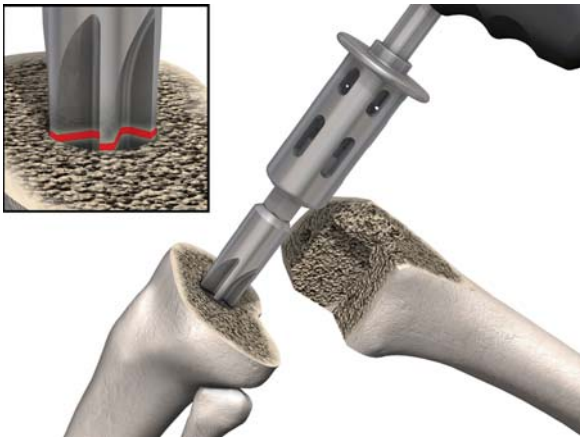
The 200 mm length is only available in the cementless version.

Controlling the stem position



An extramedullary reamer alignment guide, which is attached to the reamer, can be used to check the position of the stem in axial alignment and depth (the end of the reamer alignment guide corresponds to the tip of the reamer).

Preparing the tibial stem connection



If it is reamed only to diameters Ø 10, Ø 12 or Ø 14, the stem connection recess has to be reamed with the Ø 10/16 mm stepped reamer until the laser marking (corresponding to the resection level).

IM positioning and control with trial stems



The chosen trial stem is attached to the extension for trial stem (Ø 8 mm) and with the modular handle carefully inserted into the tibial IM canal so the line marked with PRIMARY respectively REV. is approximately level to the proximal bone resection. The modular handle is now removed. It is important to avoid putting excessive pressure in the tibial IM canal.

Note

With too short IM guidance, the alignment may be incorrect (varus/valgus, extension/flexion).

Locating the tibial cutting block







The two tibial resection guide IM components are coupled together by jointing arrow ⇩ to arrow ⇧ and pressing the button.

The femoral/tibial revision cutting block is attached to the tibial resection guide IM with the top small grub screw and slid completely onto the trial stem extension (Ø 8 mm).

Note

Ensure the lock lever is set to OPEN to slide in place the tibial resection guide IM. The lock lever is then reversed to fix the tibial resection guide IM in place.

The femoral/tibial revision cutting block is first lifted upwards by pressing the button so the tibial stylus can be attached.

Setting the resection height



The tibial stylus is positioned on the tibial plateau. The tibial stylus can be used for both primary resections (11 mm marking) and for revision resections (1 mm marking).

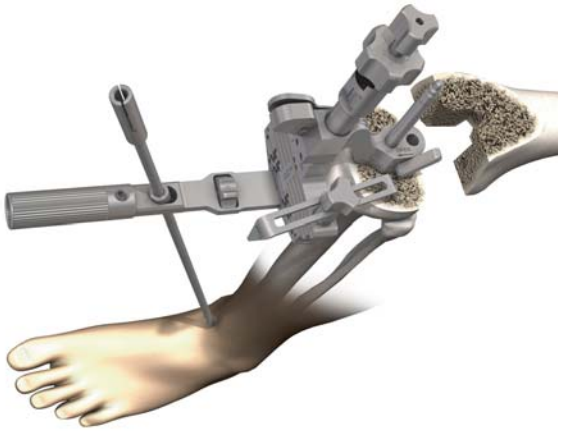
Notes

In primary revision procedures, the 11 mm tibial stylus is positioned on the lowest point of the less-damaged condyle.

In revision procedures where no tibial augmentation blocks are required the 1 mm tibial stylus is positioned on the lowest area of the tibial plateau.

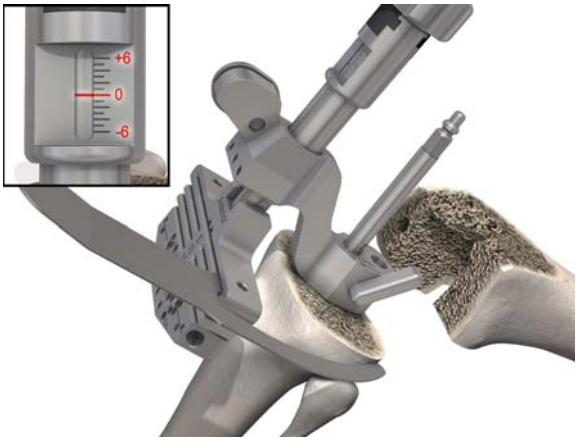
In revision procedures where augmentation blocks are required, 1 mm tibial stylus is positioned on the lowest point of the less-damaged condyle.

Controlling the alignment and the tibial resection



The alignment is checked again with the axial alignment rod. The rod tip must point to the center of the ankle joint.

The tibial stylus can now be removed.



The resection height is checked with the resection stylus. The femoral/tibial revision cutting block can be adjusted using the large grub screw ±6 mm.

Note

The top small grub screw is used for assembling the femoral/tibial revision cutting block only.



After preliminary drilling with the Ø 3.2 mm drill, the femoral/tibial revision cutting block is fixed with two bone pins (75 mm or 100 mm long) through the holes marked 0.

Handles can be attached.



The lock lever is set to OPEN and the tibial resection guide IM is removed from the femoral/tibial revision cutting block by unscrewing the top small grub screw.

The trial stem with the extension is also removed using the modular handle.

The femoral/tibial revision cutting block is slid onto the bone.

Tibial resection



The tibial resection is performed using a 1 mm saw blade through the 0 saw slot (closed slot with facet).

Notes

For locking the femoral/tibial revision cutting block, an additional pin can be inserted into the oblique holes marked with AUX. After resections the pin can be removed.

The ligaments must be protected during all resections.



When using tibial blocks, the resection is conducted through the open saw slots. Blocks 5 mm, 10 mm and 15 mm high are available.



As guidance for the vertical tibial augmentation block cut, two bone pins (length 75 mm or 100 mm) are inserted into the two proximal holes level with closed saw slot. The vertical cut is performed between the two pins to the depth of the augmentation block.

Important

If the femoral/tibial revision cutting block is distally or proximally relocated (purpose of thicker or thinner bone resection), this is moved to the right (±2 mm) or parallel (±4 mm). Should the relocation be moved to the right, the vertical cut should be performed external to the right pin rather than between the pins.

The femoral/tibial revision cutting block is now removed.

Controlling the joint gaps



The tension in flexion and extension is checked with spacers. The spacers (8, 11 and 14) represent the femoral component and the full tibial component heights (tibial component and tibial insert).
When using augmentation blocks, the corresponding spacer blocks must be fixed to the spacer. Note the corresponding thickness (5 mm, 10 mm or 15 mm). These can be fixed either on the tibial side or on the femoral side.
If necessary, further release or resection is performed.



Note

To release the spacer blocks, a long pin can be inserted in the hole and used as a lever.

The two bone pins in the tibia are then removed.

Tibial size determination



The chosen trial stem is attached to the extension for trial stem (Ø 8 mm) and with the modular handle carefully inserted into the tibial IM canal so the line marked with PRIMARY respectively REV. is approximately level to the proximal bone resection. The modular handle is now removed. It is important to avoid putting excessive pressure in the tibial IM canal.

The tibial sizer trial and the handle are assembled and placed intramedullary with the tibial chisel guide over the extension for trial stem (Ø 8 mm) and applied onto the proximal bone resection.

The tibial sizer trial should completely cover the cortex without projecting beyond the tibia. In case of doubt, a lateral projection is preferred, because a medial projection may cause irritation of the pes anserinus. If the projection is not acceptable, a smaller size should be used (pay attention to the combination!). The correct tibial size is then determined.

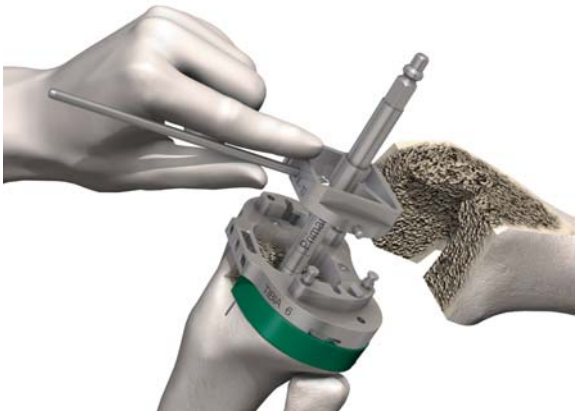
Notes

By use of tibial blocks, the corresponding blocks are to be attached to the tibial sizer. Note the corresponding heights (5 mm, 10 mm or 15 mm) and side (Rlat/Lmed or Llat/Rmed). The 15 mm tibial blocks are anatomically bent M/L and posterior. Therefore, the undercontour is always a size smaller than the upper contour.
Size 2 tibial component cannot be combined with size 4 femoral component.

Setting the tibial rotation



The tibial rotation is determined anatomically statically (orientation to the tibial tuberosity, and the axial alignment rod tip must point to the center of the ankle joint).



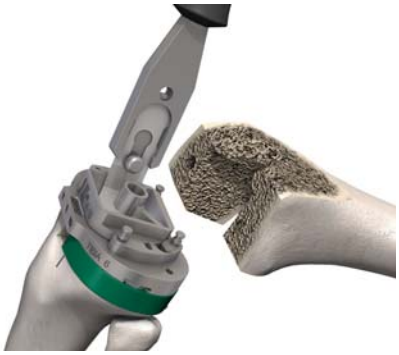
After preliminary drilling with the Ø 3.2 mm drill, the tibial sizer is fixed with at least two bone pins with head.

Remove the chisel guide and the trial stem and refit the chisel guide.

Note

Positioning of the chisel guide is achieved by introducing and rotating the chisel guide clockwise in the tibial sizer. If insertion or removal proves difficult, a long pin can be used as a lever, which is placed in the anterior hole of the chisel guide.

Preparing the tibial IM canal



Prepare the proximal tibial anchorage with the osteotome and the rasp.

By using the thin narrow 10 mm chisel, the tibial cavity is preliminary prepared along the internal tibial chisel guide contour. This in oder to avoid bone fractures, especially with bad bone quality. The chisel must be flush with the tibial chisel guide.

Now remove the tibial chisel guide.



Notes

If sclerotic bone, the fins are especially important to be prepared! They can as well be used a reference for the tibial rotation positing.

In order to prepare the tibial trial, we recommend screwing the trial stem onto the tibial trial at this point.





With the tibial rasp, the proximal tibial cavity is definitively prepared. The rasp must be knocked in far enough to ensure that the top of the rasp is flush with the (more proximal) bone resection (or flush with the height of the lower plane of the tibial sizer).

Notes

In order to avoid bone fractures, knock the rasp in carefully.



In order to protect the rasp sharp threats, perform rasping without the tibial sizer if necessary. In this case, with a thin chisel or by using an electro-cauter, the tibial anchorage fins positions are mark on the bone in order to guide the rasp.

If both side tibial augmentation blocks are planned, it is unnecessary to rasp down to the resection level. The rasp must be knocked down so far that the 5 mm, 10 mm or 15 mm line marked on the rasp corresponds to the bone resections.

Trial reduction



The purpose of the trial reduction is to check the radius of movement, patella guidance and the tension of the soft-tissue mechanism.

The tibial trial together with the trial stem (depending on the last reamer diameter and depth) are inserted with using the impactor.

Note

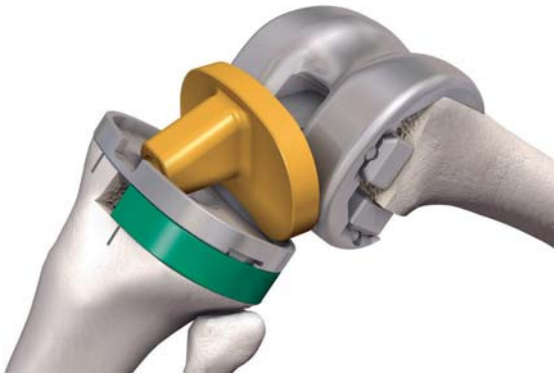
It is possible that the same trial stem is required on the femur and on the tibia. In this case, for the femoral trial fit a shorter trial stem with the same diameter or one of equal length with a smaller diameter or do not fit a trial stem at all.



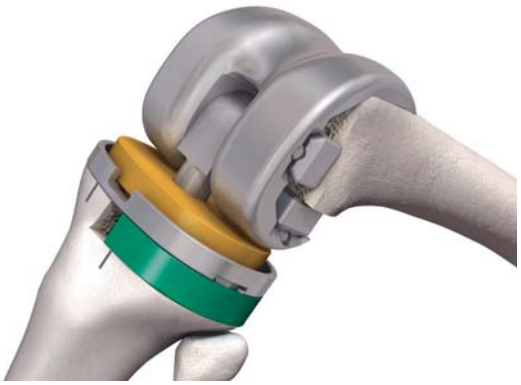
The femoral trial together with the trial stem (depending on the last reamer diameter and depth) are inserted with using the impactor.

Note

When using blocks, there are appropriate block trials available (5 mm, 10 mm and 15 mm), which are fixed to the tibial trial or femoral trial.

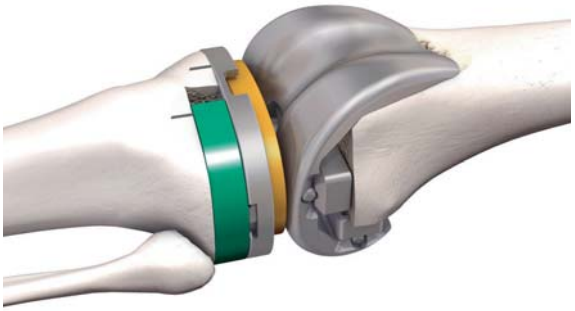


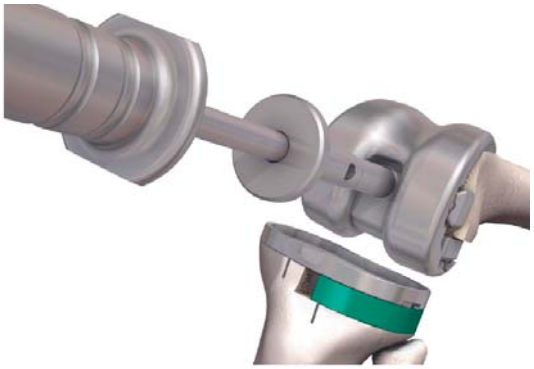
Attach the appropriate tibial insert trial, which has been previously defined with the spacer, onto the rotation peg of the femoral trial in the 90° flexed position and insert it into the tibial trial by hand.



The implant fit, the kinematics of the knee joint, and patellar function are checked.

At this point, a definitive decision should be taken regarding patella replacement (see instructions on page 41 ff).





When the definitive implants have been selected, make the components ready for assembly (see instructions on page 43 ff).

Remove the trial components with the slap hammer, starting with the femur.

Note

As reference, it is recommended to leave assembled the trial components with stem and eventual blocks. They are used for controlling, respectively as comparison with the definitive implant.

The leg is extended. Soft tissue on the posterior surface of the patella is exposed preserving the ligaments.

If the posterior surface of the patella is not replaced, the patella is freed from osteophytes and denerved.

Positioning the patella clamp and patella resection



The patellar instruments permit the use of the “onlay” technique, in which 10 mm of the bone are resected and replaced by a 10 mm thick patellar implant (if an 8 mm thick patellar implant is planned, resect just 8 mm accordingly).

An alternative option is the “inlay” technique, in which the implant is partially countersunk (3 mm to 5 mm). Here, the patella is only resected approx. 7 mm to 5 mm below the ridge. The thickness of the residual bony patella should not be less than 12 mm. See also the “Milling” section on page 42.

After placing the patellar cutting guide on the patellar clamp with the ratchet, grasp the patella with the clamp. The patellar thickness can be read from the mm scale on the handle.

Adjust the patella osteotomy insert (mm scale) to the height to be resected and resect the patella with the oscillating saw (1 mm saw blade with unset teeth).

Note

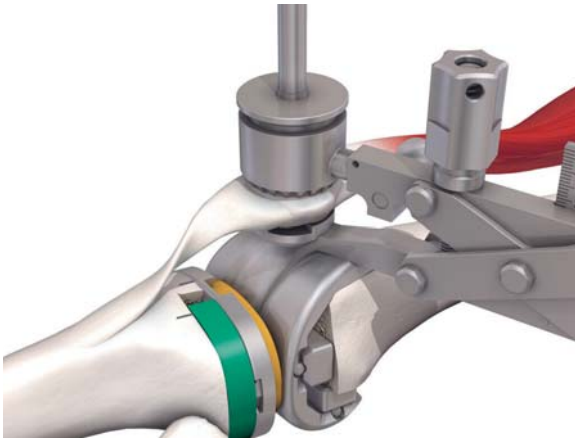
When resecting, ensure that the saw blade does not wander, e.g., due to sclerotic bone sectors.

Patellar size determination



Determine patellar size using the patellar sizer. Supplied sizes are Ø 26, Ø 29, Ø 32 and Ø 35 mm. Note that the patellar component is implanted with a slight medial offset, thus matching the position of the natural patellar ridge. Small implant sizes are recommended for small patella to enable this offset to be reproduced.

Milling



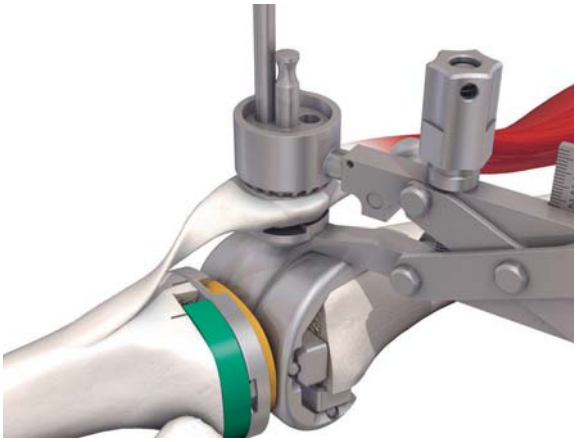
Mount the patellar bushing onto the patellar clamp with the ratchet.

Select the patellar reamer to match the corresponding patella size. Depending on the selected anchoraging technique, mill briefly ("onlay" technique) or countersink by 3 mm to 5 mm ("inlay" technique). Milling down to the stop results in a depth of 5 mm.

Note

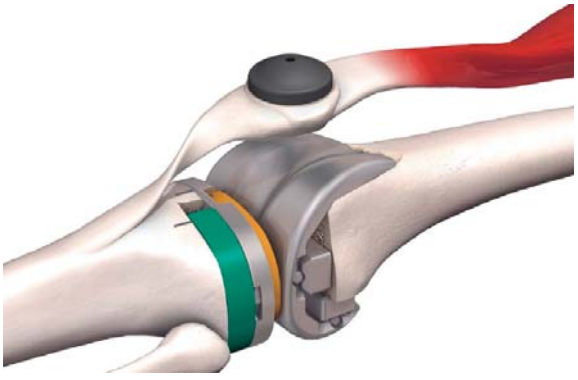
Patellar implants with a height of 10 mm are recommended as standard. Implants with a height of 8 mm are available as an alternative for thin patella.

Drill anchoring holes



Using the patellar drill guide and the patellar drill with stop, prepare the anchoring holes for the pegs.

Trial reduction



Patellar trials are available for trial reduction.

The assembling block is essential for safe and gentle assembling of the implants.

Note

When assembling the implant component, always start with the stem first. Then the blocks can be fixed. Otherwise the block screw may come loose during impacting.

Important

Be aware: if any screw or clamp is missing from the respective component or for any reason is not sterile, a set of replacement screws and clamps (page 57) is available.

Assembling the tibial component



The tibial component (page 54) is positioned in the specified position on the assembling block.

The stem (page 58) is inserted into the taper. It is recommended to turn the stem so that the security screw is positioned medially (lower stress in this zone), and that no fin but a groove is anteriorly positioned (thereby a larger surface is in contact with the internal cortical bone).

Important

Pay attention that the tapered connection is undamaged, clean and dry before mounting and when using cementless stems that a pocket is anterior, not a rib.

Fixing the stem (cemented/cementless) to the tibial component



The prepared automatic hammer with adaptor is placed on the stem. The stem is securely attached to the tibial component by **impacting** the stem **three times.**

Notes

When using 200 mm stems, place the cross-shaped stem protector into the adaptor for automatic hammer.

A stem connection with 3° posterior slope is integrated into the tibial component.

Securing the stem



With the stem screw the stem is additionally secured. The screw has to be tightened with the provided screwdriver.

Note

The stem screwdriver is intentionally slim designed and must be used carefully.

Assembling the tibial blocks





There are blocks with a thickness of 5 mm, 10 mm and 15 mm available for the tibial component (page 57).

To enable tibial block assembly, the required PE pegs must first be removed.

Note

When using blocks, care must be taken to ensure that the femoral implants are dry and clean. Observe the appropriate size combinations.



The tibial blocks are also fixed mechanically with the preassembled screws with the screwdriver with torque. The required torque is reached when the line reaches the “Stem/ Block” position (4.5 Nm).

Notes

The tibial blocks can be inserted either medially or laterally (except tibial blocks size 15 mm). The 15 mm tibial blocks are anatomically conical tapered and therefore differently used (R-Lat/L-Med, respectively; L-Lat/R-Med).

The screws are screwed into the block through the tibial component and must always be countersunk.

Assembling the femoral component



The femoral component (page 54) is positioned in the specified position on the assembling block.

Fixing the stem (cementless) to the femoral component



The stem (page 58) is inserted into the taper. It is recommended to turn the stem so that the security screw is positioned medially (lower stress in this zone, and in addition will facilitate the screwing later on), and that no fin but a groove is anteriorly positioned (thereby a larger surface is in contact with the internal cortical bone).

Important

Pay attention that the tapered connection is undamaged, clean and dry before mounting and by using cementless stems that a pocket is anterior, not a rib.

The prepared automatic hammer with adaptor is placed on the stem. The stem is securely attached to the femoral component by **impacting** the stem **three times.**

Notes

When using 200 mm stems, place the cross-shaped stem protector into the adaptor for automatic hammer.

A stem connection with 6° valgus angle is integrated into the femoral component.

Securing the stem



With the stem screw the stem is additionally secured. The screw has to be tightened with the provided screwdriver.

Note

The stem screwdriver is intentionally slim designed and must be used carefully.

Assembling the femoral blocks



There are blocks with a thickness of 5 mm, 10 mm and 15 mm available for the femoral components (15 mm only distal) (page 56).

Note

When using blocks, care must be taken to ensure that the femoral implants are dry and clean. Observe the appropriate size combinations.

The femoral blocks are also fixed mechanically with the preassembled screws with the screwdriver with torque. The required torque is reached when the line reaches the “Stem/ Block” position (4.5 Nm).



Notes

The distal and posterior femoral blocks (5 mm, 10 mm und 15 mm) can be inserted either medially or laterally.

When using distal and posterior blocks, it is recommended to screw tightly the posterior block first and then the distal block. This is particularly advisable when using a 15 mm distal block.

Mix the bone cement according to the respective manufacturer's instructions. Clean, wash and dry the bone bed sufficiently. Modern cementing techniques using a vacuum mixer and jet lavage are recommended.

The RT-PLUS◇ Modular knee is used with cement, with the exception of cementless stems. First cement the tibial component and then the femoral component.

Note

With sclerotic bone it is recommended to drill several holes using a Ø 3.2 mm drill. This improves anchorage between the bone cement and the bone.

Ti_6Al_4V stems: The backs of the condyles and the box walls of the femoral component are coated with cement. The back of the tibial component is coated with cement (back of plateau and box). The Ti_6Al_4V stems are not cemented.

Important

When implanting Ti_6Al_4V stems, pay attention that the rotation alignments of the femoral and tibial components correspond already when the stems are inserted to the definitive implant positions. This prevents unnecessary rib notches occurring in the IM canal.

CoCr stems: The medullary plugs are accordingly placed deeper than the components. It is recommended to fill up the IM canals using a cement gun.

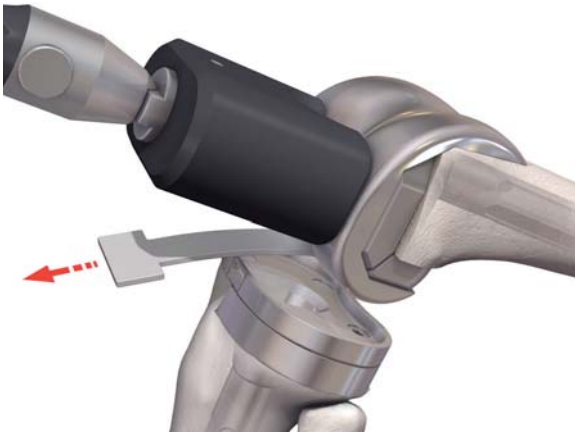


Implanting the tibial and femoral components

In 90° flexed position, the tibial component is hammered using the corresponding impactor. Excess cement is carefully removed. While the cement is setting, the implant components must be under continuous pressure.

Note

Make sure that cement is applied between the fin connection and stem connection when using tibial blocks.



The femoral component is hammered using the impactor. Here, too, continuous pressure must be maintained and excess cement removed.

Important

Make sure that the posterior femoral condyles do not come into contact with the tibial component when impacting the femoral component. We recommend covering the tibial component with a compress.

Before the femoral component cement has set, the plastic lug that protects the box against the entry of cement must be removed.

Last controlling



Prior to definitive assembly of the tibial insert it is possible to use the tibial insert trial for a final trial reduction.

Before the cement has set, the excess cement must be removed in extension.

Insertion of the tibial insert



The tibial insert of the corresponding size (see page 55) may only be inserted when the cement has fully hardened.

In 90° flexed position, the tibial insert is placed on the femoral component rotation peg and slid into the tibial component by hand.

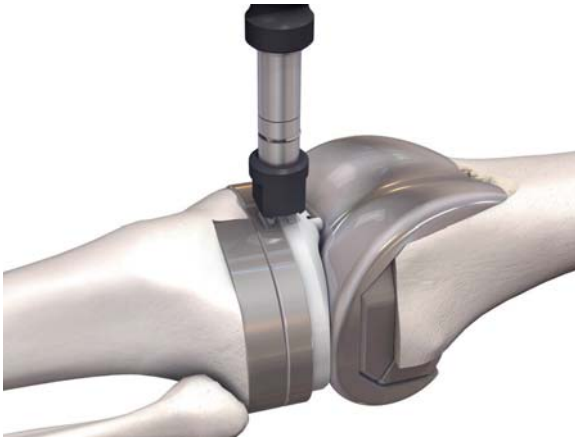
Important

Note the correct anatomical alignment. It is important to make sure that no soft tissue is coming between the tibial insert and the tibial component.

Note

In order to prevent the anterior metal clamp from falling out, handle the tibial insert carefully.

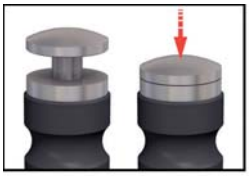
Fixation of the tibial insert



Place the impacting attachment on the plug inserter.

In extension position the tibial insert clamp is manually completely inserted from anterior to posterior by using the plug inserter with the impacting attachment fitted.

It should end up positioned completely against the tibial insert and the tibial component.





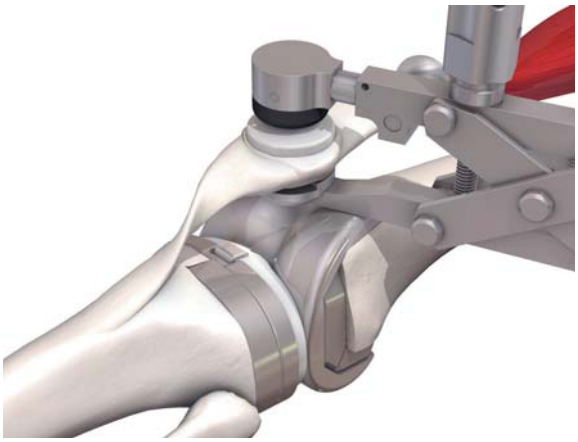
Remove the impacting attachment from the plug inserter.

In order to secure the clamp, the plug inserter is in 90° flexed position placed into the anterior tibial insert hole over the polyethylene plug. With complete pressure until stop on plug inserter, the polyethylene plug is set into the clamp.

Note

If a tibial insert needs to be removed from the tibial component, the polyethylene plug is drilled to a depth of 6–8 mm using a Ø 3.2 mm drill and the clamp is removed from anterior. Make sure that such removed tibial insert will not be reused.

Implanting the cemented patellar component



If patellar replacement is indicated, the patellar component (page 54) of the TC-PLUS◇ knee system is used since the geometry of the patellar groove is matched to this implant.

Mount the patellar inserter on the patellar clamp with the ratchet. Coat the back of the patellar component with cement and fill the three peg holes of the patella with cement. Insert the patellar component by hand with the leg extended and press in, using the patellar clamp with the ratchet fitted with the patellar inserter. Remove excess cement. Leave the clamp in place until the cement has completely set.

Wound closure



The wound must again be rinsed out thoroughly after implantation. Close the wound in layers, inserting two intra-articular and one subcutaneous Redon drain.

Postoperative Treatment



Rehabilitation

The operated leg is immobilized in a splint and the knee joint is cooled. Isometric contraction exercises should be performed on the first postoperative day. Thrombosis prophylaxis is required until full load can be borne.

On the second postoperative day, after removing the drains, assisted movement exercises and the use of a motorized splint (CPM) are started. The operated leg can generally bear a load early on.

Mobilization of the patient initially occurs with a walking frame or crutches, which can be limited as steadiness of gait improves.

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Müller C, Basad E, Melzer C
Mid Term Result With A New Rorating Hinge Total Knee Arthroplasty (Poster)
AAOS Annual Meeting, March 5–9, 2008, San Francisco, USA

Sterilization

Implants

All the implants described in this Surgical Technique are sterile when they are delivered by the manufacturer. Resterilization is not allowed.

Instruments

System components and instruments are not sterile when they are delivered. Before use they must be cleaned by the usual methods in accordance with internal hospital regulations and sterilized in an autoclave in accordance with the legal regulations and guidelines applicable in the relevant country. (For detailed information please refer to leaflet Lit. No. 1363.)

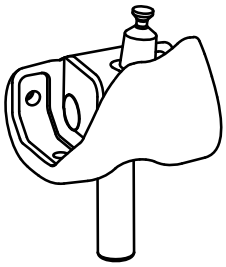
The correct settings are given in the instructions for use issued by the autoclave manufacturer. Instrument manufacturers and dealers accept no responsibility for sterilization of products by the customer.

Implants

RT-PLUS◇ Modular Implants for Cemented Application

Femoral components left

Art. No. PLUS	Art. No. S&N	Size
24322	75005554	2
24324	75005555	4
24326	75005556	6
24328	75005557	8
24330	75005558	10

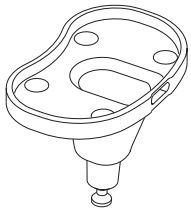


Femoral components right

Art. No. PLUS	Art. No. S&N	Size
24312	75005549	2
24314	75005550	4
24316	75005551	6
24318	75005552	8
24320	75005553	10

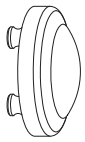
Tibial components

Art. No. PLUS	Art. No. S&N	Size
24332	75005559	2
24334	75005560	4
24336	75005561	6
24338	75005562	8
24340	75005563	10



Patellar components

Art. No. PLUS	Art. No. S&N	Size	Height
21182*	75004784*	Ø 26 mm	8 mm
21192	75004787	Ø 26 mm	10 mm
21183*	75004785*	Ø 29 mm	8 mm
21193	75004788	Ø 29 mm	10 mm
21184*	75004786*	Ø 32 mm	8 mm
21194	75004789	Ø 32 mm	10 mm
21195	75004790	Ø 35 mm	10 mm

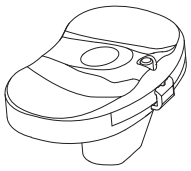


* Special sizes (on request)

The patellar components are the same as those of the TC-PLUS◇ knee system.

Tibial inserts

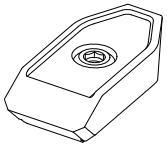
Art. No. PLUS	Art. No. S&N	Size	Height
24046	75005461	2	8 mm
24047	75005470	2	11 mm
24048	75005481	2	14 mm
24056	75005482	4	8 mm
24057	75005483	4	11 mm
24058	75005484	4	14 mm
24066	75005485	6	8 mm
24067	75005486	6	11 mm
24068	75005487	6	14 mm
24076	75005488	8	8 mm
24077	75005489	8	11 mm
24078	75005490	8	14 mm
24086	75005491	10	8 mm
24087	75005492	10	11 mm
24088	75005493	10	14 mm



The tibial inserts are the same as those of the RT-PLUS® knee system.

Femoral blocks distal

Art. No. PLUS	Art. No. S&N	Size	Height
24371	75005574	2	5 mm
24372	75005575	2	10 mm
24373	75005576	2	15 mm
24374	75005577	4	5 mm
24375	75005578	4	10 mm
24376	75005579	4	15 mm
24377	75005580	6	5 mm
24378	75005581	6	10 mm
24379	75005582	6	15 mm
24380	75005583	8	5 mm
24381	75005584	8	10 mm
24382	75005585	8	15 mm
24383	75005586	10	5 mm
24384	75005587	10	10 mm
24385	75005588	10	15 mm



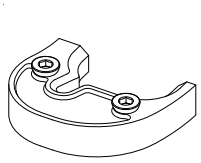
Femoral blocks posterior

Art. No. PLUS	Art. No. S&N	Size	Height
24350	75005564	2	5 mm
24351	75005565	2	10 mm
24352	75005566	4	5 mm
24353	75005567	4	10 mm
24354	75005568	6	5 mm
24355	75005569	6	10 mm
24356	75005570	8	5 mm
24357	75005571	8	10 mm
24358	75005572	10	5 mm
24359	75005573	10	10 mm



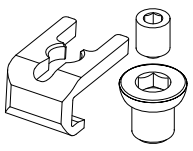
Tibial blocks

Art. No. PLUS	Art. No. S&N	Size	Height	
24300	75005539	2	5 mm	
24301	75005540	2	10 mm	
24390	75005589	2	15 mm	R-lal/L-med
24395	75005594	2	15 mm	L-lat/R-med
24302	75005541	4	5 mm	
24303	75005542	4	10 mm	
24391	75005590	4	15 mm	R-lal/L-med
24396	75005595	4	15 mm	L-lat/R-med
24304	75005543	6	5 mm	
24305	75005544	6	10 mm	
24392	75005591	6	15 mm	R-lal/L-med
24397	75005596	6	15 mm	L-lat/R-med
24306	75005545	8	5 mm	
24307	75005546	8	10 mm	
24393	75005592	8	15 mm	R-lal/L-med
24398	75005597	8	15 mm	L-lat/R-med
24308	75005547	10	5 mm	
24309	75005548	10	10 mm	
24394	75005593	10	15 mm	R-lal/L-med
24399	75005598	10	15 mm	L-lat/R-med



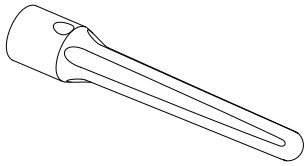
Set of replacement screws and clamp

Art. No. PLUS	Art. No. S&N	Description
24289	75005538	Set of Spare Screws and Clamp: 1× Tibial Insert Clamp 1× Stem Screw 2× Tibial Block Screw



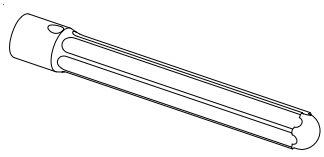
Cemented stems (conical) [CoCrMo]

Art. No. PLUS	Art. No. S&N	Height
24232	75005515	95 mm
24231	75005514	120 mm
24233	75005516	160 mm



Cementless stems – straight [Ti_6Al_4V]

Art. No. PLUS	Art. No. S&N	Size	Height
24251	75005517	Ø 10 mm	95 mm
24252	75005518	Ø 12 mm	95 mm
24254	75005520	Ø 14 mm	95 mm
24253	75005519	Ø 16 mm	95 mm
24256	75005521	Ø 12 mm	120 mm
24259	75005524	Ø 14 mm	120 mm
24257	75005522	Ø 16 mm	120 mm
24260	75005525	Ø 18 mm	120 mm
24258	75005523	Ø 20 mm	120 mm
24266	75005530	Ø 12 mm	160 mm
24267	75005531	Ø 14 mm	160 mm
24268	75005532	Ø 16 mm	160 mm
24269	75005533	Ø 18 mm	160 mm
24270	75005534	Ø 20 mm	160 mm
24261	75005526	Ø 12 mm	200 mm
24264	75005529	Ø 14 mm	200 mm
24262	75005527	Ø 16 mm	200 mm
24265	75005530	Ø 18 mm	200 mm
24263	75005528	Ø 20 mm	200 mm



Cemented and cementless stems are identical for femoral and tibial components of RT-PLUS° Modular knee system.

RT-PLUS° Modular Instrument Set

Set No. PLUS/S&N
0944033/75200235

Trial stems and reamers

Case Set No. PLUS/S&N
0944034/75200236

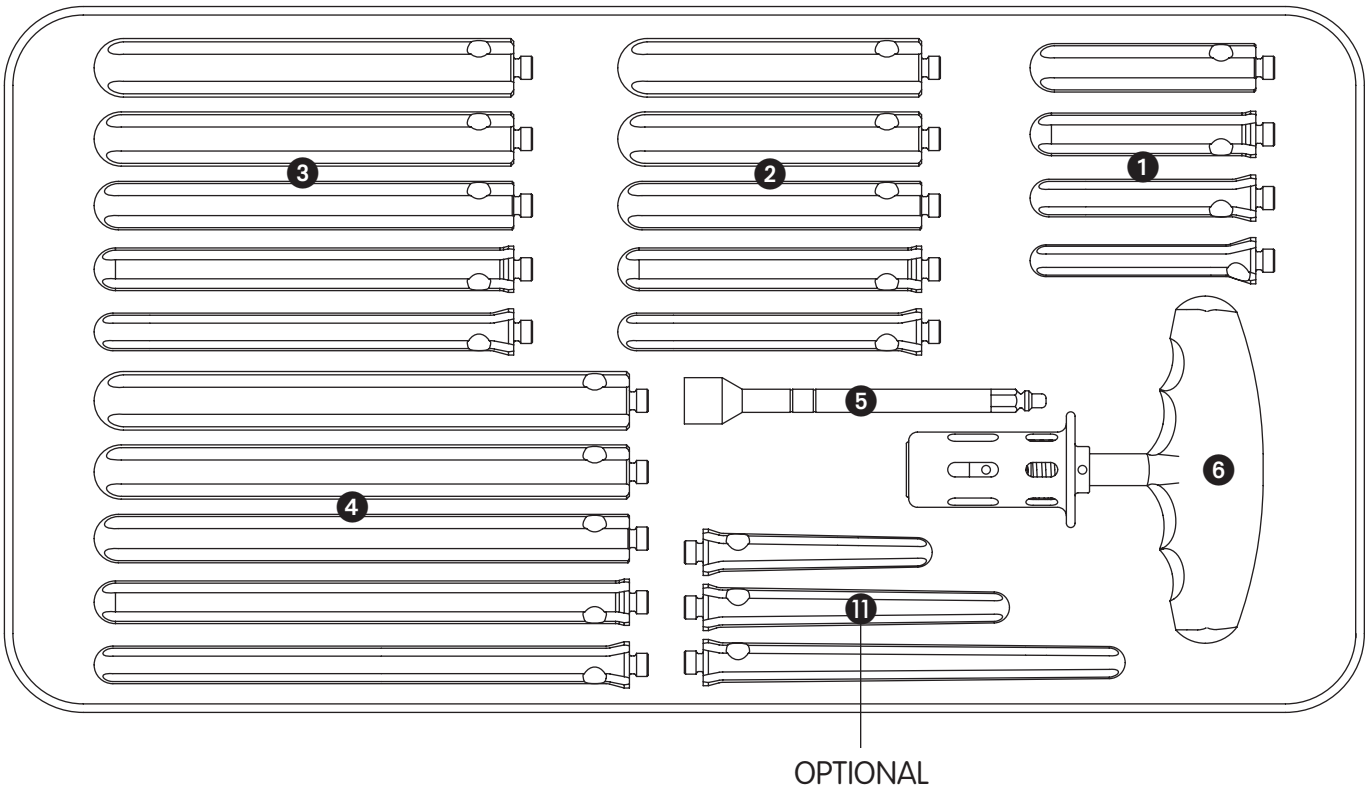
	Art. No. PLUS	Art. No. S&N	Description	Size
	240462	**75005464**	**Case Trial Stems, Empty**	
	990019	**75007661**	**Case Lid**	
❶	240112	75005341	Trial Stem	Ø 10 / 95 mm
	240113	75005342	Trial Stem	Ø 12 / 95 mm
	240114	75005343	Trial Stem	Ø 14 / 95 mm
	240115	75005344	Trial Stem	Ø 16 / 95 mm
❷	240116	75005345	Trial Stem	Ø 12 / 120 mm
	240117	75005346	Trial Stem	Ø 14 / 120 mm
	240118	75005347	Trial Stem	Ø 16 / 120 mm
	240119	75005348	Trial Stem	Ø 18 / 120 mm
	240120	75005349	Trial Stem	Ø 20 / 120 mm
❸	240121	75005350	Trial Stem	Ø 12 / 160 mm
	240122	75005351	Trial Stem	Ø 14 / 160 mm
	240123	75005352	Trial Stem	Ø 16 / 160 mm
	240124	75005353	Trial Stem	Ø 18 / 160 mm
	240125	75005354	Trial Stem	Ø 20 / 160 mm
❹	240126	75005355	Trial Stem	Ø 12 / 200 mm
	240127	75005356	Trial Stem	Ø 14 / 200 mm
	240128	75005357	Trial Stem	Ø 16 / 200 mm
	240129	75005358	Trial Stem	Ø 18 / 200 mm
	240111	75005340	Trial Stem	Ø 20 / 200 mm
❺	600195	75011898	Extension for Trial Stem	Ø 8 mm
❻	600112	75007098	Reamer + Trial Stem Handle	

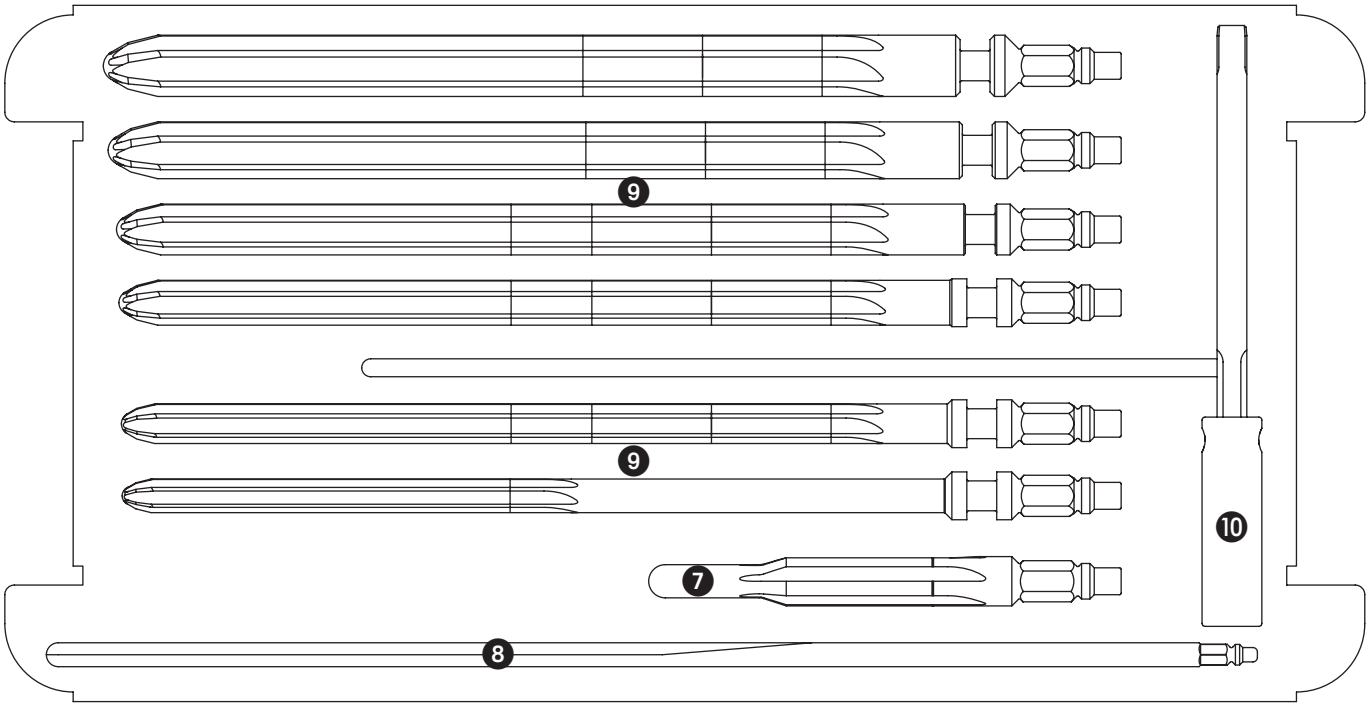
	240461	**75005463**	**Tray Reamer, Empty**	
❼	240142	75005360	Stepped Reamer	Ø 10 / 16 mm
❽	600232	75007168	IM Rod	Ø 8 mm
❾	240380	75005413	Reamer	Ø 10 mm
	240381	75005414	Reamer	Ø 12 mm
	240382	75005415	Reamer	Ø 14 mm
	240383	75005416	Reamer	Ø 16 mm
	240384	75005417	Reamer	Ø 18 mm
	240385	75005418	Reamer	Ø 20 mm
❿	240387	75005419	Reamer Alignment Guide EM	

Optional cemented trial stems (on request)

Set No. PLUS/S&N
0944045/75200247

	Art. No. PLUS	Art. No. S&N	Description	Size
⓫	240109	75005338	Trial Stem	95 mm
	240398	75005422	Trial Stem	120 mm
	240110	75005339	Trial Stem	160 mm





Femoral instruments

Case Set No. PLUS/S&N
0944035/75200237

	Art. No. PLUS	Art. No. S&N	Description	Size
	240463	**75005465**	**Case Femoral Instruments, Empty**	
	990019	**75007661**	**Case Lid**	
❶	240169	75005364	IM Femoral Drill Guide, Adjustable	
❷	240002	75005299	Awl	
❸	240003	75005300	Stepped Drill	Ø 8 / 14 mm
❹	251073	75005659	IM Drill with Starter Tip	Ø 8 mm
❺	251065	75005663	Drill Bohrer (2 pieces)	Ø 3.2 mm
	600179	75007140	Bone Pin (4 pieces)	75 mm
	600180	75007141	Bone Pin (4 pieces)	100 mm
	600177	75007138	Bone Pin with Head (4 pieces)	25 mm
	600178	75007139	Bone Pin with Head (4 pieces)	38 mm
	MEM01179	75005420	Allen Wrench	SW 3.5
❻	240391	75018329	Pin Extractor	
❼	240305	75005389	Femoral Sizer	2
	240306	75005390	Femoral Sizer	4
	240307	75005391	Femoral Sizer	6
	240308	75005392	Femoral Sizer	8
	240309	75005393	Femoral Sizer	10
❽	600187	75007148	Femoral Suspension Device Revision	
❾	600184	75007145	Femoral Bushing	6°
❿	600183	75007144	Femoral Distal Spacer Revision	7 mm
⓫	600398	75007233	Femoral/Tibial Cutting Block Revision	
⓬	252746	75005902	Resection Stylus	1 mm
⓭	240401	75005423	Femoral Cutting Block Revision	2
	240402	75005424	Femoral Cutting Block Revision	4
	240403	75005425	Femoral Cutting Block Revision	6
	240404	75005426	Femoral Cutting Block Revision	8
	240405	75005427	Femoral Cutting Block Revision	10
⓮	252068	75005857	Quick Lock Handle (2 pieces)	
⓯	240149	75005361	Centering Template	
⓰	240395	75005421	Box Saw Guide Pos. Device IM	2
	240325	75005398	Box Saw Guide Pos. Device IM	4–10
⓱	240326	75005399	Box Saw Guide IM Positioning	2
	240327	75005400	Box Saw Guide IM Positioning	4–8
	240328	75005401	Box Saw Guide IM Positioning	10
⓲	240335	75005408	Box Saw Guide IM	2
	240336	75005409	Box Saw Guide IM	4–10
⓳	240451	75005455	Box Rasp	2
	240452	75005456	Box Rasp	4–10

Optional drill with AO connection (on request)

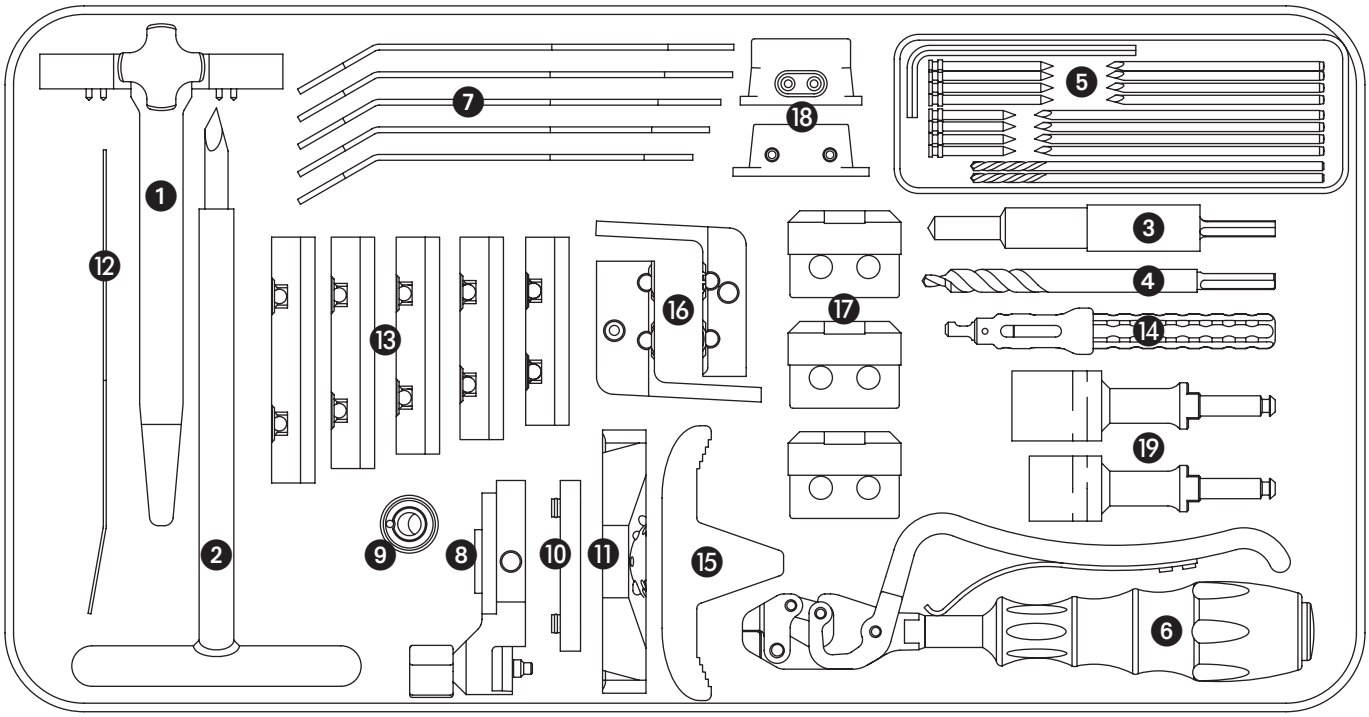
Set No. PLUS/S&N
0944046/75200248

	Art. No. PLUS	Art. No. S&N	Description	Size
(❸)	240374	75005412	Stepped Drill (AO)	Ø 8 / 14 mm
(❹)	251097	75005673	IM Drill with Starter Tip (AO)	Ø 8 mm
(❺)	251096	75005672	Drill (AO)	Ø 3.2 mm

Optional EM Box Preparation (on request)

Set No. PLUS/S&N
0944047/75200249

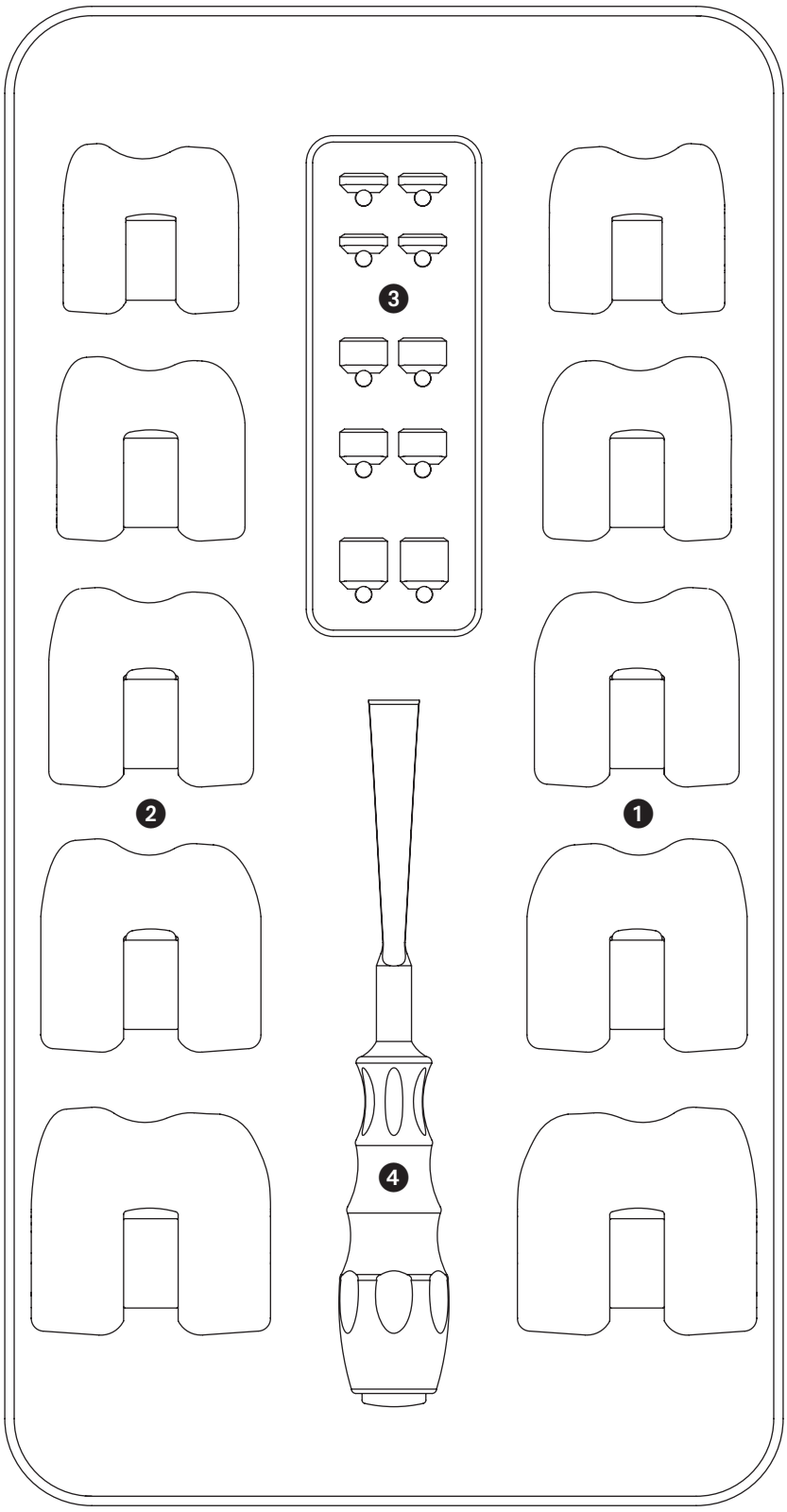
	Art. No. PLUS	Art. No. S&N	Description	Size
(⓰)	240407	75005429	Box Saw Guide EM	2
	240406	75005428	Box Saw Guide EM	4–10



Femoral trials

Case Set No. PLUS/S&N
0944036/75200238

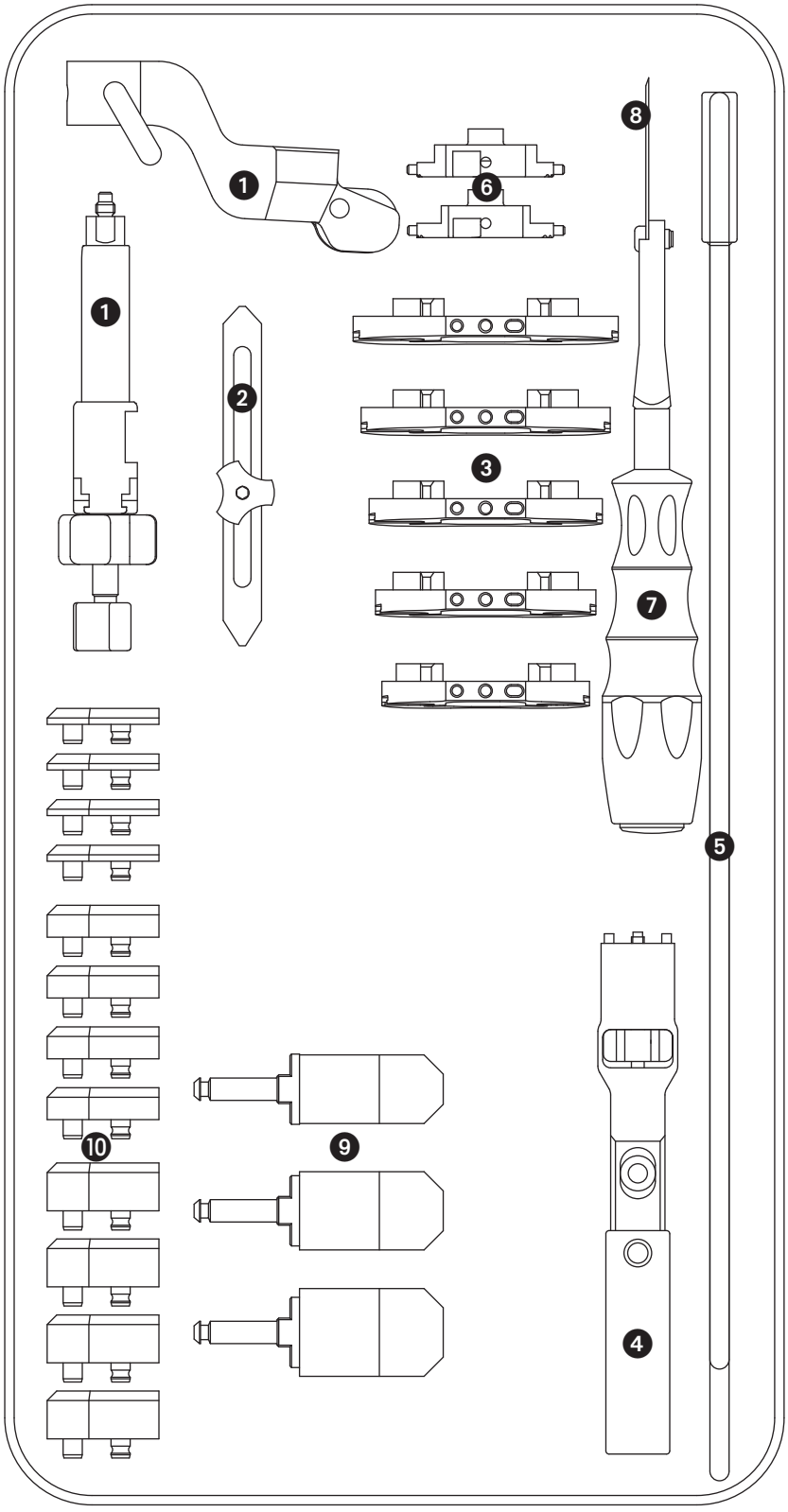
	Art. No. PLUS	Art. No. S&N	Description	Size
	240464	**75005466**	**Case Femoral Trials, Empty**	
	990019	**75007661**	**Case Lid**	
❶	240300	75005384	Femoral Trial Left	2
	240301	75005385	Femoral Trial Left	4
	240302	75005386	Femoral Trial Left	6
	240303	75005387	Femoral Trial Left	8
	240304	75005388	Femoral Trial Left	10
❷	240330	75005403	Femoral Trial Right	2
	240331	75005404	Femoral Trial Right	4
	240332	75005405	Femoral Trial Right	6
	240333	75005406	Femoral Trial Right	8
	240334	75005407	Femoral Trial Right	10
❸	600204	75007156	Femoral Block Trial (4 pieces)	5 mm
	600205	75007157	Femoral Block Trial (4 pieces)	10 mm
	600201	75007154	Femoral Block Trial (2 pieces)	15 mm
❹	600238	75007169	Curved Osteotome	


3
2
1
4

Tibial instruments

Case Set No. PLUS/S&N
0944037/75200239

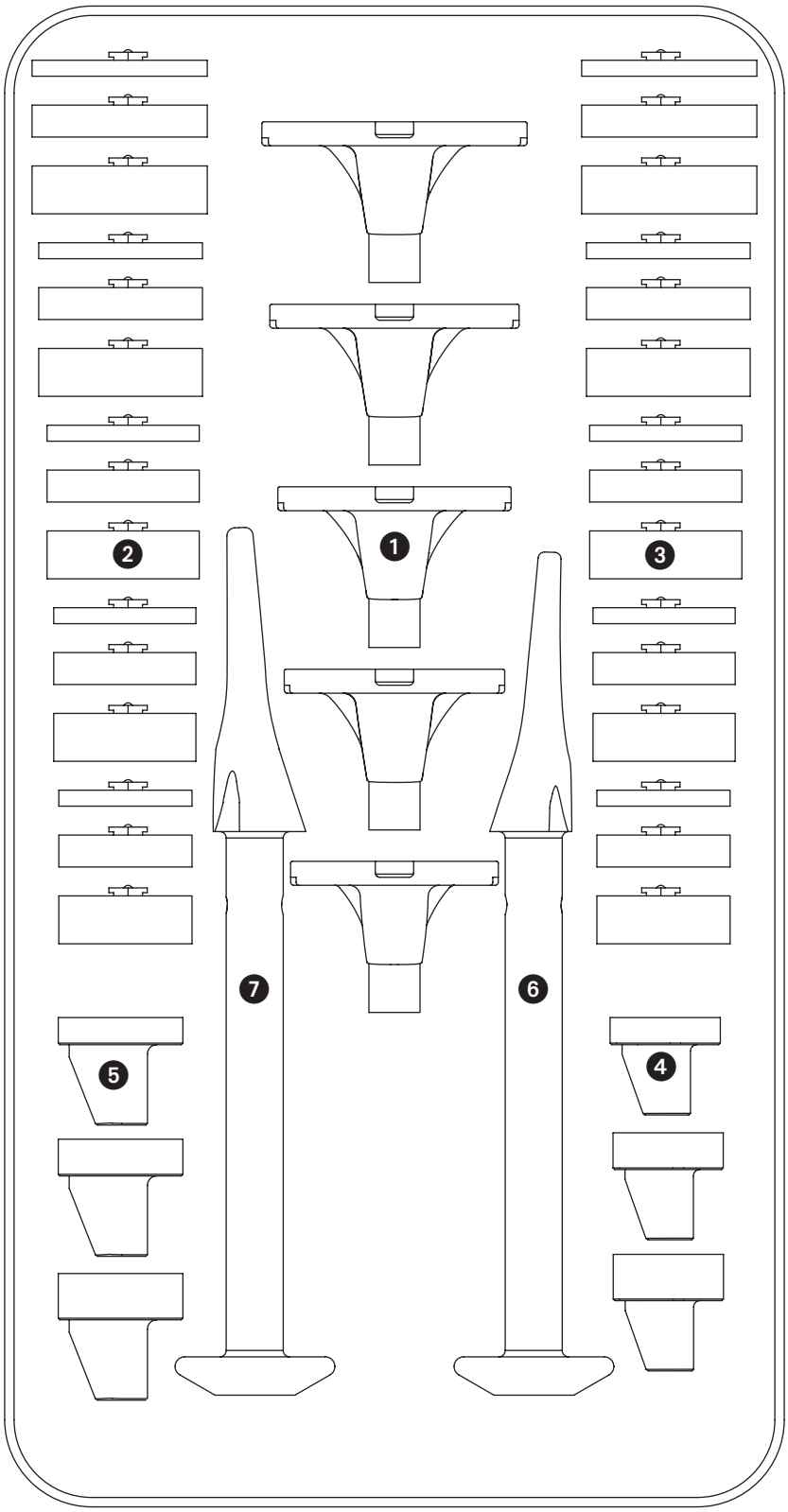
	Art. No. PLUS	Art. No. S&N	Description	Size
	240465	**75005467**	**Case Tibial Instruments, Empty**	
	990019	**75007661**	**Case Lid**	
❶	600162	75007131	Tibial Resection Guide IM (I / II)	± 6 mm
❷	600173	75010947	Tibia Stylus	1 mm / 11 mm
❸	240438	75000979	Tibial Sizer	2
	240439	75000980	Tibial Sizer	4
	240440	75000981	Tibial Sizer	6
	240441	75000982	Tibial Sizer	8
	240442	75000983	Tibial Sizer	10
❹	600175	75007137	Tibial Sizer Handle	
❺	600172	75007135	Axial Alignment Rod (I / II)	
❻	240372	75005410	Tibial Chisel Guide	2
	240373	75005411	Tibial Chisel Guide	4–10
❼	22000443	75018080	Chisel Handle	
❽	MEFL668R	75018330	Chisel Blade	10 mm / 45 mm
❾	240455	75005457	Spacer	8 mm
	240456	75005458	Spacer	11 mm
	240457	75005459	Spacer	14 mm
❿	240229	75005381	Spacer Attachment (4 pieces)	5 mm
	240230	75005382	Spacer Attachment (4 pieces)	10 mm
	240329	75005402	Spacer Attachment (2 pieces)	15 mm


1
6
8
1
2
3
7
5
10
9
4

Tibia trials

Case Set No. PLUS/S&N
0944038/75200240

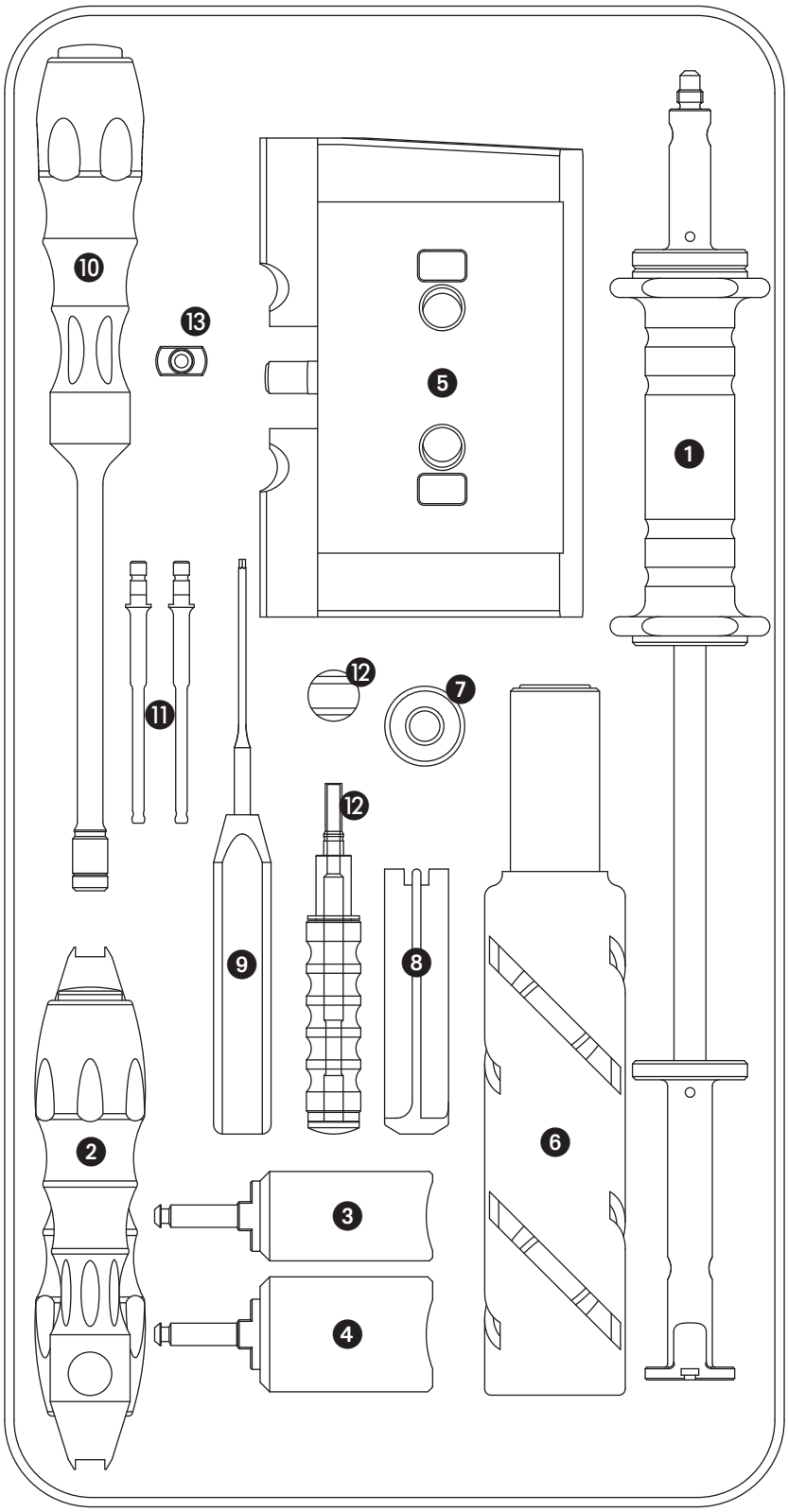
	Art. No. PLUS	Art. No. S&N	Description	Size
	240466	**75005468**	**Case Tibial Trials, Empty**	
	990019	**75007661**	**Case Lid**	
❶	240411	75005430	Tibial Trial	2
	240412	75005431	Tibial Trial	4
	240413	75005432	Tibial Trial	6
	240414	75005433	Tibial Trial	8
	240415	75005434	Tibial Trial	10
❷	240416	75005435	Tibial Block Trial R-Lat / L-Med	2 / 5 mm
	240418	75005437	Tibial Block Trial R-Lat / L-Med	2 / 10 mm
	240470	75005471	Tibial Block Trial R-Lat / L-Med	2 / 15 mm
	240420	75005439	Tibial Block Trial R-Lat / L-Med	4 / 5 mm
	240422	75005441	Tibial Block Trial R-Lat / L-Med	4 / 10 mm
	240471	75005472	Tibial Block Trial R-Lat / L-Med	4 / 15 mm
	240424	75005443	Tibial Block Trial R-Lat / L-Med	6 / 5 mm
	240426	75005445	Tibial Block Trial R-Lat / L-Med	6 / 10 mm
	240472	75005473	Tibial Block Trial R-Lat / L-Med	6 / 15 mm
	240428	75005447	Tibial Block Trial R-Lat / L-Med	8 / 5 mm
	240430	75005449	Tibial Block Trial R-Lat / L-Med	8 / 10 mm
	240473	75005474	Tibial Block Trial R-Lat / L-Med	8 / 15 mm
	240432	75005451	Tibial Block Trial R-Lat / L-Med	10 / 5 mm
	240434	75005453	Tibial Block Trial R-Lat / L-Med	10 / 10 mm
	240474	75005475	Tibial Block Trial R-Lat / L-Med	10 / 15 mm
❸	240417	75005436	Tibial Block Trial L-Lat / R-Med	2 / 5 mm
	240419	75005438	Tibial Block Trial L-Lat / R-Med	2 / 10 mm
	240475	75005476	Tibial Block Trial L-Lat / R-Med	2 / 15 mm
	240421	75005440	Tibial Block Trial L-Lat / R-Med	4 / 5 mm
	240423	75005442	Tibial Block Trial L-Lat / R-Med	4 / 10 mm
	240476	75005477	Tibial Block Trial L-Lat / R-Med	4 / 15 mm
	240425	75005444	Tibial Block Trial L-Lat / R-Med	6 / 5 mm
	240427	75005446	Tibial Block Trial L-Lat / R-Med	6 / 10 mm
	240477	75005478	Tibial Block Trial L-Lat / R-Med	6 / 15 mm
	240429	75005448	Tibial Block Trial L-Lat / R-Med	8 / 5 mm
	240431	75005450	Tibial Block Trial L-Lat / R-Med	8 / 10 mm
	240478	75005479	Tibial Block Trial L-Lat / R-Med	8 / 15 mm
	240433	75005452	Tibial Block Trial L-Lat / R-Med	10 / 5 mm
	240435	75005454	Tibial Block Trial L-Lat / R-Med	10 / 10 mm
	240479	75005480	Tibial Block Trial L-Lat / R-Med	10 / 15 mm
❹	22000398	75005064	Tibial Insert Trial	2 / 8 mm
	22000399	75005065	Tibial Insert Trial	2 / 11 mm
	22000400	75005066	Tibial Insert Trial	2 / 14 mm
❺	240075	75005333	Tibial Insert Trial	4–10 / 8 mm
	240076	75005334	Tibial Insert Trial	4–10 / 11 mm
	240077	75005335	Tibial Insert Trial	4–10 / 14 mm
❼	22000412	75005074	Tibial Rasp	2
❽	22000413	75005075	Tibial Rasp	4–10


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Assembly instruments

Case Set No. PLUS/S&N
0944039/75200241

	Art. No. PLUS	Art. No. S&N	Description	Size
	240467	**75005469**	**Case Assembly Instrument, Empty**	
	990019	**75007661**	**Case Lid**	
❶	600181	75007142	Slap Hammer	
❷	600300	75007202	Modular Handle (2 pieces)	
❸	600288	75007200	Impactor	Small
❹	600289	75007201	Impactor	Large
❺	600239	75007170	Assembling Block	
❻	600228	75007166	Automatic Hammer	
❼	600299	75007201	Adapter for Automatic Hammer	
❽	600230	75007167	Stem Protector Cross	
❾	240093	75005337	Screwdriver for Stems (2 pieces)	SW 2
❿	253271	75005998	Screwdriver with Torque	
⓫	600279	75007188	Adapter with Spherical Hexagonal Head (2 pieces)	SW 3.5
⓬	240176	75005371	Plug Inserter	
	240177	75005372	Impacting Connection	
⓭	22000395	75005063	Adapter to Modular Handle	SW 6


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Patellar instruments

Case Set No. PLUS/S&N
0944003/75200207

	Art. No. PLUS	Art. No. S&N	Description	Size
	22000451	**75018088**	**Case Patellar Instruments, Empty**	
	990019	**75007661**	**Case Lid**	
❶	251204	75005702	Patellar Clamp	
❷	252203	75005881	Patellar Clamp Cutting Guide	
❸	251292	75005723	Patellar Trial	Ø 26 / 10 mm
	251293	75005724	Patellar Trial	Ø 29 / 10 mm
	251294	75005725	Patellar Trial	Ø 32 / 10 mm
	251295	75005726	Patellar Trial	Ø 35 / 10 mm
❹	251278	75005717	Patellar Drill with Stop	Ø 5.5 mm
❺	251282	75005719	Patellar Sizer	
❻	251277	75005716	Patellar Inserter	
❼	251230	75005707	Patellar Clamp Bushing	Ø 26 mm
	251231	75005708	Patellar Clamp Bushing	Ø 29 mm
	251232	75005709	Patellar Clamp Bushing	Ø 32 mm
	251233	75005710	Patellar Clamp Bushing	Ø 35 mm
❽	251240	75005711	Patellar Drill Guide	Ø 26 mm
	251241	75005712	Patellar Drill Guideg	Ø 29 mm
	251242	75005713	Patellar Drill Guide	Ø 32 mm
	251243	75005714	Patellar Drill Guide	Ø 35 mm
❾	251216	75005706	Patellar Mill with Stop	Ø 26 mm
	251283	75005707	Patellar Mill with Stop	Ø 29 mm
	251284	75005708	Patellar Mill with Stop	Ø 32 mm
	251285	75005709	Patellar Mill with Stop	Ø 35 mm
❿	22000327	75005034	Bone Thickness Sizer	

Optional patellar trials 8 mm (on request)

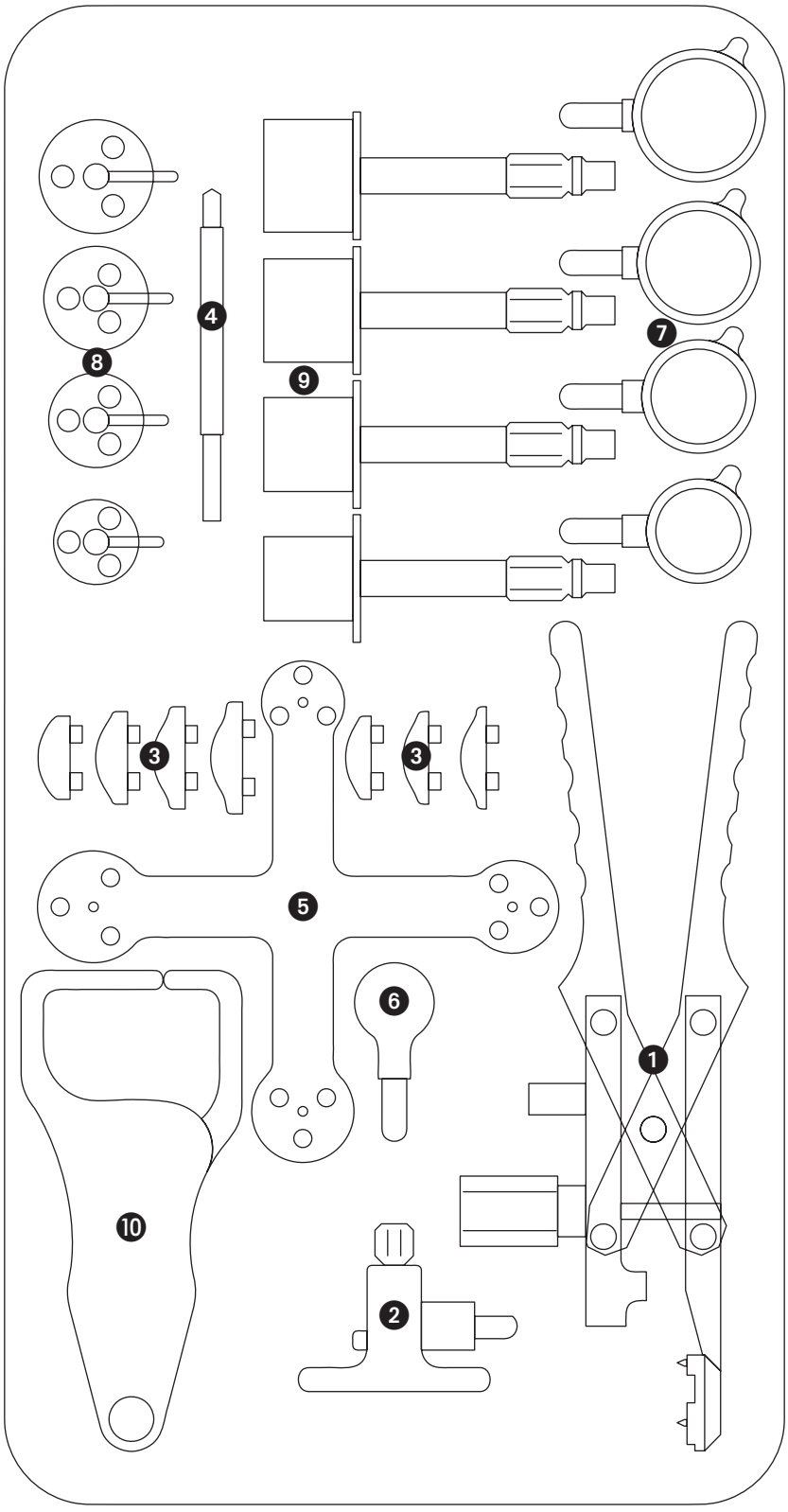
Set No. PLUS/S&N
0944008/75200212

	Art. No. PLUS	Art. No. S&N	Description	Size
(❸)	251209	75005703	Patellar Trial	Ø 26 / 8 mm
	251210	75005704	Patellar Trial	Ø 29 / 8 mm
	251211	75005705	Patellar Trial	Ø 32 / 8 mm

Optional reamer/drill with AO coupling type (on request)

Set No. PLUS/S&N
0944049/75200251

	Art. No. PLUS	Art. No. S&N	Description	Size
(❹)	22000038	75004871	Patellar Drill with Stop (AO)	Ø 5.5 mm
(❾)	22000280	75004989	Patellar Mill with Stop (AO)	Ø 26 mm
	22000281	75004990	Patellar Mill with Stop (AO)	Ø 29 mm
	22000282	75004991	Patellar Mill with Stop (AO)	Ø 32 mm
	22000283	75004992	Patellar Mill with Stop (AO)	Ø 35 mm


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RT-PLUS® Modular



Patellar component

Ø 26	Ø 29	Ø 32	Ø 35
21182* / 8mm 21192 / 10mm	21183* / 8mm 21193 / 10mm	21184* / 8mm 21194 / 10mm	21195 / 10mm

* Special sizes

Femoral blocks distal/posterior

Size 2	Size 4	Size 6	Size 8	Size 10
Distal: 24371 / 5mm 24372 / 10mm 24373 / 15mm	Distal: 24374 / 5mm 24375 / 10mm 24376 / 15mm	Distal: 24377 / 5mm 24378 / 10mm 24379 / 15mm	Distal: 24380 / 5mm 24381 / 10mm 24382 / 15mm	Distal: 24383 / 5mm 24384 / 10mm 24385 / 15mm
Posterior: 24350 / 5mm 24351 / 10mm	Posterior: 24352 / 5mm 24353 / 10mm	Posterior: 24354 / 5mm 24355 / 10mm	Posterior: 24356 / 5mm 24357 / 10mm	Posterior: 24358 / 5mm 24359 / 10mm

Femoral component right/left

Size 2	Size 4	Size 6	Size 8	Size 10
24312 24322	24314 24324	24316 24326	24318 24328	24320 24330

Tibial inserts

Size 2	Size 4	Size 6	Size 8	Size 10
24046 / 8mm 24047 / 11mm 24048 / 14mm	24056 / 8mm 24057 / 11mm 24058 / 14mm	24066 / 8mm 24067 / 11mm 24068 / 14mm	24076 / 8mm 24077 / 11mm 24078 / 14mm	24086 / 8mm 24087 / 11mm 24088 / 14mm

Tibial component

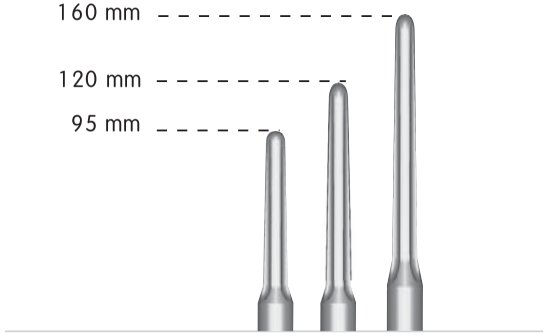
Size 2	Size 4	Size 6	Size 8	Size 10
24332	24334	24336	24338	24340

Tibial blocks

Size 2	Size 4	Size 6	Size 8	Size 10
24300 / 5mm 24301 / 10mm 24390 / 15mm R-Lat / L-Med 24395 / 15mm L-Lat / R-Med	24302 / 5mm 24303 / 10mm 24391 / 15mm R-Lat / L-Med 24396 / 15mm L-Lat / R-Med	24304 / 5mm 24305 / 10mm 24392 / 15mm R-Lat / L-Med 24397 / 15mm L-Lat / R-Med	24306 / 5mm 24307 / 10mm 24393 / 15mm R-Lat / L-Med 24398 / 15mm L-Lat / R-Med	24308 / 5mm 24309 / 10mm 24394 / 15mm R-Lat / L-Med 24399 / 15mm L-Lat / R-Med

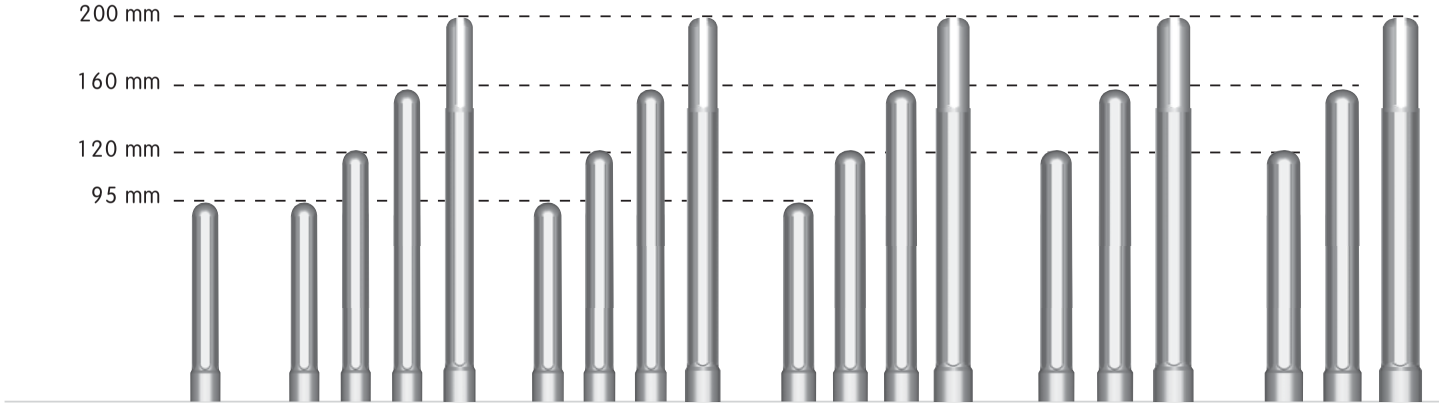
Straight stems

Cemented stems



24232 / 95mm
24231 / 120mm
24233 / 160mm

Non-cemented stems



Ø10

24251 / 95mm

Ø12

24252 / 95mm
24256 / 120mm
24266 / 160mm
24261 / 200mm

Ø14

24254 / 95mm
24259 / 120mm
24267 / 160mm
24264 / 200mm

Ø16

24253 / 95mm
24257 / 120mm
24268 / 160mm
24262 / 200mm

Ø18

24260 / 120mm
24269 / 160mm
24265 / 200mm

Ø20

24258 / 120mm
24270 / 160mm
24263 / 200mm

Documents

Note

The following documents are available for your assistance.

Product-accompanying Documents

Description	Lit. No.
Product Portfolio PLUS SOLUTION KNEE FAMILY	1685
Sawblades for the PLUS SOLUTION KNEE FAMILY	1403
Surgical Technique “Intramedullary Application”	1313
Product Information	1330
X-Ray Templates (1.15:1)	1135-A-B
X-Ray Templates (1:1)	1584-A-B
Product Overview	1346
Clinical Video “TKR with Severe Joint Instability”	1798

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Switzerland

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Lit. No. 1313-e Ed. 05/09

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