AESCULAP® OrthoPilot®

THA Universal Version 2
Navigated Surgical Technique

B|BRAUN
SHARING EXPERTISE

OrthoPilot® THA Universal Version 2

THA - Total Hip Arthroplasty

AESCULAP® OrthoPilot®

Trust in your ambition

OrthoPilot® supports the implantation of knee and hip endoprostheses. An important criterion for the development of this technology was the full integration into the operative workflow. At the same time, the central topic was a patient-friendly and patient-specific navigation.

From the beginning, a method was developed that dispenses CT and MRI pre-examination and supports the integration into the OR workflow.

- No CT required
- In accordance to common preparation instruments
- Ergonomic instruments aligned to surgery (1)
- User-friendly navigation workflow (1)
- Modular and adjustable workflows
- Supports implant alignment
- Intra-operative documentation
- International studies confirm better alignment (2)
- Used in over 600 hospitals

(1) Aesculap AG, Usability test: Usability validation of OrthoPilot Elite, test report no. TR-USE-20190528-01. Following the test plan the system was easy and safe to operate and configure for the users. A safe and reliable working with the system could be observed.
(2) www.orthopilot.com

Content

25 Years of Advancements

Get more information about the OrthoPilot® navigation system by clicking on this area.

www.orthopilot.com

New New features compared to THA Universal Version 1

01 | OrthoPilot® Navigation System

OrthoPilot® THA Universal Version 2

Indication

The OrthoPilot® navigation system with its HipSuite smart module is suited for primary hip joint replacement with implants approved by AESCULAP® for navigated application.

All indications for a total hip replacement are generally included.

Contraindication

Use of a navigation system is contraindicated in the following cases:

- If the hip joint is too severely damaged
- If palpation of the landmarks is not possible
- In cases of severe pelvis deformities
- In cases of severe femoral deformities
- In cases of severe knee deformities

Contraindications for the respective implants, which are specified in the instructions for use, must be observed in addition.

Pre-Op Planning

Even if the use of the navigation system is planned, pre-operative planning is highly recommended in order to assess the patient-specific original state.

Taking images in both planes (AP and ML) is recommended. For all AESCULAP® hip implant systems, x-ray templates in 1.15:1 scale are available.

These are also available in appropriate formats for digital planning systems.

02 | HipSuite

OrthoPilot® THA Universal Version 2

HipSuite SMART

OrthoPilot® HipSuite smart includes applications that give a variety of important information for Total Hip Arthroplasty (THA) and can be used with different approaches and patient positions.

HipSuite smart applications support conventional as well as minimally invasive surgical techniques.

OrthoPilot® navigation can be used with all AESCULAP® cup and stem implants.

HipSuite smart represents the collection of all existing hip software applications. Each single application can furthermore be adapted to the individual surgeon's needs.

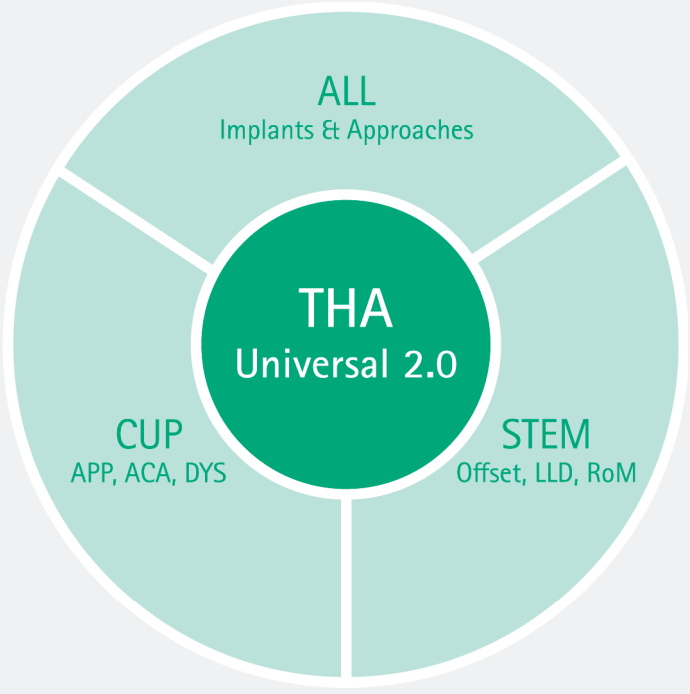
THA Universal Version 2

As the most comprehensive software THA Universal Version 2 provides the possibility for cup positioning and orientation including a dedicated feature for dysplastic acetabular cases as well as leg length difference (LLD), offset management, combined anteversion and range of motion (RoM) simulations for the implantation of the femoral component.

The software provides different options for pelvis orientation. The Acetabular Center Axis (ACA), including the optional palpation of the Transverse Acetabular Ligament (TAL), is especially useful for lateral patient positions.

Navigation using the Anterior Pelvic Plane (APP) as reference is most suitable for THA in supine patient position.

THA Universal Version 2 software can be ordered under the article number: FS239.



03 | Technology

OrthoPilot® THA Universal Version 2

Transmitter Technology

The OrthoPilot® navigation system works with state-of-the-art wireless transmitter technology. The single-use marker spheres with a reflective surface layer and an additional plastic protection, reflect infrared light falling on them from the camera.

Contaminations with blood or soft tissue can be wiped away easily from the plastic cover. The cap markers can easily be mounted on the transmitters. A well attached cap marker gives a haptic and acoustic clicking feedback.

As transmitters reflect the light from the camera, light coming from OR lamps can interfere with them. In these cases, light from OR lamps should be turned away from the transmitters.

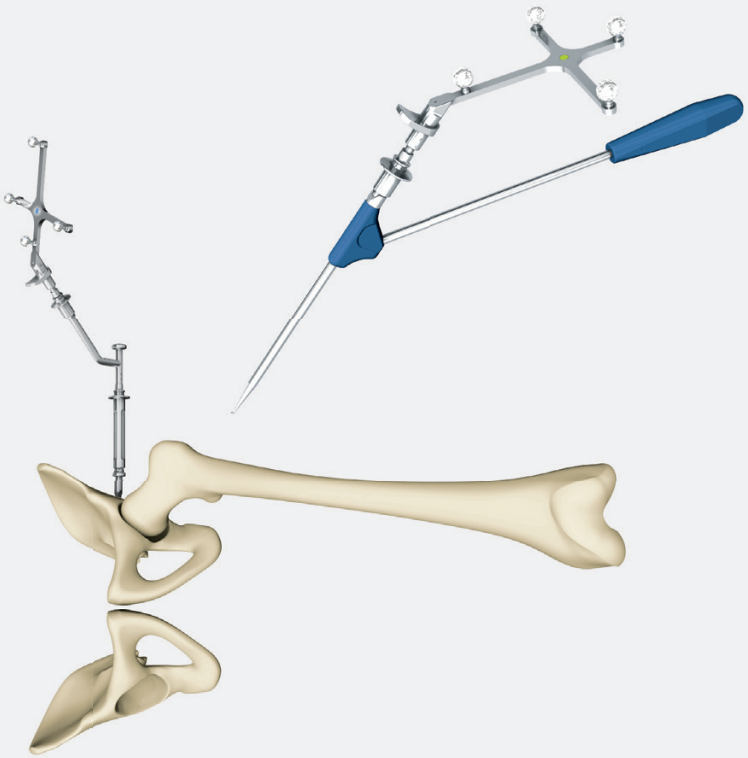
Affixed and Mobile

In order to assure reliable navigation results, the transmitters need to be fixed tightly to the patient and the instruments. Any movement of the transmitters must be avoided.

The blue transmitter (FS634) is fixed to the pelvis of the patient in order to locate the patient. This transmitter needs to be attached before dislocation or resection of the femoral head.

In order to record the reference points for the navigation of the cup or the stem implants the 45° bent pointer (FS934) is used with the yellow transmitter (FS633) attached to it.

In workflows were the Antetorsion / ROM option is selected an additional red transmitter (FS635) must be fixed on the greater trochanter with a c-clamp device.



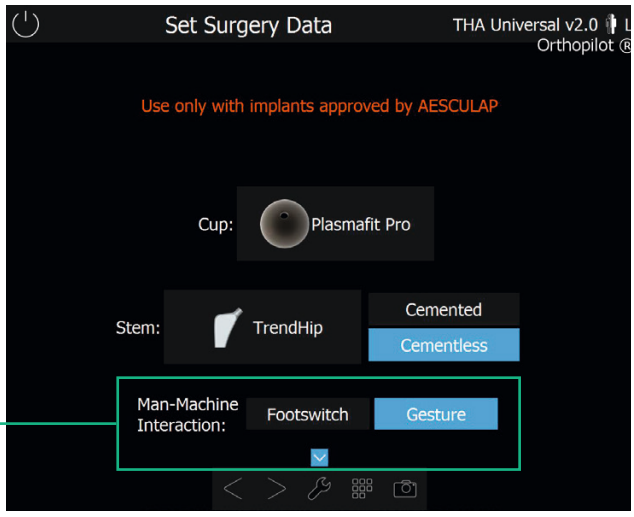
04 | Interaction

OrthoPilot® THA Universal Version 2

Man Machine Interaction

For THA Universal Version 2 either footswitch or gesture control can be selected.
In the screen SET SURGERY DATA the Man Machine Interaction (MMI) must be defined.

Besides that, the touch screen (control TOOLBAR, buttons, virtual keyboard), the virtual pointer and the PIE MENU are always available.



Note | Should one of the above-named interaction methods experience a technical failure, the OrthoPilot® touch screen can also be used as an interaction tool. This will require someone who is not directly within the operating field to press the symbols on the screen to trigger the corresponding actions during surgery.

Footswitch

Simple and easy control with the wireless foot pedal.
For use with OrthoPilot® *Elite*.

Note | When using the OrthoPilot® System FS101 with pointer and foot pedal, use the wired foot pedal (FS007).

1 Central Foot Button

Short click: Toggle forward / record data
Long click: Only triggers an action during the software steps:

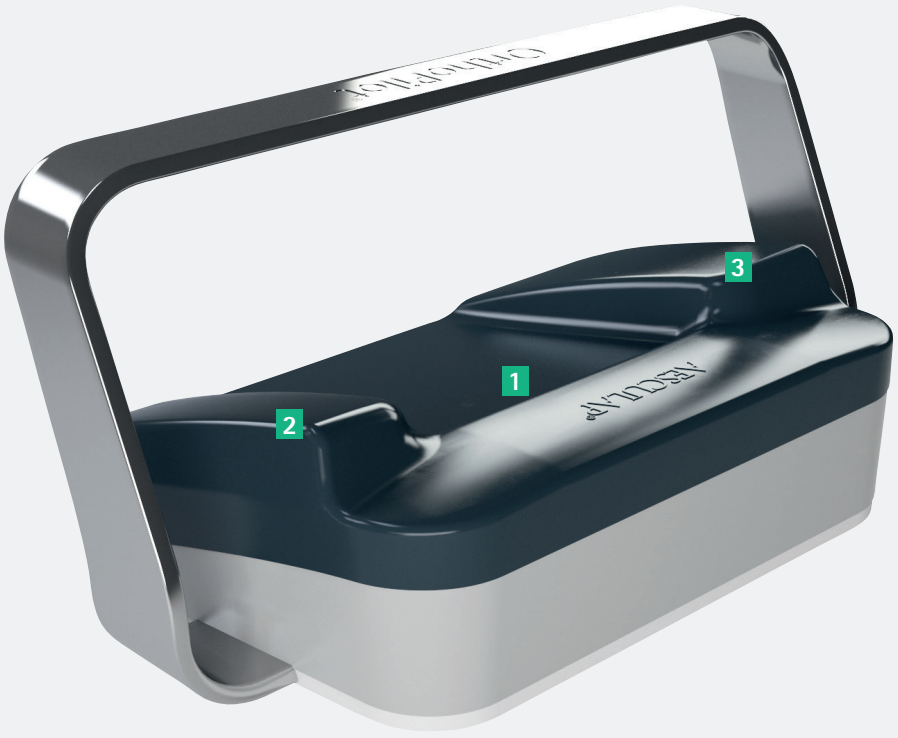
- ACA sup. / ant. / post. references
- Dysplasia Teardrop and post. references
- TAL ligament
- Cloud acquisitions

2 Right Foot Button

Short click: Open the PIE MENU
Long click: Screen shot

3 Left Foot Button

Long click: Delete data within the current step



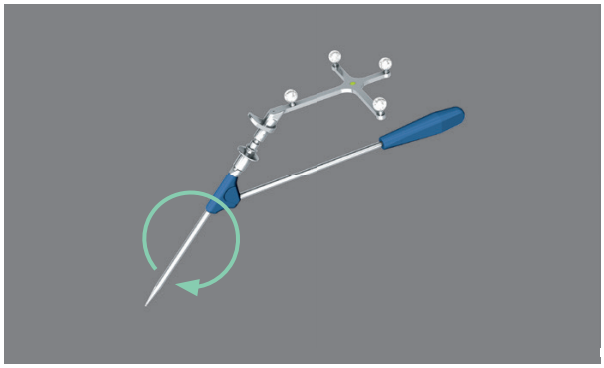
04 | Interaction

OrthoPilot® THA Universal Version 2

Gesture

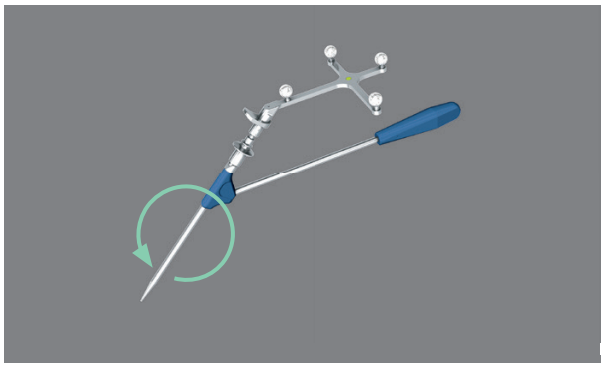
With the pointer FS934 and the mounted FS633 transmitter the user can palpate bone reference points and control the software using specific defined gestures.

Note | The software TOOLBOX includes a tutorial for all gestures with an individual explanation and the possibility to practice.



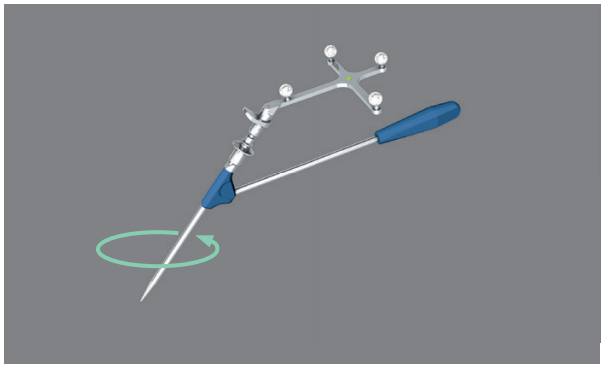
Go to Next Step

Gesturing with the pointer in a **vertical clockwise** circle.



Go to Previous Step

Simulating a **vertical counter-clockwise** circle.



Open the Pie Menu

Gesturing with the pointer in a **horizontal counter-clockwise.**

Timer function

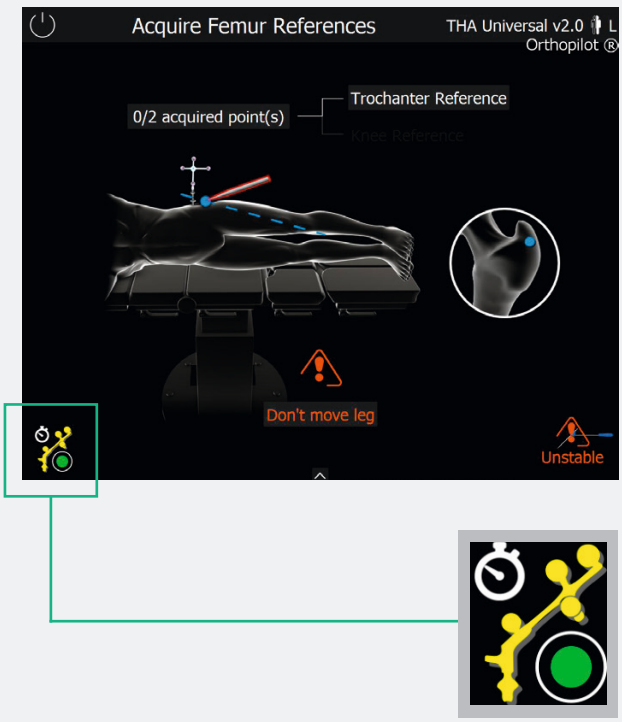
The pointer also has a timer function for use in pure data acquisition. Hold the tip of the pointer still until the record symbol appears on the OrthoPilot® screen, and a blue highlight begins gradually appearing around the edge.

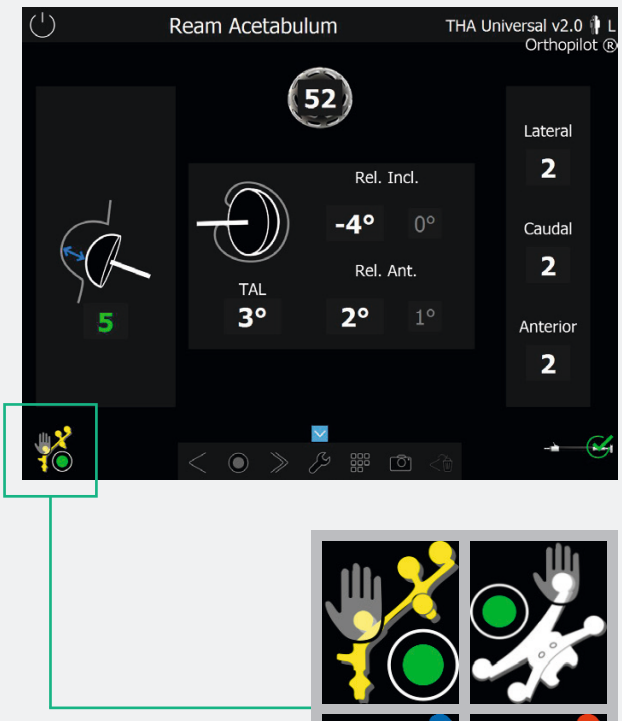
Once the record symbol is completely outlined in blue, the data has been successfully recorded, and the software will proceed to the next step.

Hiding Function

To record a specific position of reamer or implant hiding the indicated marker acquires the position of the device.

When the gesture control has been selected the icons on the bottom left corner show the needed action which needs to be taken to proceed the workflow.





05 | Implant System

OrthoPilot® THA Universal Version 2

Stem Implants

The main stem implants of the AESCULAP® hip portfolio can be navigated with OrthoPilot® THA Universal software:

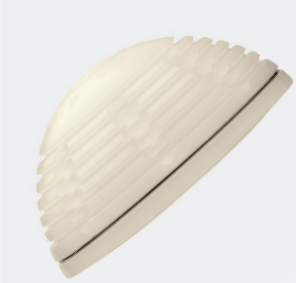
1 CoreHip®
2 Excia®
3 Excia® T
4 Metha®
5 Bicontact®
6 TRJ®
7 TrendHip®

Cup Implants

Besides the cementless and cemented acetabular implants also the various articulation diameters are included into the software:

1. Plasmafit®
2. Cemented Cup
3. CoCr metal head
4. Biolox® delta
5. Isocer®

1



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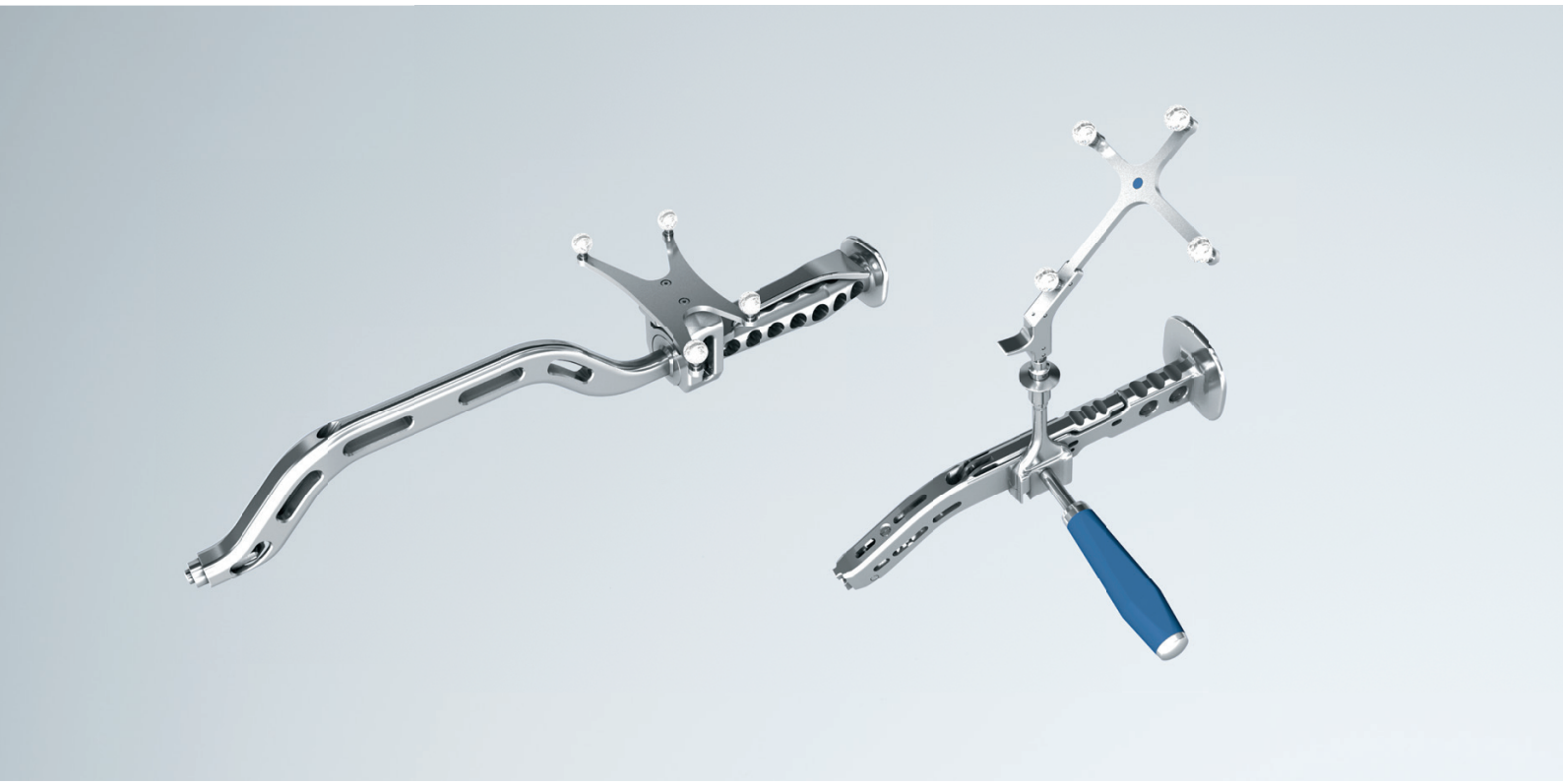
06 | Instruments

OrthoPilot® THA Universal Version 2



Cup Navigation

Instruments used for THA can be navigated by attaching the appropriate transmitters. Reamers and cup recorders are navigated with the yellow transmitter (FS633). The cup impactors for the navigation of the trial cup as well as the implantation of the final cup are navigated with the impactor Rigid Body for Plasmafit®.

Note | It must also be taken care during the complete surgical procedure that the OrthoPilot® system can always detect clearly both the fixed as well as the mobile transmitters.

Stem Navigation

For the rasp navigation the blue transmitter is affixed to the rasp handle by using the corresponding transmitter adapter.

For the stem navigation in reduced position with rasp or implant, the 45° pointer with the yellow transmitter is needed.

Platform Rasp Handles

According to the surgical approach and the surgeons' preference a suitable range of specific rasp handles is available.

The platform rasp handles are used for all stem implants, except Metha®. This reduces the learning curve as well as the instrument stock in the OR and makes the change of implants more efficient.

To guarantee backward compatibility the OrthoPilot® THA Universal Version 2 software works also with non-platform handles of previous generations.

For navigation, the appropriate adapter for the transmitter is attached to the respective rasp handle.

Adapters are available for:

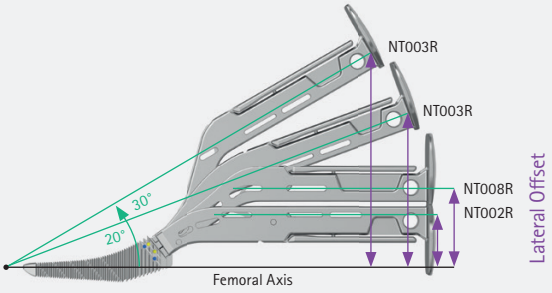
- Platform handles: for supine (FS716R) and lateral (FS718R) patient position
- Metha® handles: for supine (FS916R) and lateral (FS918R) patient position

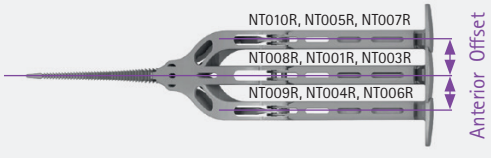
Note | Only the rasp handle series NT001R-NT010R with the ending "R" are compatible with THA navigation.

Alignment	Offset lateral** [mm]	Straight	Offset anterior [30 mm]		Patient Position	Surgical Approach	Rigid Body Adapter
			Left	Right			
30°	187	NT003R / NF140R*	NT006R / NF138R*	NT007R / NF139R*	Supine	Direct anterior	FS716R / FS916R*
20°	130	NT001R / NF180R*	NT004R / NF141R*	NT005R / NF142R*		Antero-lateral Lateral	FS716R / FS916R*
0°	70	NT008R	NT009R	NT010R		Direct anterior Antero-lateral Lateral	FS716R
0°	40	NT002R / NF144R*	NT010R / NF142R*	NT009R / NF141R*	Lateral	Posterior	FS718R / FS918R*
20°	130	NT001R / NF180R*	NT004R / NF141R*	NT005R / NF142R*		Antero-lateral Lateral	FS718R / FS918R*
0°	70	NT008R	NT009R	NT010R			

* For Metha® short stem

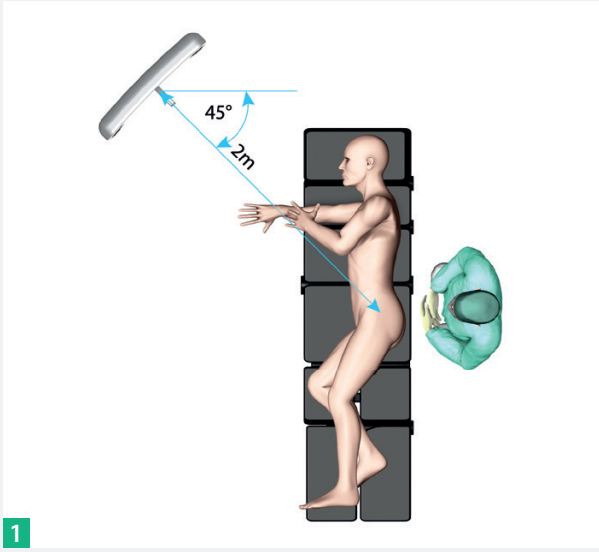
** There might be a slight deviation in the values depending on stem type and rasp size.





07 | OR Set-up

OrthoPilot® THA Universal Version 2



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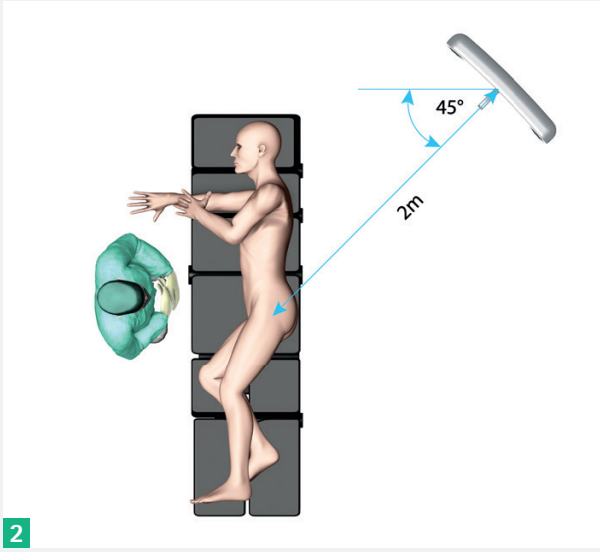


2

Lateral Patient Position

Regarding the positioning of the camera for lateral patient position, the ideal position is opposite of the surgeon at a distance of 1.8 - 2.2 m for FS101 and 2.5 - 3.0 m for OrthoPilot® Elite from the hip joint on the cranial side. The OrthoPilot® is set up at the height of the patient's head at an angle of 45°.

1 For different approaches in lateral patient position the surgeon can stand on the front or the back side of the patient.

For all approaches where the surgeon is standing dorsal to the patient the OrthoPilot® camera is positioned as described above on the ventral side of the patient, in order to assure a good view on the screen and visibility of the instruments during the navigation workflow.

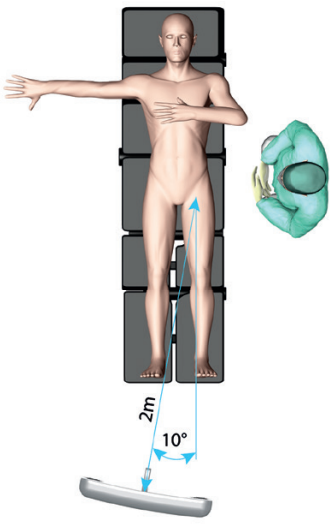
2 For all approaches where the surgeon is standing on the front side of the patient e.g. the so called modified Röttinger approach, the OrthoPilot® has to be positioned as described above but on the dorsal side of the patient.

Note | For positioning and sterile draping of the patient the standard procedures are followed. When using the Anterior Pelvic Plane for reference in lateral patient position it is advisable to affix the patient holders in more cranial position to allow unhindered access to the palpation points of the anterior superior iliac spine and the symphysis.

Supine Patient Position

3 For supine patient position, the ideal position of the camera is on the opposite side of the operated hip joint at the foot of the operating table at a distance of 1.8 - 2.2 m for FS101 and 2.5 - 3.0 m for OrthoPilot® Elite and an angle of 10° to the surgical field.

Note | For positioning and sterile draping of the patient the standard procedures are followed. Especially in supine patient position, when using the Anterior Pelvic Plane for reference, care must be taken not to fix excessively thick layers of draping foil in the region of the palpation points of the anterior superior iliac spine and the symphysis.



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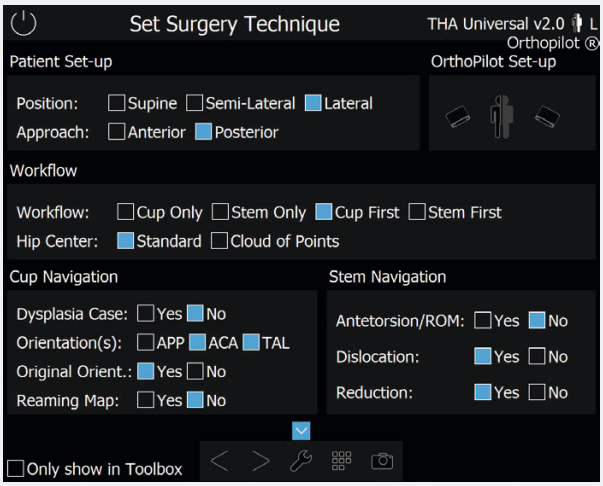
08 | Navigation Set-up

OrthoPilot® THA Universal Version 2



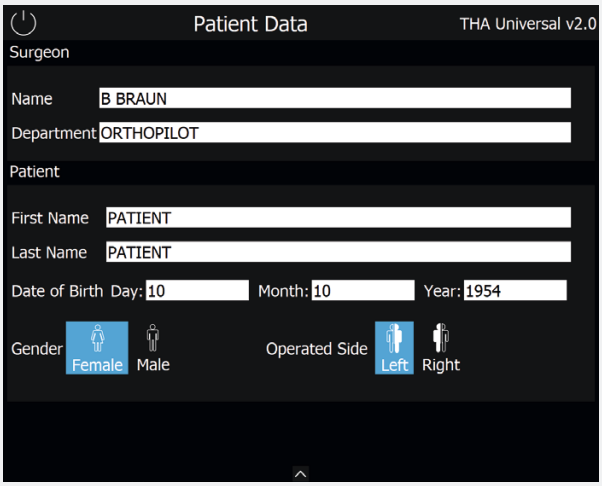
Set Surgery Technique

In this step the patient position and surgical approach as well as the position of the OrthoPilot® camera is defined. Furthermore the workflow and the acquisition of the hip center are determined. For minimally invasive approaches the hip center can also be recorded with the Cloud of Points option.

For cup navigation Dysplasia Case, Anterior Pelvis Plane (APP) or Acetabular Center Axis (ACA) orientation including the additional palpation of the Transverse Acetabular Ligament (TAL), the initial orientation of the cup position and the Reaming Map can be selected.

If also the stem implant should be navigated, offset and leg length can be simulated. Further choices need to be done if additionally Range of Motion (ROM) should be navigated. In this case an additional red rigid body fixation on the femur is necessary. Moreover the stem workflows can be displayed in dislocated and / or reduced leg position.

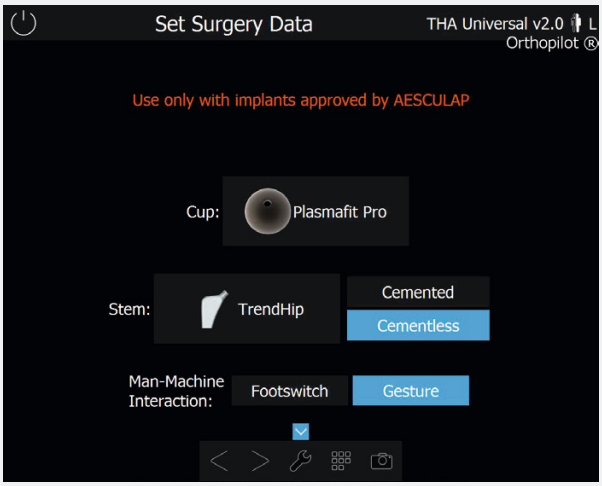
Note | ACA function might be disabled. For enabling, please get in contact with B. Braun Aesculap.



Set Patient Data

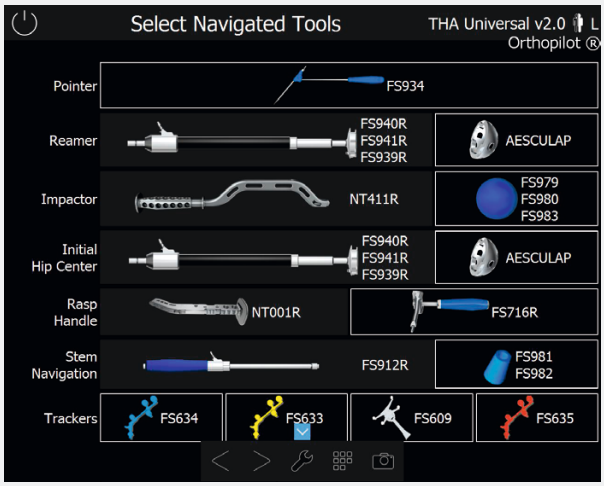
In the next step hospital and patient related data is entered into the software. The hospital related data can already be pre-defined via the installation.

Note | All fields must be filled with information to be able to advance to the next step. For OrthoPilot® *Elite* this step is already pre-filled thanks to the home screen.



Set Surgery Data

Implant information is entered. The selected implant can be adapted later during the workflow, if necessary. The possible implant choice displayed in this step can be pre-defined via the installation by the Aesculap service technicians, according to the implants available on site.

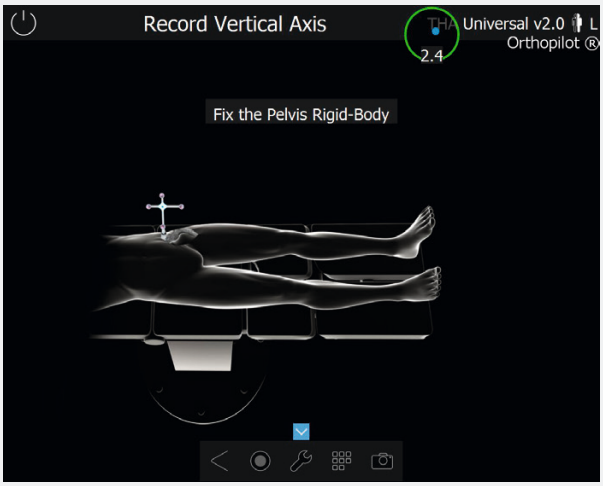


Select Navigated Tools

All instruments needed for the selected navigation options will be displayed in this step. For reamers, cup impactors or cup recorders as well as rasp handles further definition might be necessary during this step. All instrument definitions made for the selected navigation options will be memorized and pre-defined for the next surgery.

09 | Transmitter & Visibility

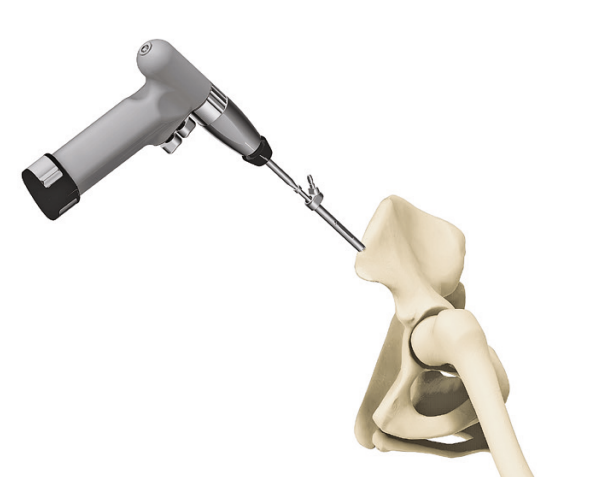
OrthoPilot® THA Universal Version 2



Fixation of the Pelvis Transmitter

At the beginning of the surgery the blue transmitter (FS634) is fixed to the pelvis of the patient. This needs to be done before dislocation or resection of the hip joint. For supine and lateral position different fixing devices are available.

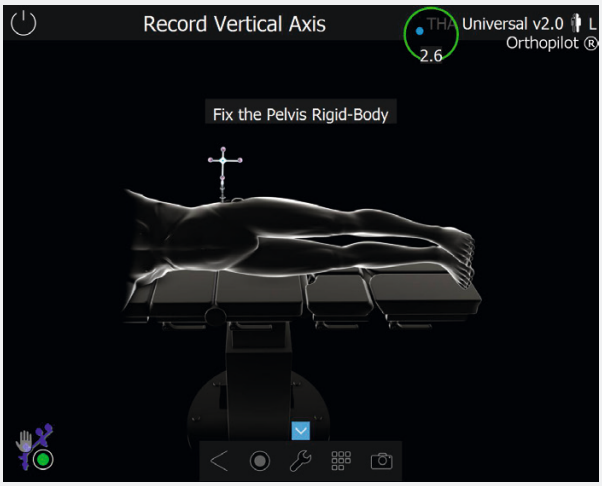
Note | It is necessary to maintain unobstructed visual contact between the transmitters and the camera for data acquisition.



Supine Position – Pelvis Screw

For achieving exact navigation results the secure attachment of the reference transmitters to the patient's bone for the whole duration of the navigation is important. For this purpose, the pelvic reference transmitter is affixed with the appropriate holding screw by making a stab incision of approx. 1 cm, about 5 cm posterior from the ipsilateral anterior superior iliac spine (ASIS). The holding screw is first screwed in by machine, and then by hand for the last turns using the screwdriver. The adapting position for the transmitter must point in a medial direction to ensure visibility by the camera.

Note | Pre-condition for achieving exact navigation results is the secure attachment of the reference transmitters to the patient's bone for the whole duration of navigation.



Lateral Position – Pelvis Nail

For procedures with lateral patient position, it is suitable to use the pelvic nail (FS985R). This technique avoids an additional incision on the iliac crest. The hip joint is dissected but not yet dislocated. The pelvic nail (FS985R) is placed into the holder at the end of the pelvic nail impactor (FS936R). Then the tip of the nail is placed superior to the acetabulum with the extraction feet of the nail extractor pointing inferiorly.

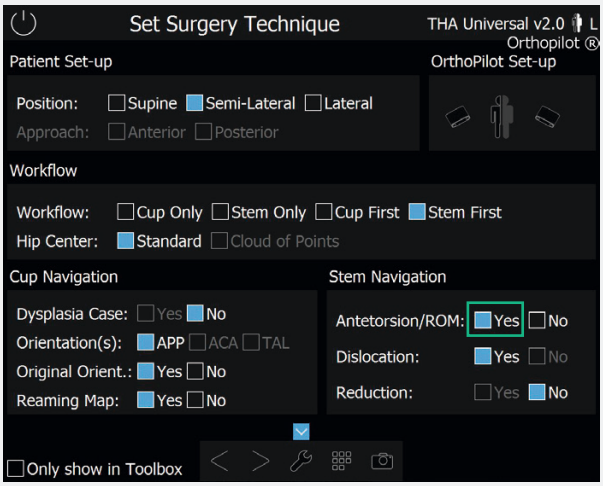
The nail should be placed approximately 2 cm superior and slightly anterior to the superior rim of the acetabulum and be oriented vertically. It must be assured that the position will not interfere with the reaming of the acetabulum. The nail is impacted through the ilium until the tip engages but does not perforate the medial cortex.

The nail impactor can be removed by gently pulling it vertically. If the bone connection for the nail is more than 1 cm below the surface of the skin, the extra long pelvic nail (FS986R) may be used. The nail can be removed at the end of the surgery by hooking the extraction feet of the nail impactor around the connection hub of the nail and pulling vertically.

Additional modular nail options are available for dedicated surgical needs.

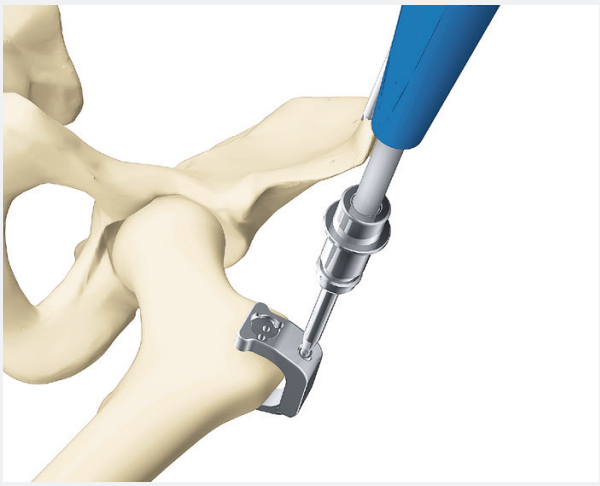
09 | Transmitter & Visibility

OrthoPilot® THA Universal Version 2



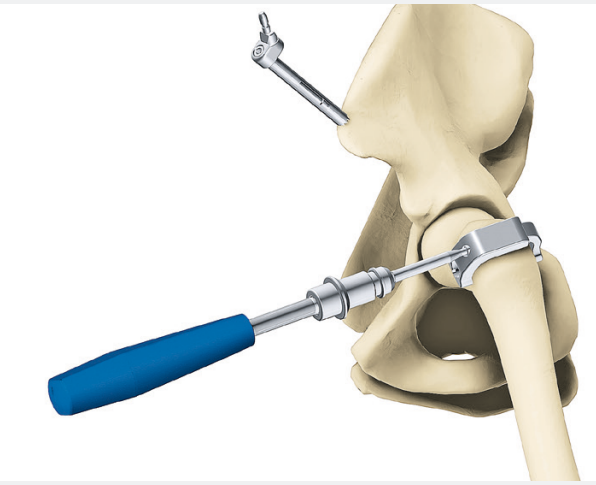
Fixation of the Femur Transmitter

If Antetorsion & Range of Motion are navigated, an additional femur transmitter needs to be fixed at the greater trochanter.



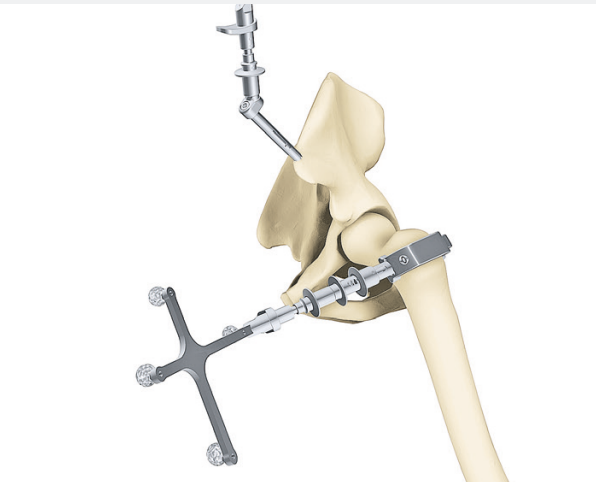
Supine Position

The c-clamp is affixed with the femur in slight adduction and internal rotation. The screw on the c-clamp is tightened using the assembled screwdriver (NE358R & GB413R & NP614R), so that the two jaws of the clamp are firmly seated on the femur and are fixed in the bone with their teeth. The extension for attaching the transmitter is then fitted to the c-clamp.



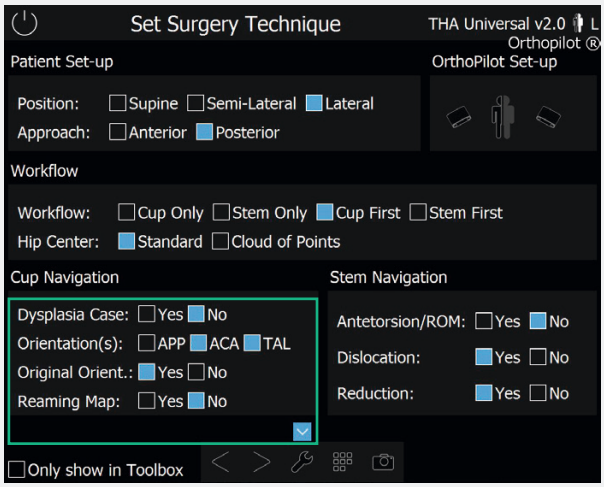
Lateral Position

For the antero-lateral approach, the transmitter attachment on the c-clamp points in a ventral direction, for posterior access the attachment forms an angle.



10 | Cup Navigation

OrthoPilot® THA Universal Version 2



Pelvis Orientation

Pelvis orientation is the basis for the navigation of the cup component. There are different ways to orient the pelvis. Either the Anterior Pelvic Plane (APP) defined by both spinae iliaca anterior superior (ASIS) and the symphysis or the Acetabular Center Axis (ACA) can be used for the orientation of the pelvis.

(3) Hiddema W, van der Merve J, van der Merve W, The Transverse Acetabular Ligament as an Intraoperative Guide to Cup Abduction. The Journal of arthroplasty. 2016 Jul;31(7):1609-13.

(4) Fujita K, Kabata T, Maeda T, Kajino Y, Iwai S, Kuroda K, Hasegawa K, Tsuchiya H. The use of the transverse acetabular ligament in total hip replacement: An analysis of the orientation of the trial acetabular component using a navigation system. The bone anf joint journal. 2014 Mar;96-B(3):306-11.

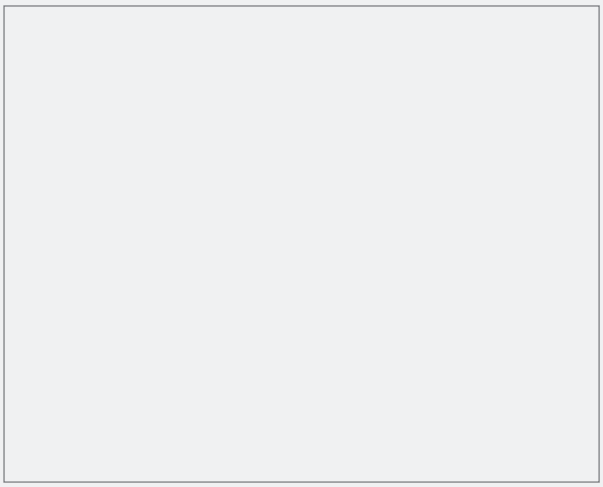
(5) Meftah M, Yadav A, Wong AC, Ranawat AS, Ranawat CS, A novel method for accurate and reproducible functional cup positioning in total hip arthroplasty. The Journal of arthroplasty, 2013 Aug;28(7):1200-5.

Acetabular Center Axis (ACA)

The ACA reference is patient-specific independent of variations in anatomy or pelvic position. The surgeon gets the orientation of the reamer or cup impactor in relation to the Acetabular Center Axis and can therefore determine the cup orientation and position in relation to the original hip center. The new cup center should preferably be within 4 mm of the ACA for a good stability and minimal impingement risk. Desired aim for cup inclination is 0° whereas the anteversion should be kept within ± 5°. ACA referencing relies on landmarks palpated around the acetabular rim. The use of the ACA for pelvis orientation is especially recommended for THA in lateral patient position.

Transverse Acetabular Ligament (TAL)

Optionally the TAL can be recorded to acquire an additional landmark for the alignment of the anteversion of the cup implant (3-5).



Anterior Pelvic Plane (APP)

The APP remains the most used reference for the navigation of cup inclination and anteversion. The APP is defined by the anterior superior spines and the symphysis. Based on this plane, the cup can be oriented according to the so called Lewinnek safe zone (6) with 15 ± 10° anteversion and 40 ± 10° inclination to limit the risk of dislocation. The most important point to get an accurate cup orientation regarding inclination and anteversion angles is the palpation of the bony landmarks.

Inclination

The angle of inclination results from the straight line defined by the palpation of the two iliac spines. It changes when the landmarks are shifted in cranial or caudal direction. Palpation of the ASIS must therefore be performed symmetrically.

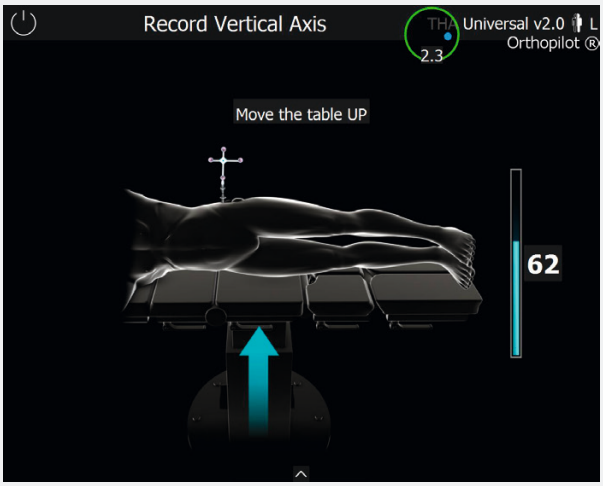
Anteversion

The angle of anteversion depends on the tilt of the plane resulting from the palpation of all three landmarks. The height of point on the symphysis has the greatest influence on the anteversion angle. The angle of anteversion displayed on navigation screen decreases with growing distance between the palpated point and the bone surface, corresponding to the thickness of the soft tissue layer.

(6) Lewinnek GE, Lewis JL, Tarr R, Compere CL, Zimmerman JR. Dislocations after total hip-replacement arthroplasties. The Journal of bone and joint surgery American volume. 1978;60(2):217-20.

10.1 | ACA Cup Navigation incl. TAL

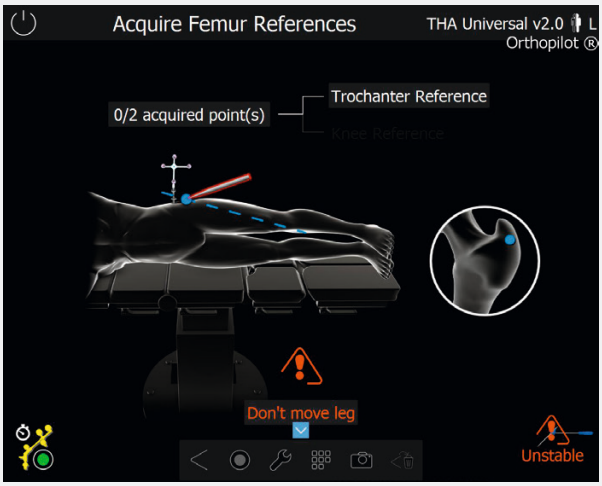
OrthoPilot® THA Universal Version 2



Record Vertical Axis

The cup position is defined by the registration of the vertical axis. In order to register this axis, the table is moved 10 cm upwards. The indicator on the right side shows the height of movement, as soon as the required height is achieved, the screen will automatically switch to the next screen.

Note | For lateral patient position the movement of the table defines the medial / lateral axis, for supine position the anterior / posterior axis.



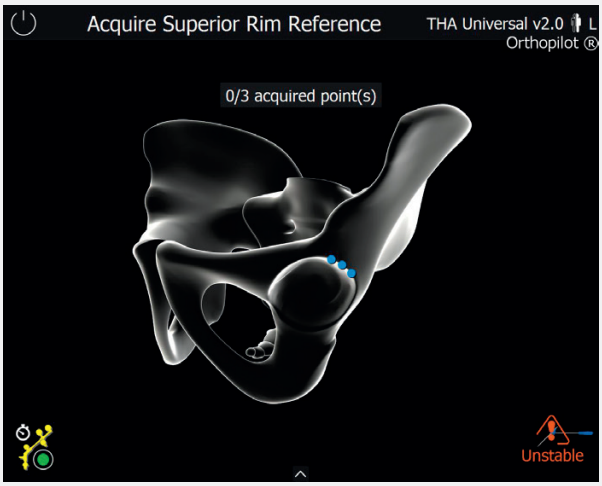
Acquire Initial Femur

The initial femur position is recorded by palpating references on the trochanter and the knee. The femur must be kept in a straight position. Both points should be pre-marked as they need to be palpated again during the navigation procedure.

The point on the greater trochanter serves as reference for the offset and the leg lengthening values. Ideally the greater trochanter is palpated at its most lateral point. A cortical screw can be used as a possible mark, but also a deep notch on the bone surface.

The femur cranio-caudal axis is referenced via the point palpated on the knee. The point can either be on the patella or on the medial or lateral epicondyle. The chosen point can be marked with a sterile pencil.

Note | It is important not to move the leg in-between the palpation of trochanter and knee references.



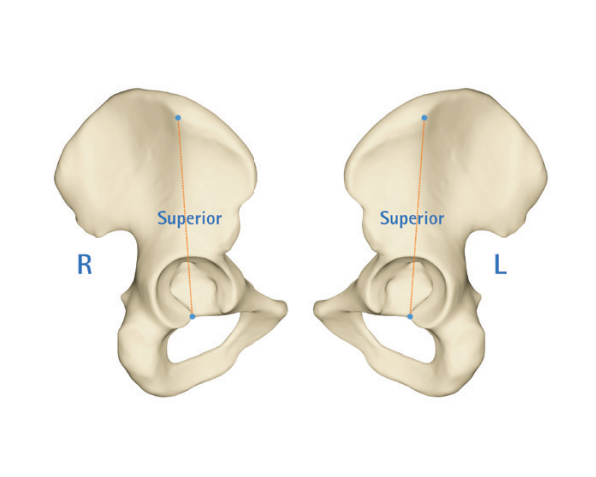
Acetabular Center Axis Acquisition

For the calculation of the acetabular center axis points along the acetabular rim are palpated in three steps.

First the registration of three points in the superior area of the acetabular rim is required.

Then three points in the anterior area of the acetabular rim are palpated.

Finally, the palpation of three points along the posterior part of the acetabular rim is required.



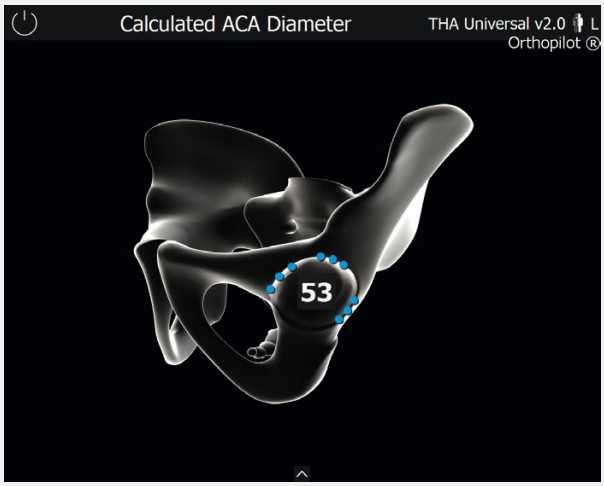
First Superior Palpation Point

The registration of the first point on the superior rim is most crucial. This point is determined by a line from the prominent iliac tubercle to the origin of the posterior transverse acetabular ligament (acetabular notch).

Note | The first superior point is not strictly at 12.00 o'clock but varies slightly to 01.00 o'clock for a left hip and to 11.00 o'clock for a right hip.

10.1 | ACA Cup Navigation

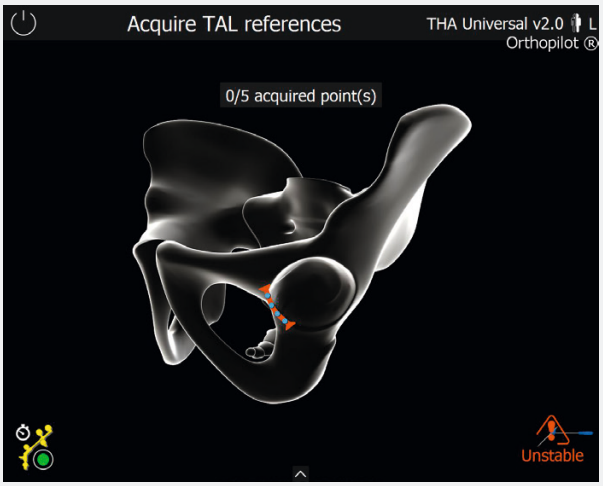
OrthoPilot® THA Universal Version 2



Calculated ACA Diameter

The best fit circle defined by the points palpated around the acetabular rim is the basis for the calculation of the ACA diameter.

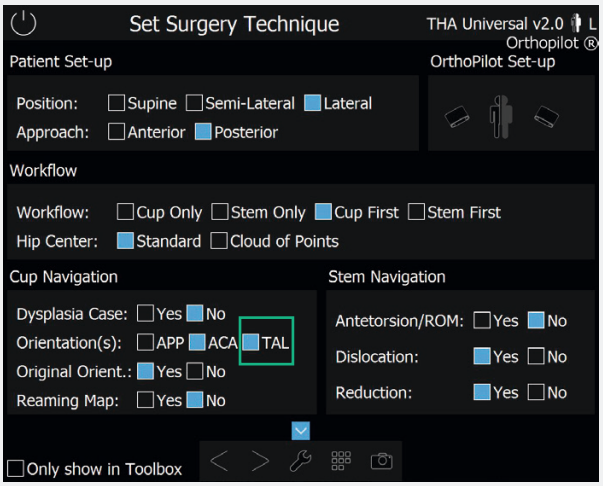
The ACA diameter is displayed automatically after the palpation of the posterior rim points. The next navigation step can be entered by pressing the right foot switch.

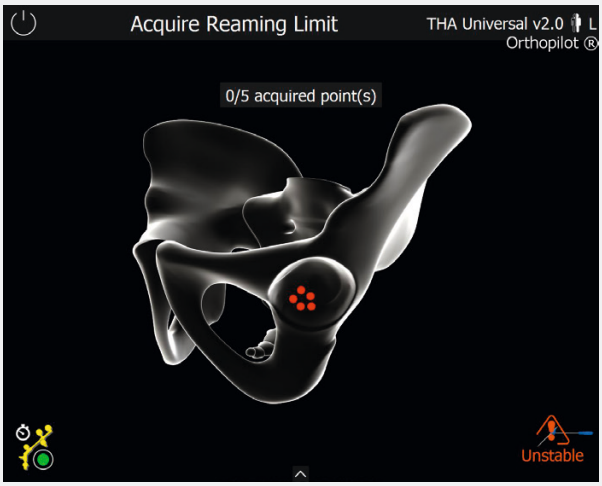


Acquire Tal Reference

As an option the transverse acetabular ligament (TAL) can be recorded to acquire an additional landmark for the alignment of the anteversion of the cup implant.

The acquisition is only available in combination with the ACA cup orientation. This option needs to be selected in the initial SET SURGERY TECHNIQUE step.

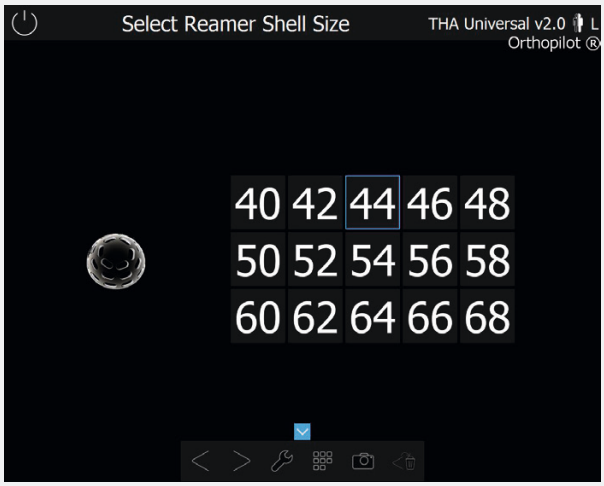




Acquire Reaming Limit

After the resection of the femoral head reference points in the deepest area of the acetabulum are palpated (medial wall). To acquire this reaming limit 1-5 points, need to be registered.

In the following reaming procedure, the depth of the reaming is displayed in respect to the limit palpated. The distance between the reamer shell and the points palpated, displayed on the screen during the reaming process, provides an indicator to avoid excessive reaming of the acetabulum or protrusion.



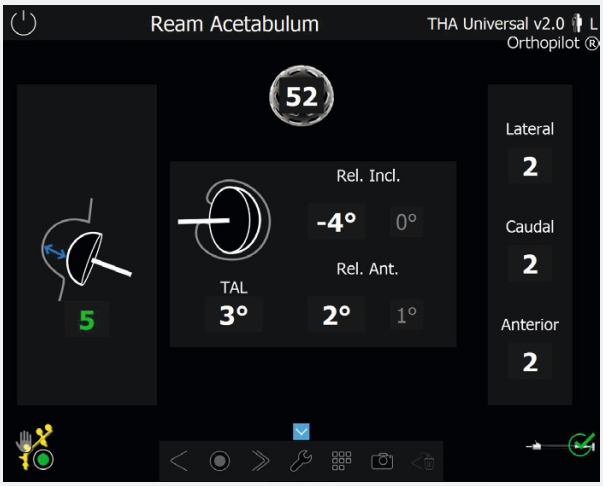
Ream Acetabulum – Size Selection

Before the reaming navigation can be started the accurate size of the reamer shell has to be chosen using the virtual pointer. Also, during the reaming process the table with the size selection will appear automatically whenever the reamer is moved away from the acetabulum (e.g. for shell size changes).

A new size can be selected with the virtual pointer and registered by using the right foot switch. If there is no size change necessary, the right foot switch can be used to re-enter the reaming navigation screen.

10.1 | ACA Cup Navigation

OrthoPilot® THA Universal Version 2

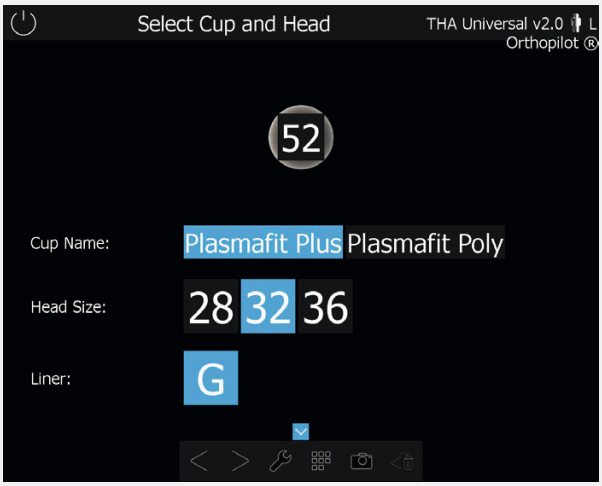


Ream Acetabulum

The acetabulum is prepared with the navigated reamer equipped with the yellow transmitter. The OrthoPilot® gives the information on the reaming depth (intern-extern) in relation to the palpated reaming limit. Over-reaming of this limit is indicated with a red warning message: "Check reaming limit".

Furthermore, the relative inclination and anteversion angles in relation to the native acetabular plane are displayed as well as the hip center shift in medial/lateral, cranial/caudal and anterior/posterior directions. In accordance with the pre-operative planning the new acetabular center can be prepared.

Note | If in the step SET SURGERY TECHNIQUE the checkbox „Original Orientation" has been activated, the initially recorded cup orientation is now displayed in grey during the reaming screen as well as during the implantation screen.

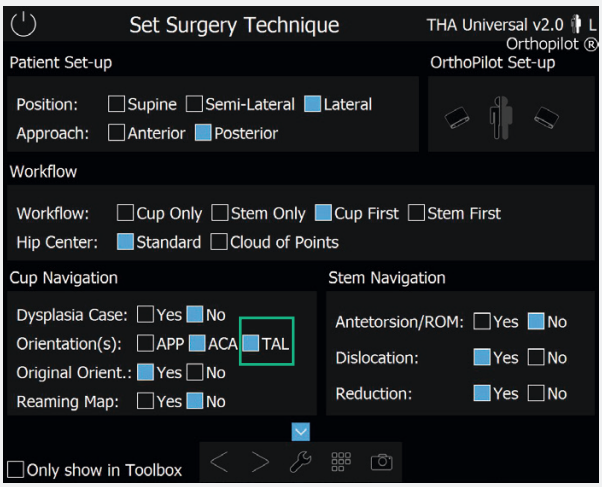


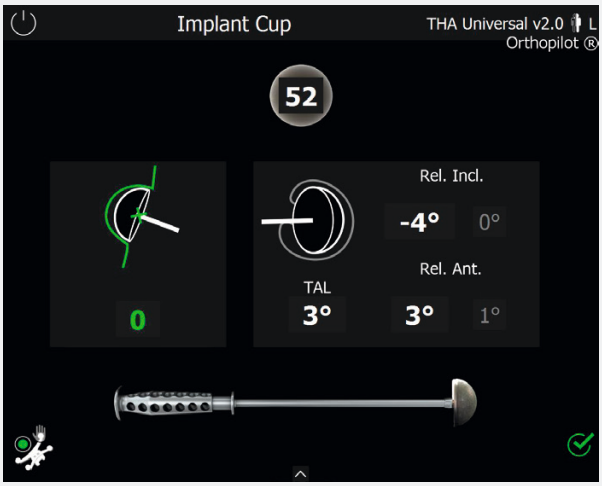
Select Cup & Head Size

Before the final cup can be implanted the size of the implant has to be defined. On the screen the last reamer size used is displayed.

The implant size can now be selected corresponding to the last reamer size.

Cup implant type and head size are selected, additionally the liner size is displayed.



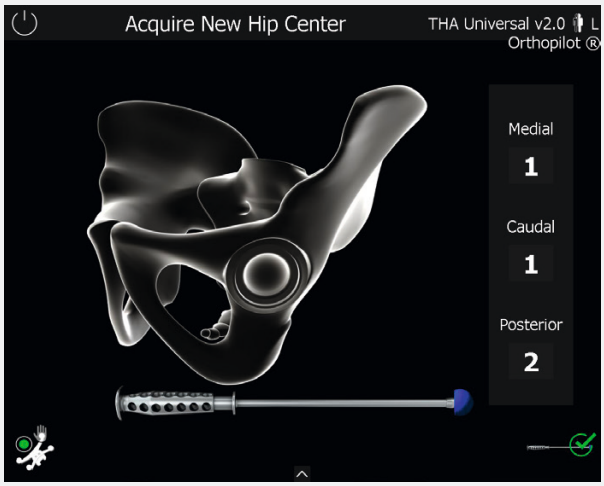


Implant Cup

During the cup implantation step a trial cup in the selected size can optionally be inserted and the depth as well as relative inclination and anteversion angles can be checked.

The same step is used for the implantation of the final cup implant. The implanting depth displayed on the screen shows the distance between the center of the cup implant and the center of the registered reamer position.

Inclination and anteversion angles are displayed in relation to the original acetabular plane.



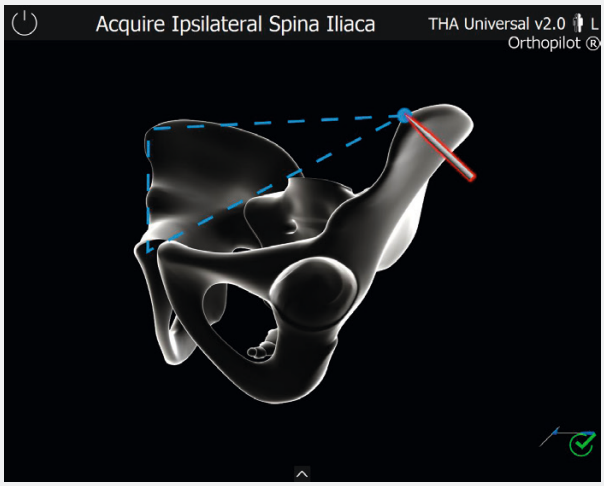
Acquire New Hip Center

After the implantation of the acetabular components, the new hip center of rotation is recorded with a Plasmafit® impactor or the recorder handle FS912R with a screwed-on pivoting ball with the defined articulation diameter. Pivoting balls are available for head diameters of 22.2, 28, 32, 36 as well as 40 mm.

The shift of the center of rotation in relation to the original center of rotation is displayed on the right side of the screen.

10.2 | APP Cup Navigation

OrthoPilot® THA Universal Version 2

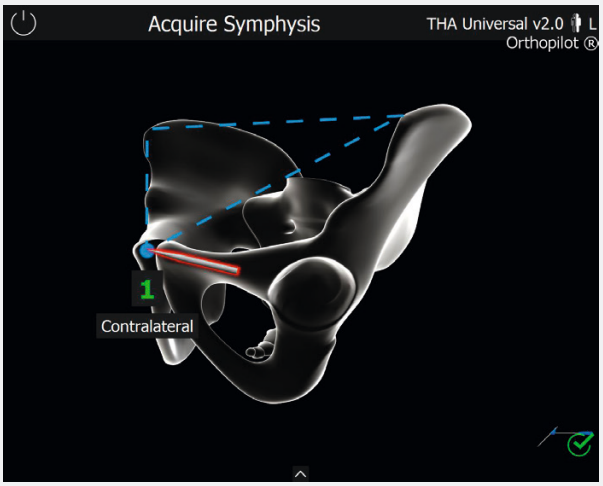


Acquisition of Spinae Iliacae

The anterior pelvic plane defines the reference plane for the orientation of the cup inclination and anteversion. Registration of this plane is performed by consecutive palpation of the ipsilateral and the contralateral anterior superior iliac spine and then the symphysis, with the mobile pointer.

Precision for inclination:
- ± 10 mm = ± 1.5°
- ± 20 mm = ± 3.0°

Note | The angle of inclination results by the straight line defined by the palpation of both spina iliaca (ASIS). The precision of the later-on displayed inclination angle is therefore influenced by the symmetry of this palpation.

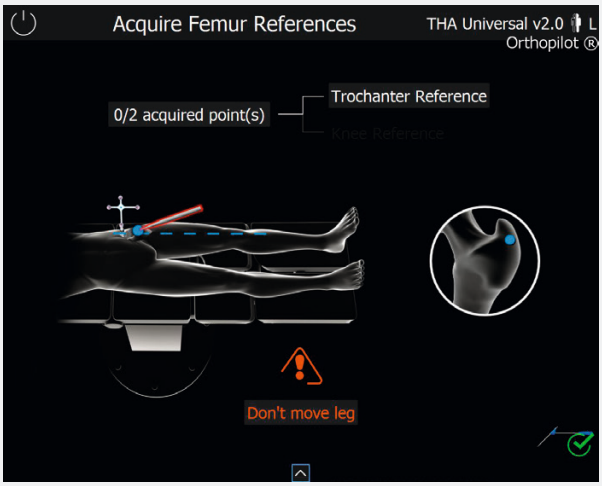


Acquisition of Pubic Symphysis

During the palpation of the symphysis a percentage figure is displayed on the screen indicating the ratio of the pointer position between the two palpated points of the anterior superior iliac spine.

Precision for anteversion:
- ± 10 mm = - 4.0°
- ± 30 mm = - 12

Note | The angle of anteversion depends on the tilt of the plane resulting from the palpation of all three landmarks, with the height of the symphysis having the greatest influence.
Therefore, the precision of the later-on displayed anteversion angle is influenced by the thickness of the tissue layer above the symphysis.

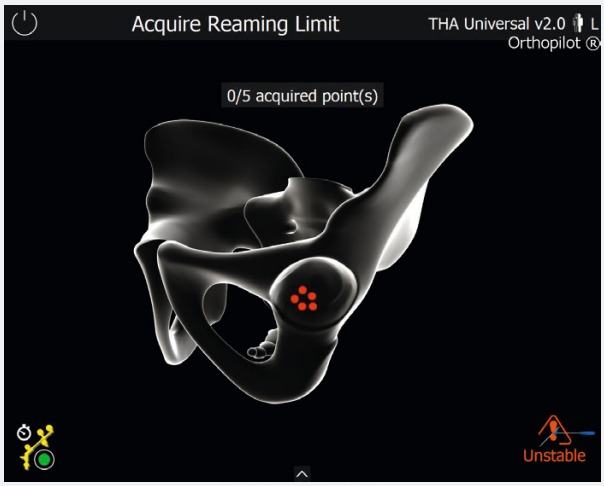


Acquire Initial Femur

When using the anterior pelvic plane for pelvis orientation the acquisition of the initial femur is only necessary if the stem is navigated. The femur must be kept in a straight position for the acquisition and should not be moved in-between the palpations.

The points palpated should be pre-marked as they need to be palpated again during the workflow. The point on the greater trochanter serves as reference for the offset and the leg lengthening values. Ideally the greater trochanter is palpated at its most lateral point. A cortical screw can be used as a possible mark, but also a deep notch on the bone surface.

The femur cranio-caudal axis is referenced via a point palpated on the knee. The point can either be on the patella or on the medial or lateral epicondyle. The chosen point can be marked with a sterile pencil.



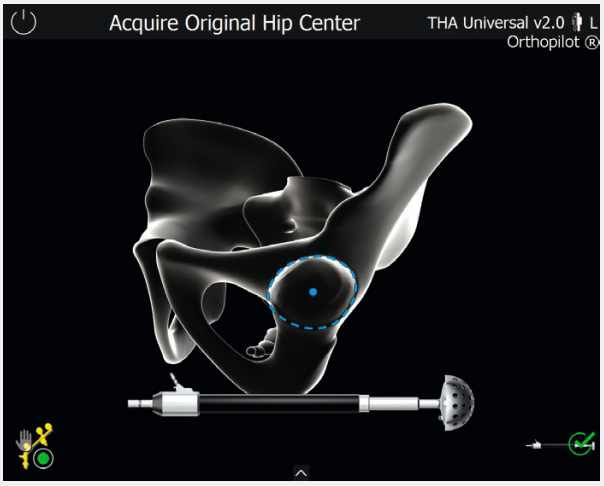
Acquire Reaming Limit

After the resection of the femoral head reference points in the deepest area of the acetabulum are palpated (medial wall). To acquire this reaming limit, 1-5 points need to be registered.

In the following reaming procedure, the depth of the reaming is displayed in respect to the limit palpated. The distance between the reamer shell and the points palpated, displayed on the screen during the reaming process, provides an indicator to avoid excessive reaming of the acetabulum or protrusion.

10.2 | APP Cup Navigation

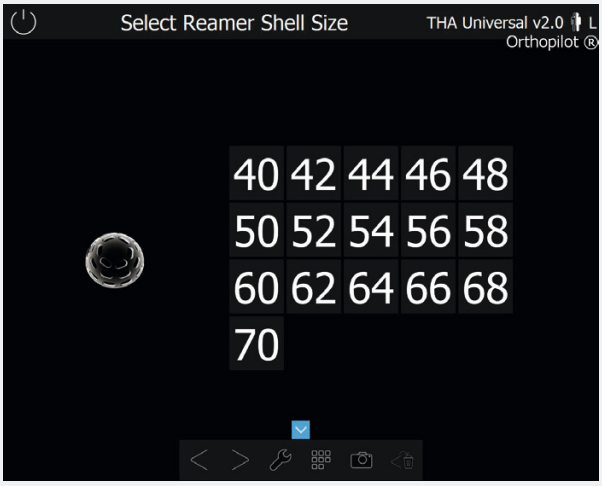
OrthoPilot® THA Universal Version 2



Acquire Original Hip Center

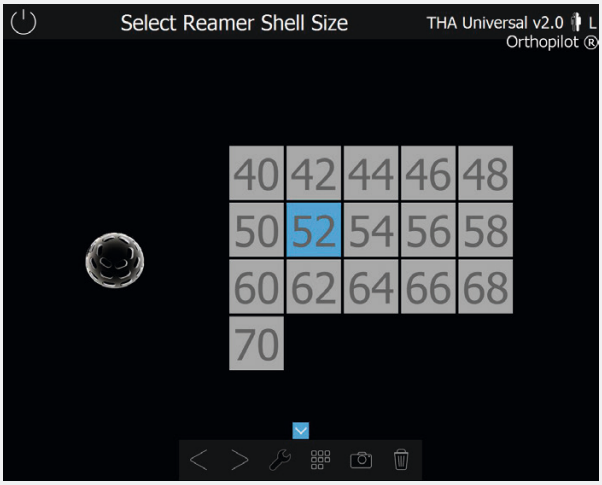
The original hip center is registered using the reamer. The correct reamer shell size ends at the level of bone surface and can be seated tightly but without pressfit in the acetabulum.

Registration of the original hip center is carried out in order to display its shift and to calculate the influence on the offset change.



Original Hip Center – Size Selection

Subsequent to the registration of the original hip center the size of the utilized reamer shell has to be selected. The correct size can be selected with the virtual pointer and is confirmed with the right foot switch.

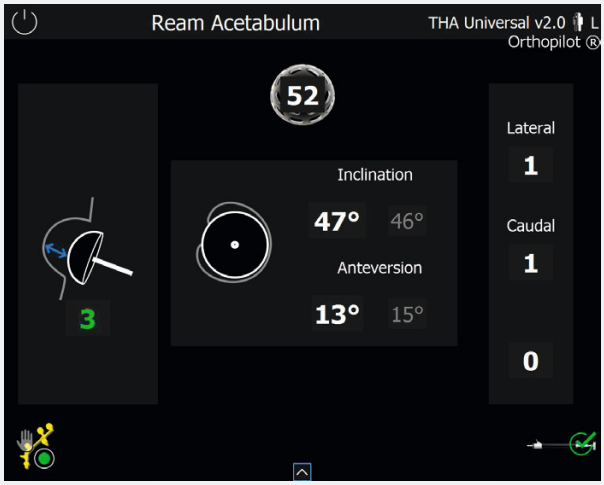


Ream Acetabulum – Size Selection

Before the reaming navigation can be started the accurate size of the first reamer shell has to be chosen using the virtual pointer.

The table will appear also automatically during the reaming process whenever the reamer is moved away from the acetabulum (e. g. for shell size changes).

A new size can be selected with the virtual pointer and registered by using the right foot switch. If there is no size change necessary, the right foot switch can be used to re-enter the reaming navigation screen.



Ream Acetabulum

The acetabulum is prepared with the navigated reamer equipped with the yellow transmitter.

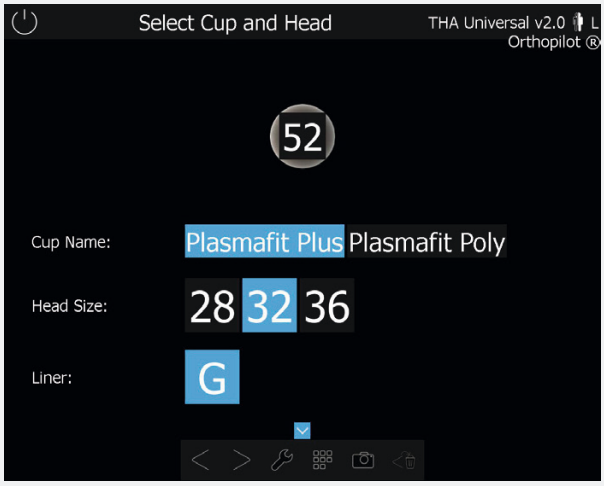
The OrthoPilot® gives the information on the reaming depth (intern-extern) in relation to the palpated reaming limit. Over-reaming of this limit is indicated with a red warning message: “Check reaming limit”.

Furthermore, the inclination and anteversion angles are displayed as well as the hip center shift in medial / lateral, cranial / caudal and anterior / posterior direction.

In accordance with the “Lewinnek safe zone” and pre-operative planning, orientation and positioning of the cup can be prepared.

10.2 | APP Cup Navigation

OrthoPilot® THA Universal Version 2

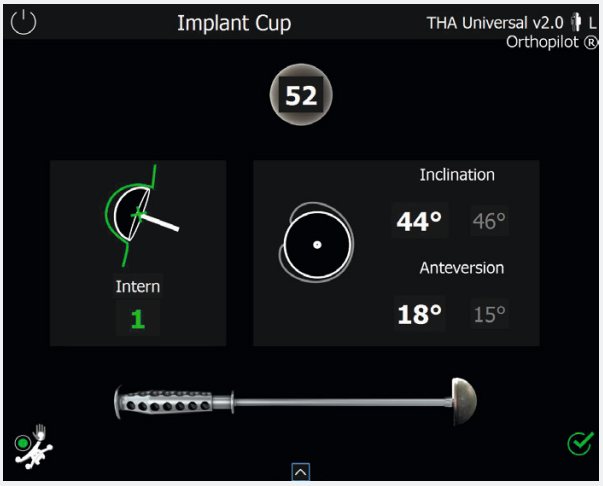


Select Cup Size

Before the final cup can be implanted the size of the implant has to be defined. On the screen the last reamer size used is displayed.

The implant size can now be selected corresponding to the last reamer size.

Cup implant type and head size are selected, additionally the liner size is displayed.



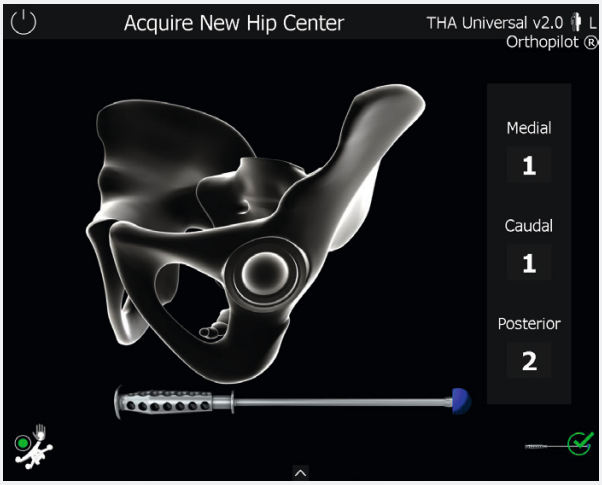
Implant Cup

During the cup implantation step a trial cup in the selected size can optionally be inserted and the depth as well as inclination and anteversion angles can be checked.

The same step is used for the implantation of the final cup implant. The implanting depth displayed on the screen shows the distance between the center of the cup implant and the center of the registered reamer position.

Furthermore, the inclination and anteversion angles are displayed.

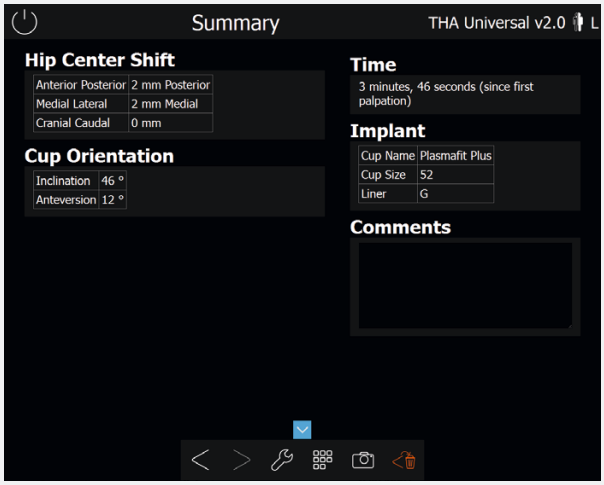
Note | If in the step SET SURGERY TECHNIQUE the checkbox „Original Orientation" has been activated, the initially recorded cup orientation is now displayed in grey during the reaming screen as well as during the implantation screen.



Acquire New Hip Center

After the implantation of the acetabular components, the new hip center of rotation is recorded with a Plasmafit® impactor or the recorder handle FS912R with a screwed-on pivoting ball with the defined diameter. Pivoting balls are available for head diameters of 22.2, 28, 32, 36 as well as 40 mm.

The shift of the center of rotation in relation to the original center of rotation is displayed on the right side of the screen.



Summary

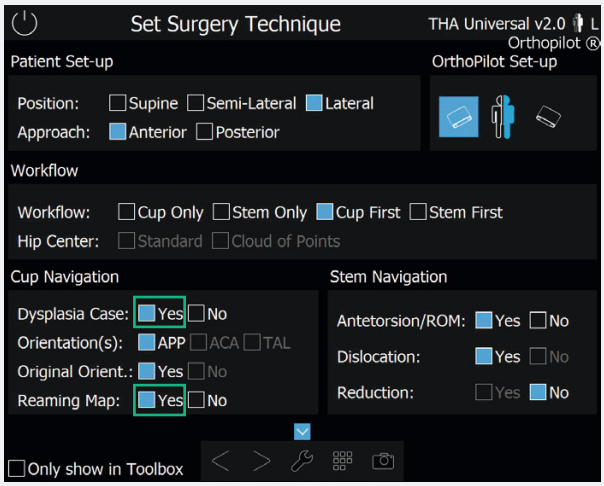
At the end of each workflow a summary report is displayed giving the following information:

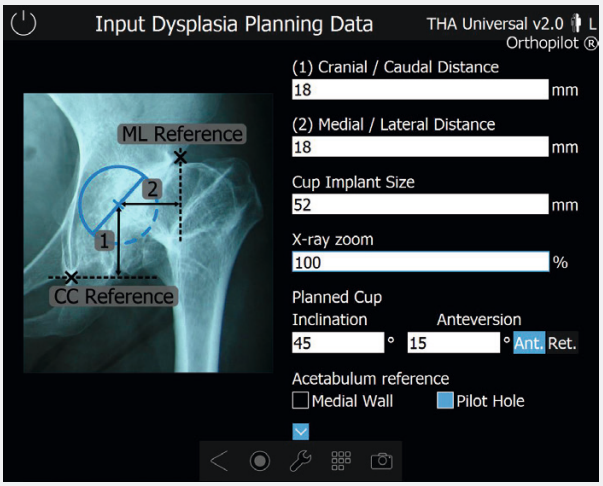
- Hip center shift
- Cup angles
- Cup implant type & size
- Navigation time*

* starts at first table axis record or first palpation record depending on the worklflow

10.3 | Dysplasia Cup Navigation incl. Reaming Map

OrthoPilot® THA Universal Version 2





Set Surgery Technique

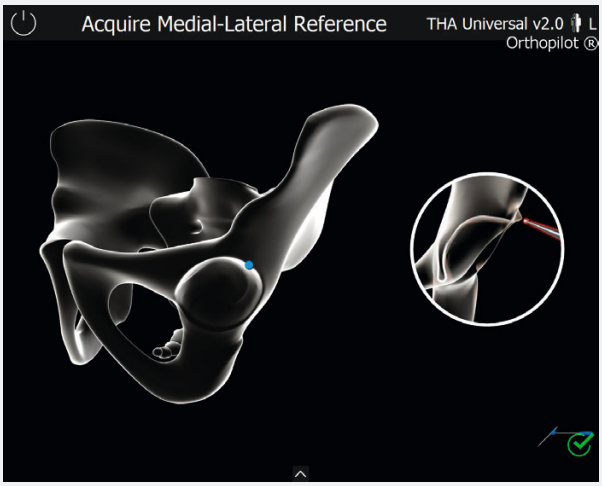
In the screen SET SURGERY TECHNIQUE, the additional option for a dysplastic cup navigation is selected. Moreover the reaming map option can help to display the reaming progress more detailed.

The dysplasia workflow uses surface reference palpations to acquire the anatomical data of the patient specific anatomy. To register a surface palpation, attach the transmitter to the palpation instrument. The landmark positions are determined by placing the tip of the instrument on the skin or bone using mild force.

Pre-Operative Planning

In the dysplasia function, cup position reflects the standard pre-operative planning of the cup. The new femoral head center is defined by the input for both distances, from the most lateral point of the osteophyte at the acetabular superior rim and the distance from the teardrop line.

The point at the osteophyte at the acetabular superior rim will be used as reference point for the navigation of the acetabular reamer and cup positioning for medial–lateral direction. The point at the teardrop line is the reference for the cranio/caudal distance to the planned center and gives the necessary information for reamer and cup positioning.



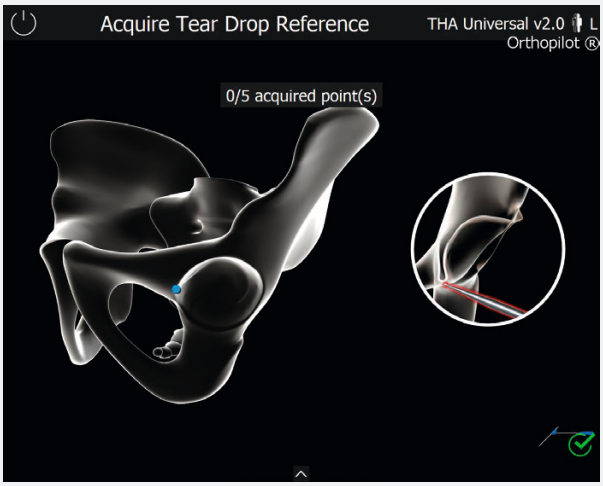
Registering Medio-Lateral Reference

Place the tip of the pointer on the superior point of the secondary acetabular rim which might be formed by an osteophyte.

This point is the medio-lateral reference point for the new cup center. Make sure to place the tip at the appropriate position in superior/inferior direction.

Note | Incorrect navigation results due to imprecise x-ray images.

- Be sure that the scale of the x-ray is determined correctly.
- Make certain that any distortion of the x-ray images is kept to a minimum.



Registering Cranio-Caudal Reference

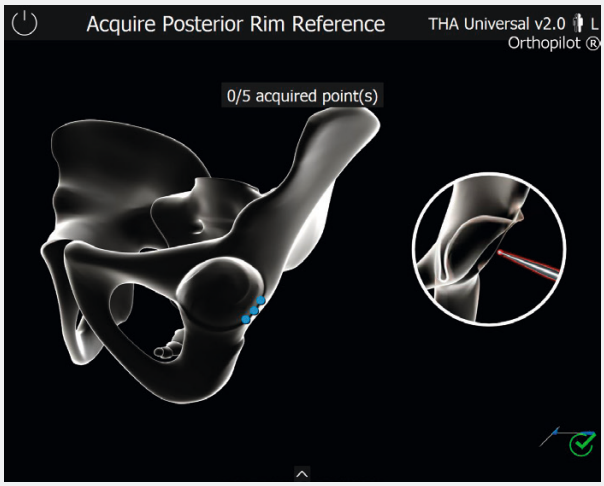
Essentially, the initial floor of the acetabulum corresponds to the radiographic teardrop. The teardrop lies in the inferior-medial portion of the acetabulum, it is just above the obturator foramen.

The lateral and medial distances correspond to the external and internal acetabular wall. The teardrop gives an accurate assessment of how much medialization is necessary to have the acetabular component rest on the true acetabular floor. Place the tip of the pointer on the teardrop and palpate the surroundings of the teardrop with up to five points.

The teardrop is the caudal reference for the cup implantation, so the selected point for calculating the distance will be the most caudal point.

10.3 | Dysplasia Cup Navigation incl. Reaming Map

OrthoPilot® THA Universal Version 2

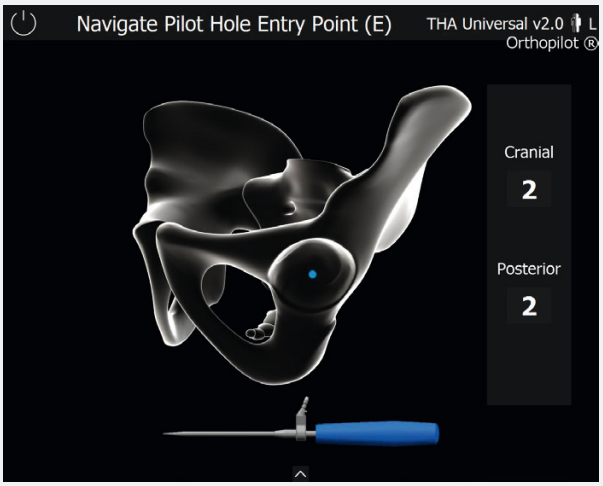


Registering Antero-Posterior Reference

The acetabular posterior rim extends from obturator foramen through the posterior aspect of the weight bearing dome of the acetabulum and then obliquely through greater sciatic notch.

Place the tip of the pointer on the posterior rim of the acetabulum and palpate this surroundings with up to five points. The selected points for calculating the distance will be the most posterior point.

Note | A pilot hole is marked by using the hammer pointer (FS869R) at the medial wall, perpendicular to the bottom of the cup.

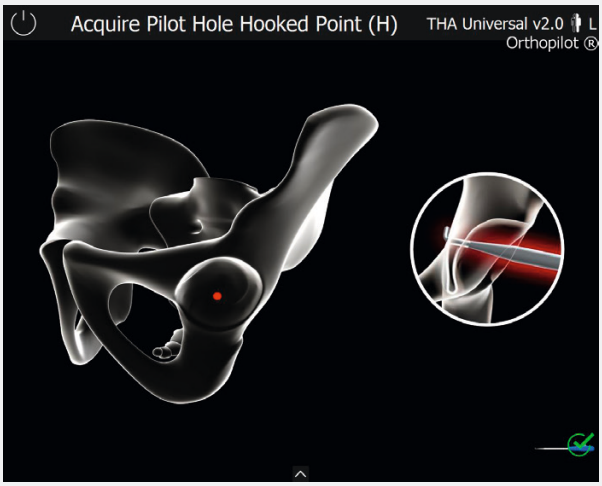


Pilot Hole Preparation

To get an information of the bone thickness and to define a sagittal reference plane for the position of the new cup position, a pilot hole is drilled. Making the pilot hole at the point with the thinnest bone at the base of the acetabulum is essential to prevent a fracture of the acetabulum by reaming too far medially.

Theoretically, the planned position of the cup center and the position of the pilot hole entry point are identical in a dysplastic hip case. This is because reaming will first take place parallel to the teardrop transverse plane, down to the thickness of the medial wall plus several millimeters by using a smaller reamer than planned.

After this initial reaming, anteversion and inclination are determined while using bigger reamer sizes up to the desired cup size. To place this pilot hole at the new cup center, the cranio-caudal distance between the planned cup center and the tip of the pointer is displayed. In addition, the antero-posterior distance between the planned cup center and the tip of the pointer is shown.



Registering The Pilot Hole

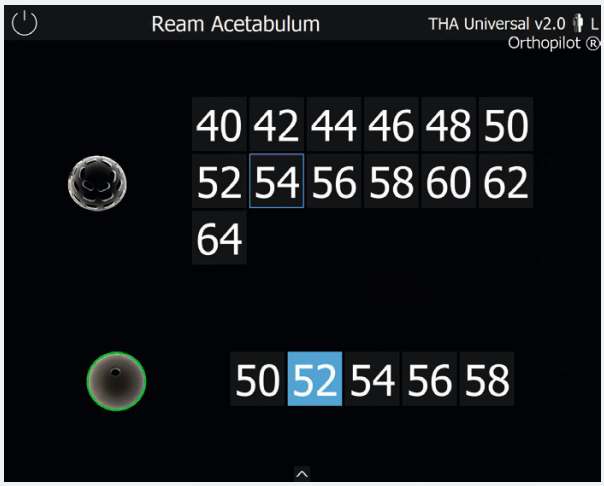
The medial side of the inner wall of the pelvis is palpated and registered through the pilot hole with a hook pointer (FS865M).

Note | Instead of the pilot hole registration, the medial wall registration is also available. The reference point for this procedure is at the deepest point of the fossa acetabuli (medial wall).

Note | Hammer pointer (FS869R) and hook pointer (FS865M) are optional instruments and need to be ordered separately.

Hammer pointer (FS869R)

Hook pointer (FS865M)



Ream Acetabulum – Size Selection

Before the reaming navigation can be started the accurate size of the first reamer shell has to be chosen using the virtual pointer.

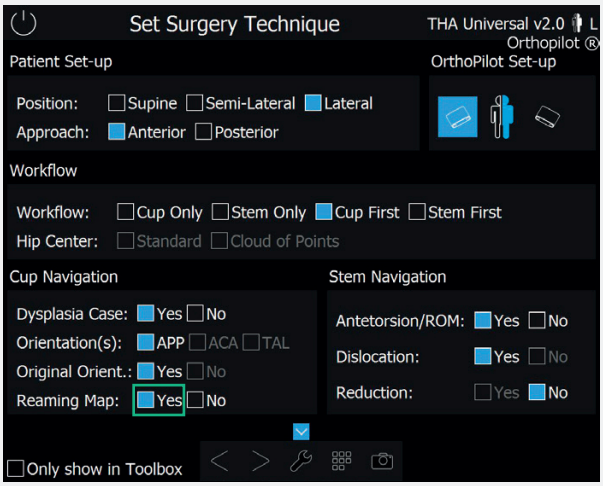
The table will appear also automatically during the reaming process whenever the reamer is moved away from the acetabulum (e.g. for shell size changes).

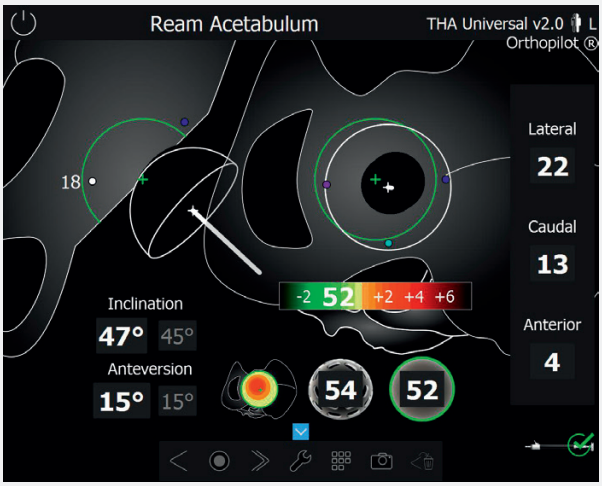
A new size can be selected with the virtual pointer and registered by using the right foot switch. If there is no size change necessary, the right foot switch can be used to re-enter the reaming navigation screen.

If the optional Reaming Map function has been selected in the step SET SURGERY TECHNIQUE, the planned cup size needs to be chosen for its correct display afterwards.

10.3 | Dysplasia Cup Navigation incl. Reaming Map

OrthoPilot® THA Universal Version 2





Reaming Map

Especially for dysplastic cup situations it might be helpful to have a more precise display of the reaming progress and the removal of the bone respectively cartilage stock.

For a correct display of the reaming map the planned cup implant size needs to be selected. This is the reference for the scale of the coloured display.

The screen is splitted into two distinct views: a RADIOGRAFIC VIEW on the left side and an ACETABULAR VIEW on the right side. This is to enable two different modes of display.

Radiographic View

In the RADIOGRAPHIC VIEW on the left side, the erosion of the acetabulum is displayed in real-time as a binary mode. The bony structure is grey, the acetabular erosion is black.

Acetabular View

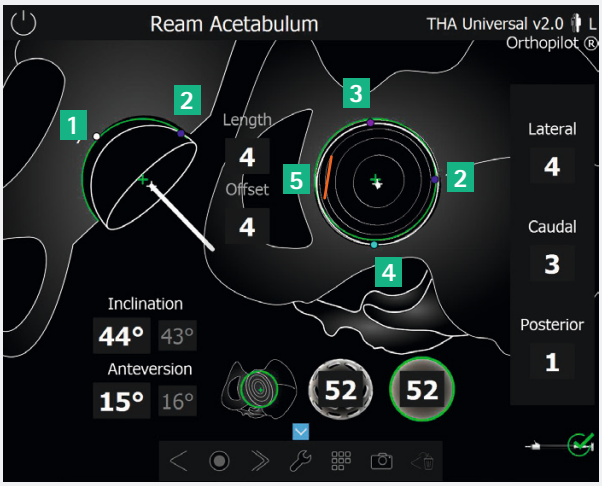
In the ACETABULAR VIEW, the user can choose either a radius mode or a relief/altitude mode.

The RADIUS MODE shows in real-time the 3D distance between each point of the reamed acetabulum and the planned hip center with the help of a specific colour range.

Green indicates a close match to the indicated size, the more the colour changes to red or even dark red the bigger is the deviation to the planned cup size.

By pointing on the icon of the acetabulum the display of the reaming map can be changed to the RELIEF MODE.

The RELIEF or ALTITUDE MODE displays in real-time the 1D distance between each point of the reamed acetabulum and the acetabulum plane.



Reference Points

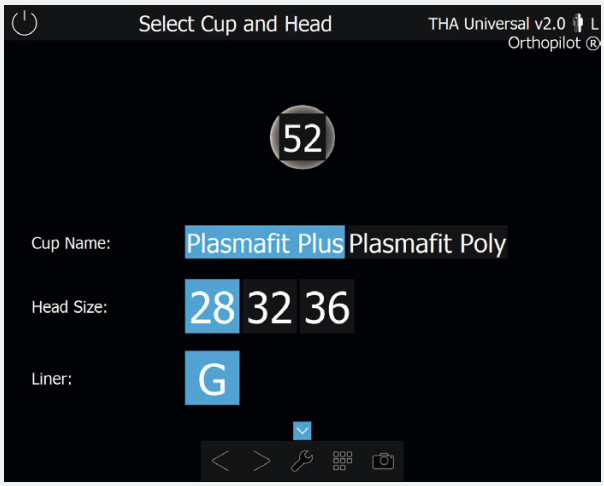
1 Is the point palpated on the medial wall or respectively the pilot hole during the dysplasia workflow.

2 The blue dot is the superior references point.

3 The purple dot indicated the anterior reference point.

4 The light blue dot references to the posterior palpation point.

5 The orange line shows the palpated transverse acetabular ligament, if this option has been chosen initially.



Select Cup & Head Size

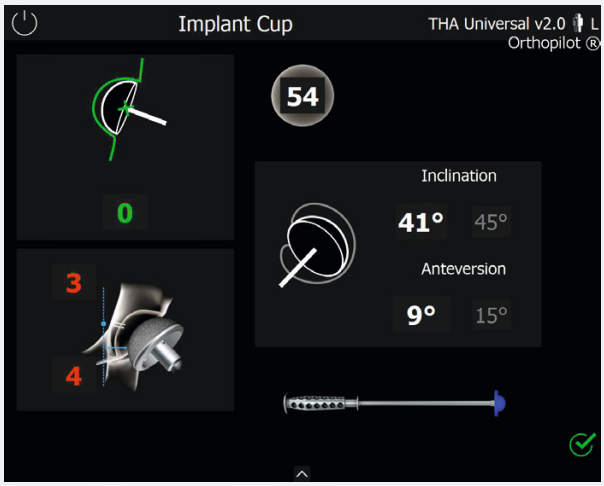
Before the final cup can be implanted the size of the implant has to be defined. On the screen the last reamer size used is displayed.

The implant size can now be selected corresponding to the last reamer size.

Cup implant type and head size are selected and in addition the liner size is displayed.

10.3 | Dysplasia Cup Navigation incl. Reaming Map

OrthoPilot® THA Universal Version 2

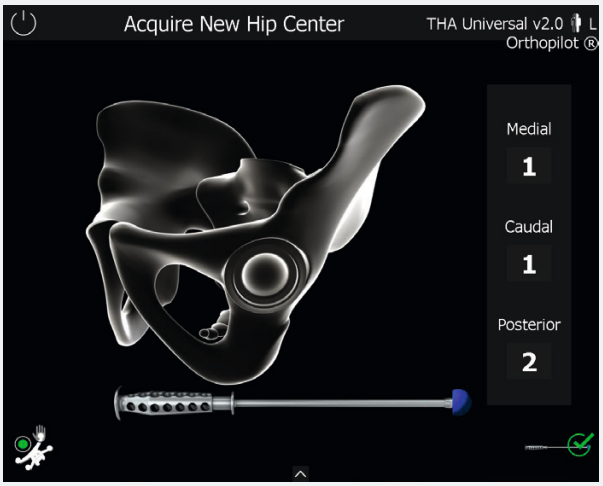


Implant Cup

The final acetabular implant is now inserted. The inclination and anteversion values of the previous screen, corresponding to either the inserted trial cup or the last recorded reamer position, is displayed in the fields with grey background.

When implanting the final implant, the neutral transmitter (FS609) is attached to the standard insertion instrument. The straight as well as the curved impactor can be used.

The current depth of the acetabular component and the distance to the pilot hole can optionally be displayed. This requires registration of the last reamer position. It will show the difference in cup depth between the final reamer and the current cup center.



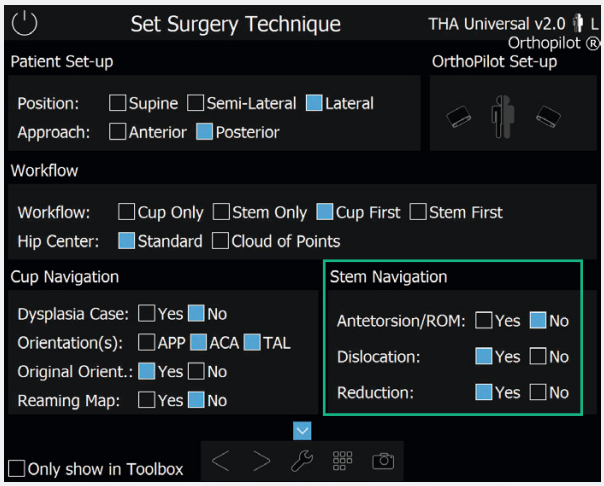
Acquire New Hip Center

After the implantation of the acetabular components, the new hip center of rotation is recorded with a Plasmafit® impactor or the recorder handle FS912R with a screwed-on pivoting ball with the defined diameter. Pivoting balls are available for head diameters of 22.2, 28, 32, 36 as well as 40 mm.

The shift of the center of rotation in relation to the original center of rotation is displayed on the right side of the screen.

11 | Stem Navigation

OrthoPilot® THA Universal Version 2



Workflow Options

THA navigation can either be performed as an isolated cup or stem only workflow or as a combination of cup and stem navigation with cup or stem first options. This leads to a large variety of different workflow options.

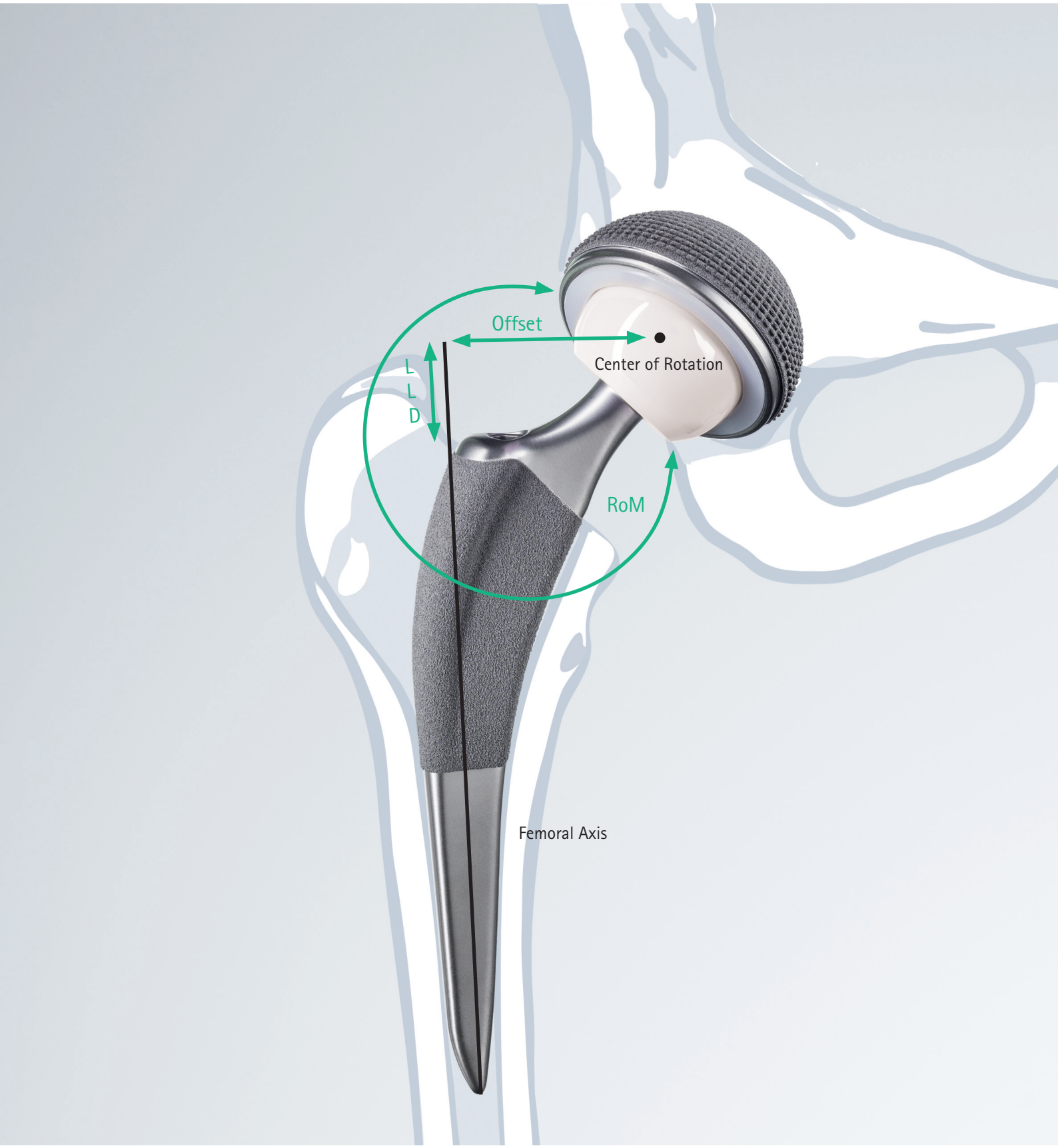
Stem Navigation Parameters

In case of a workflow selection including also the stem implant component generally leg length and offset values are navigated.

THA Universal Version 2 allows also the simulation and display of the combined anteversion, antetorsion of the femur and range of motion.

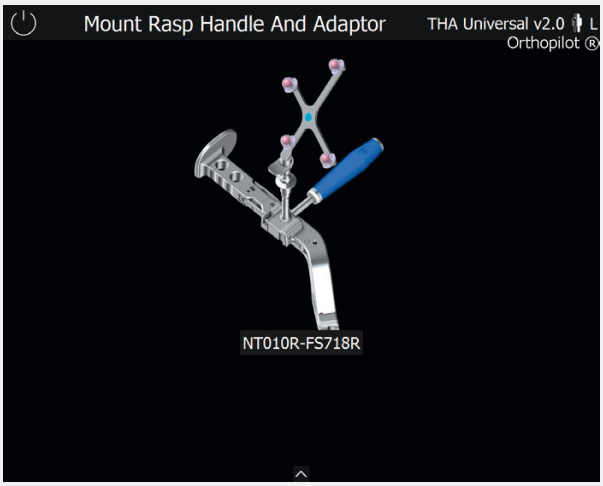
Therefore an additional rigid body fixation on the femur is needed. The red transmitter is fixed via a special c-clamp attached to the greater trochanter.

For the stem navigation workflow it can be chosen between the display in dislocated and/or reduced leg position.


Offset
Center of Rotation
L
L
D
RoM
Femoral Axis

11.1 | Offset & Leg Length

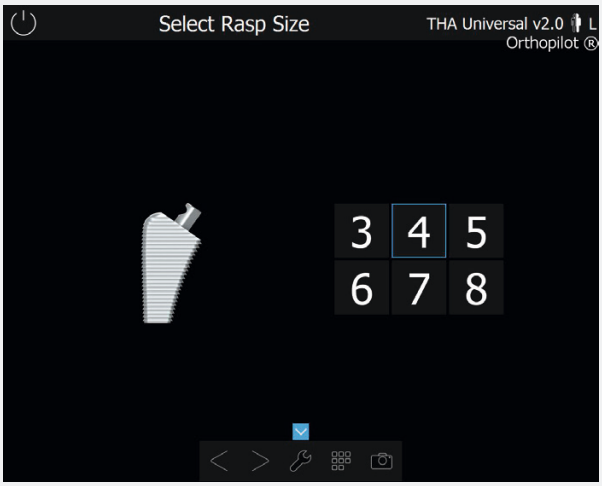
OrthoPilot® THA Universal Version 2



Prepare Rasp Handle

Before the rasping process this screen indicates how to mount the blue transmitter on the rasp handle by the use of the appropriate adapter.

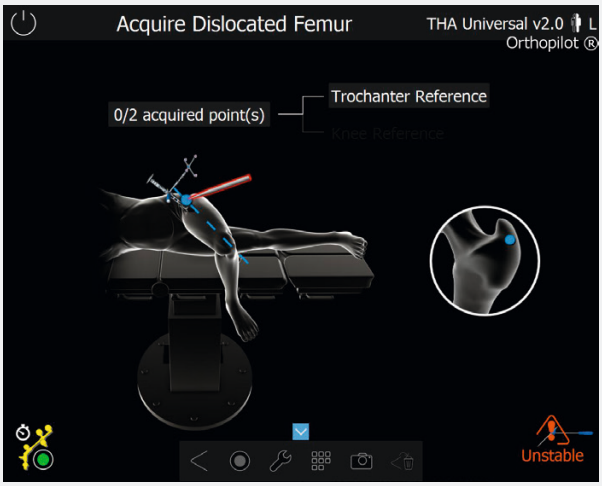
Note | With the help of the WORKFLOW NAVIGATOR the rasp handle can be changed at any time.



Select Rasp Size

To start the navigation process the appropriate rasp size inserted into the femur has to be selected with the yellow transmitter as virtual pointer. The selection can be confirmed with a right foot switch.

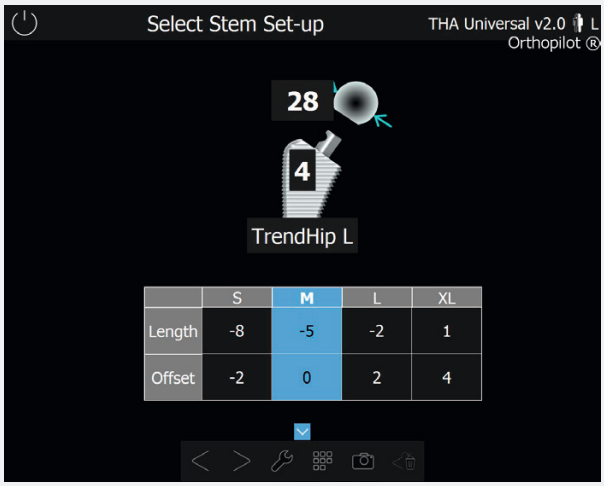
Note | The navigation of the rasp is optional. If the rasp is not navigated this step will be called: SELECT RASP/IMPLANT SIZE and will indicate the size for the rasp or implant in-situ for the trial reduction step.



Acquire Dislocated Femur

The pre-marked landmarks for offset and leg length measurement are palpated with the femur in dislocated position and the rasp in-situ. Offset and leg length changes are calculated on the basis of the trochanter landmark. The knee palpation is used to compute the femoral axis.

Note | For accurate leg length and offset measurement it is important to palpate exactly the same landmarks as for the initial acquisition. Accuracy regarding the palpation points can be increased by putting the leg always in the same position (straight or bent) whenever it is palpated during the workflow (initial – dislocation – reduction).



Select Stem Set-Up

The stem set-up shows the simulation for the offset and leg length changes according to the different implant options available:

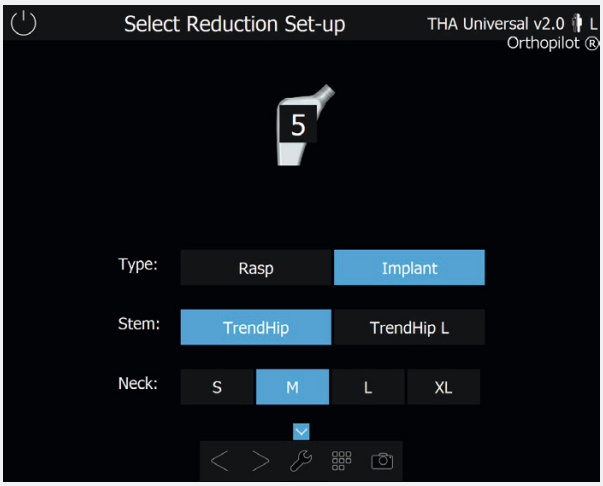
- Neck length
- Standard or high offset
- CCD angle for Metha®
- VAR / STD / VAL / DYS type for CoreHip®

Another rasp size can be selected by aiming with the virtual pointer at the rasp symbol (at the top of the screen) and using the right foot switch. For the adjusted rasp size the dislocated femur has to be palpated again.

Note | If the same rasp size has to be navigated one more time the existing information has to be deleted by entering the PIE MENU and selecting the trash bin.

11.1 | Offset & Leg Length

OrthoPilot® THA Universal Version 2

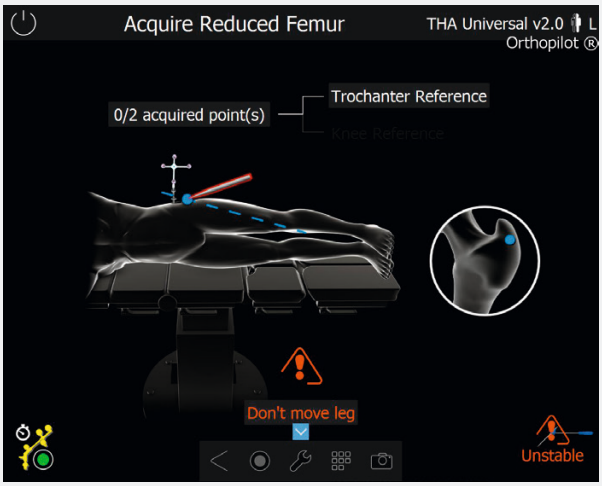


Select Reduction Set-Up

The trial reduction can be conducted with a rasp or an implant in-situ. This choice needs to be indicated during the reduction set-up. The reduction set-up can be selected by the use of the yellow transmitter as virtual pointer. The implantation options need to be configured as in-situ. The options are:

- Rasp or implant
- Rasp or implant size
- Standard or high offset version
- Neck length
- CCD angle for Metha® system
- VAR / STD / VAL / DYS for CoreHip®

Note | The dislocation navigation is optional. If the rasp is not navigated, it will appear directly after the step SELECT RASP / IMPLANT SIZE.

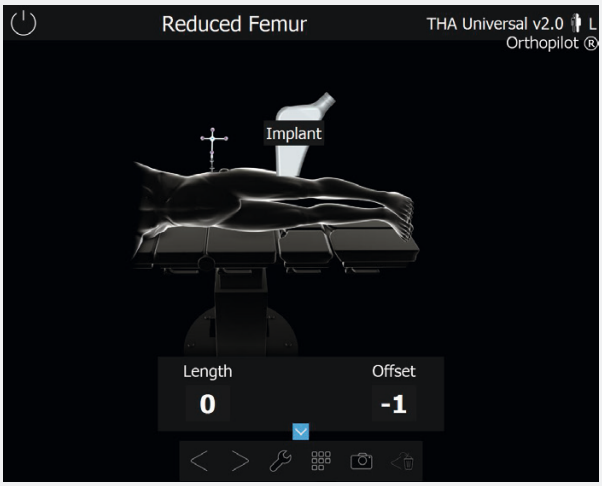


Acquire Reduced Femur

The pre-marked landmarks for offset and leg length measurement are palpated with the femur in reduced position and the rasp or the implant in-situ. Offset and leg length changes are calculated on the basis of the trochanter landmark. The knee palpation is used to compute the femoral axis.

Note | For accurate leg length and offset measurement, it is important to palpate exactly the same landmarks as for the initial acquisition.

Accuracy regarding the palpation points can be increased by putting the leg always in the same position (straight or bent) whenever it is palpated during the workflow (initial – dislocation – reduction).

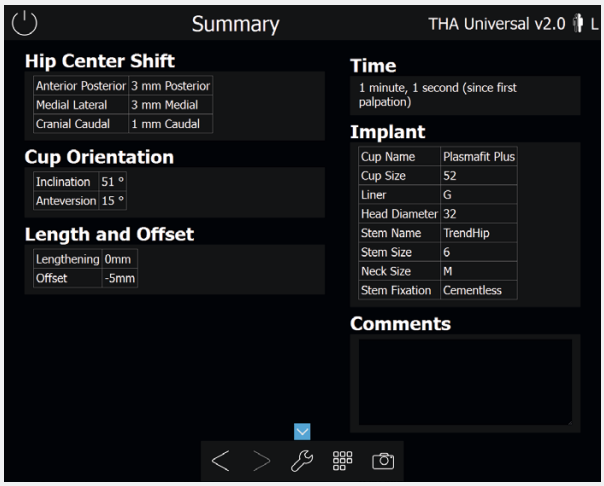


Reduced Femur

After the palpation of the femoral landmarks the final result for the reduction set-up is displayed on the screen. The icon above the patient indicates whether the reduction has been conducted with a rasp or an implant.

In order to do another reduction the virtual pointer needs to be aimed at the rasp/implant icon above the patient and the reduction set-up step is entered again. After the set-up has been changed trochanter and knee reference have to be palpated again.

Note | If the same rasp set-up should be navigated one more time, the existing information has to be deleted by entering the PIE MENU and selecting the trash bin. By clicking on the rasp/implant icon the step SELECT REDUCTION SET-UP is re-entered.



Summary

At the end of each workflow a summary report is displayed giving the following information:

- Hip center shift
- Cup angles
- Cup implant type & size
- Navigation time*

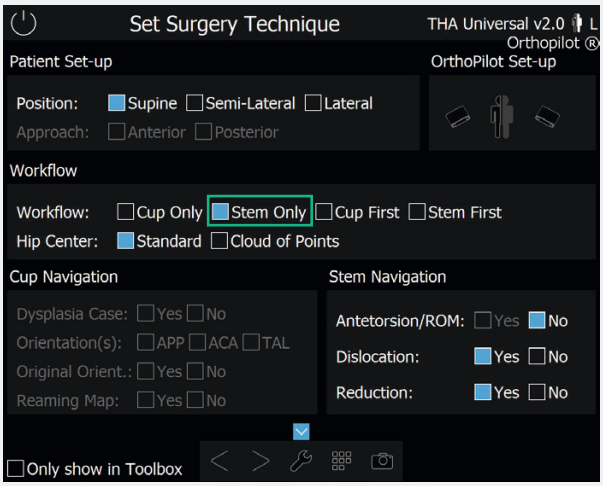
If the stem is also navigated:

- Leg length and offset
- Stem implant type
- Stem implant size
- Fixation
- Neck size
- Head component size
- CDD for Metha® system

* starts at first table axis record or first palpation record depending on the worklflow

11.2 | Stem only

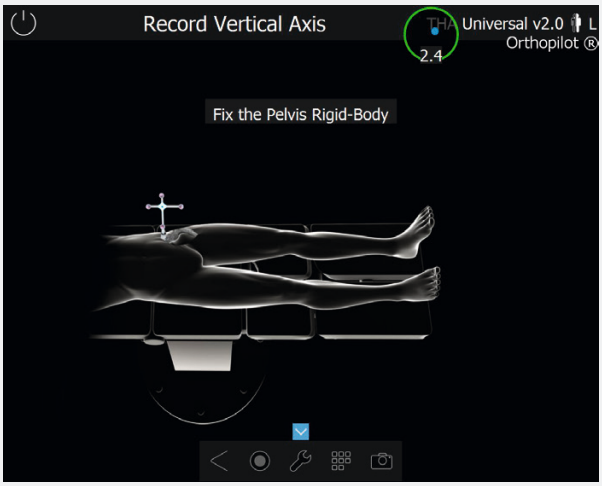
OrthoPilot® THA Universal Version 2



Set Surgery Technique

As a further option a STEM ONLY workflow can be selected. In this case only leg length and offset are navigated.

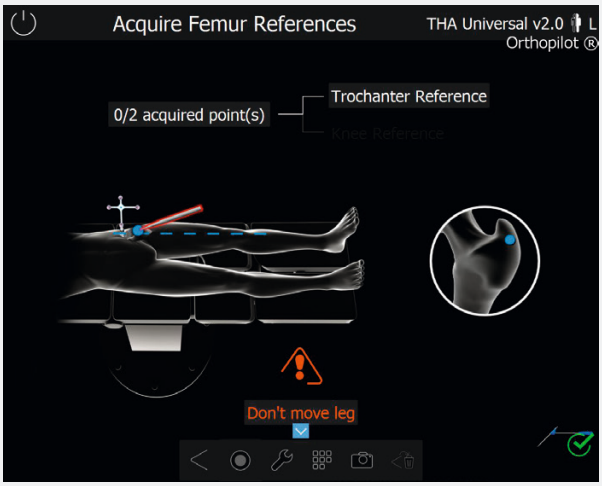
All features related to the acetabular side are not included.



Record Vertical Axis

The cup position is defined via the registration of the vertical axis. In order to register this axis the table is moved upwards 10 cm. The indicator on the right side shows the height of movement. As soon as the required height is achieved, the screen will automatically switch to the next screen.

Note | For lateral patient position the movement of the table defines the medial/lateral axis, for supine position the anterior/posterior axis.

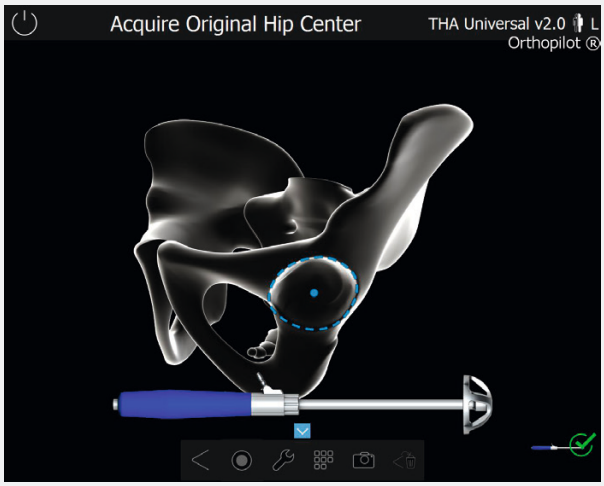


Acquire Initial Femur

The initial femur position is recorded by palpating references on the trochanter and the knee. The femur must be kept in a straight position. Both points should be pre-marked as they need to be palpated again during the navigation procedure.

The point on the greater trochanter serves as reference for the offset and the leg lengthening values. Ideally the greater trochanter is palpated at its most lateral point. A cortical screw can be used as a possible mark, but also a deep notch in the bone surface. The femur cranio-caudal axis is referenced via the point palpated on the knee. The point can either be on the patella or on the medial or lateral epicondyle. The chosen point can be marked with a sterile pencil.

Note | It is important not to move the leg in-between the palpation of trochanter and knee references.



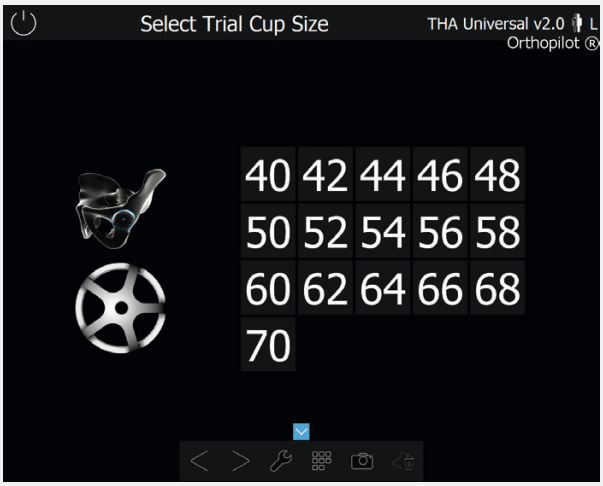
Acquire Original Hip Center

The original hip center is registered by the use of the recorder handle FS912R with a trial cup. The correct trial cup size ends at the level of bone surface and can be seated tightly but without pressfit in the acetabulum.

Registration of the original hip center is carried out in order to display the shift of hip center and to calculate the influence on the offset change.

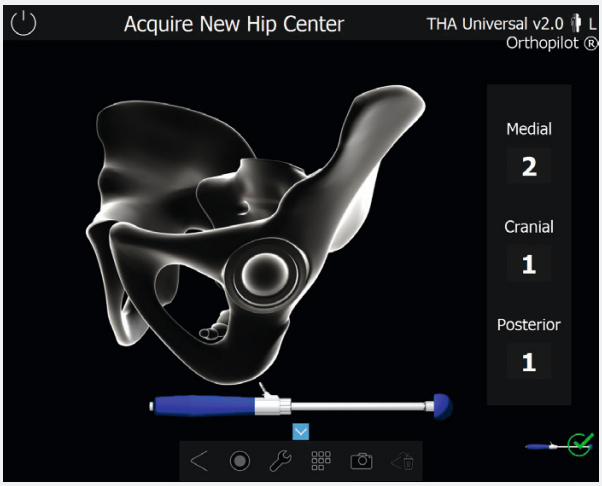
11.2 | Stem only

OrthoPilot® THA Universal Version 2



Select Trial Cup Size

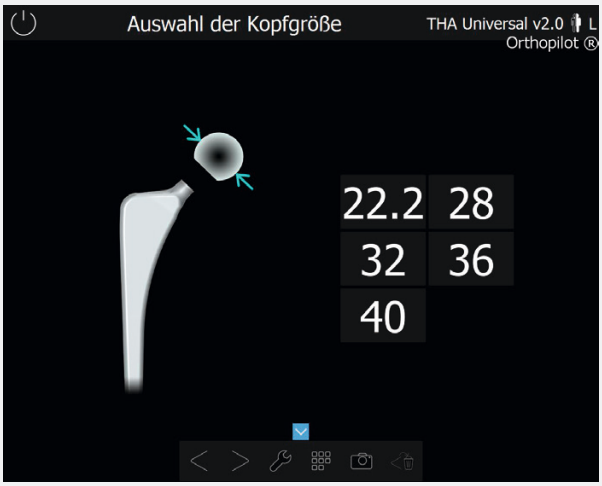
Subsequent to the registration of the original hip center the size of the utilized trial cup has to be selected. The correct size can be selected with the virtual pointer and confirmed with the right foot switch.



Acquire New Hip Center

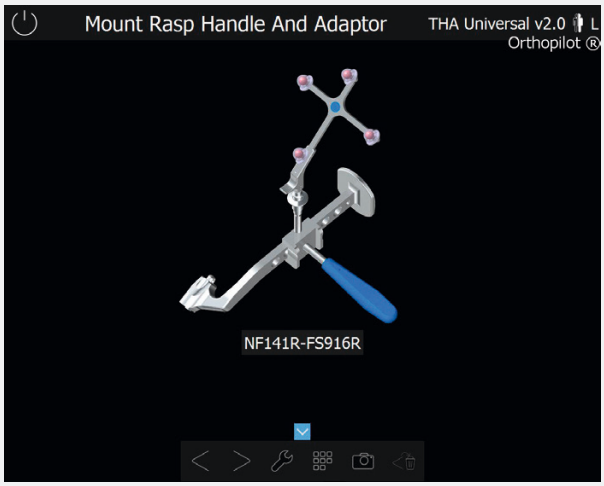
After the implantation of the acetabular components, the new hip center of rotation is recorded with a Plasmafit® impactor or the recorder handle FS912R with a screwed-on pivoting ball with the defined diameter. Pivoting balls are available for head diameters of 22.2, 28, 32, 36 as well as 40 mm.

The shift of the center of rotation in relation to the original center of rotation is displayed on the right side of the screen.



Select Head Diameter

After the acquisition of the new center of rotation the planned head diameter is selected with the virtual pointer. The selection can be confirmed with the right foot switch.



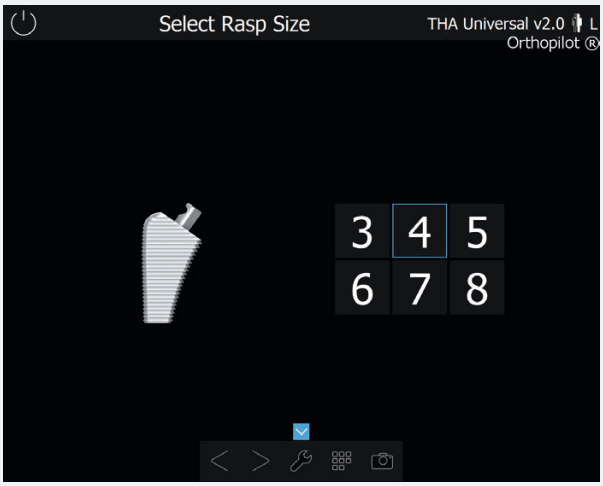
Prepare Rasp Handle

Before the rasping process this screen indicates how to mount the blue transmitter on the rasp handle by the use of the appropriate adapter.

Note | With the help of the WORKFLOW NAVIGATOR the rasp handle can be changed at any time.

11.2 | Stem only

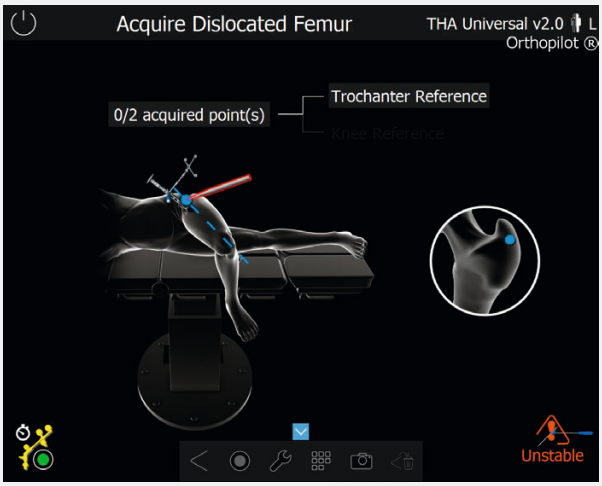
OrthoPilot® THA Universal Version 2



Select Rasp Size

To start the rasping process the appropriate rasp size inserted into the femur has to be selected with the yellow transmitter as virtual pointer. The selection can be confirmed with a right foot switch.

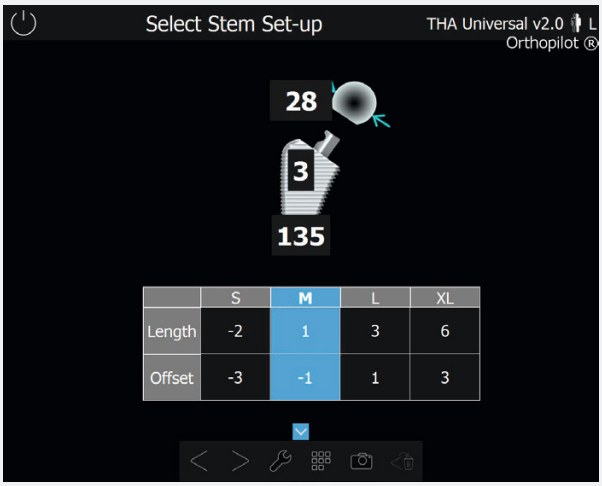
Note | The navigation of the rasp is optional. If the rasp is not navigated this step is called SELECT RASP/IMPLANT SIZE and indicates the size for the rasp or implant in-situ for the trial reduction step.



Acquire Dislocated Femur

The pre-marked landmarks for offset and leg length measurement are then palpated with the femur in dislocated position and the rasp in-situ. Offset and leg length changes are calculated on the basis of the trochanter landmark. The knee palpation is used to compute the femoral axis.

Note | For accurate leg length and offset measurement it is important to palpate exactly the same landmarks as for the initial acquisition. Accuracy regarding the palpation points can be increased by putting the leg always in the same position (straight or bent) whenever it is palpated during the workflow (initial – dislocation – reduction).



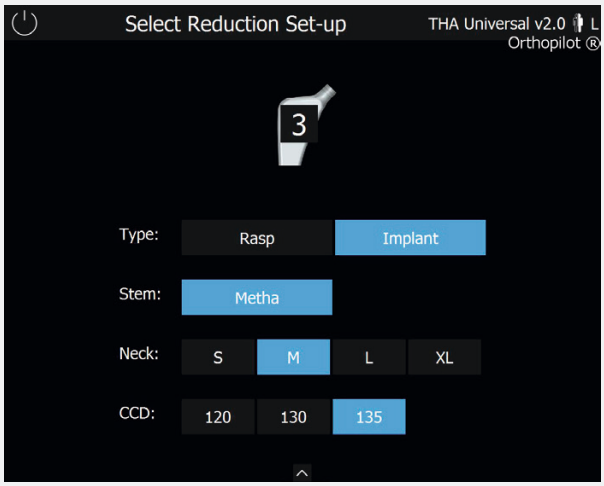
Select Stem Set-Up

The stem set-up shows the simulation for the offset and leg length changes according to the different implant options available:

- Neck length
- Standard or high offset
- CCD angle for Metha®
- VAR / STD / VAL / DYS type for CoreHip®

Another rasp size can be selected by aiming with the virtual pointer at the rasp symbol (at the top of the screen) and using the right foot switch. For the adjusted rasp size the dislocated femur has to be palpated again.

Note | If the same rasp size has to be navigated one more time, the existing information can be deleted by entering the PIE MENU and selecting the trash bin.



Select Reduction Set-Up

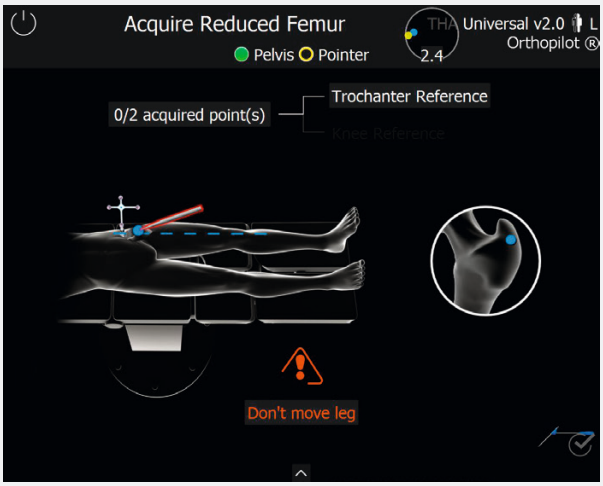
The trial reduction can be conducted with a rasp or an implant in-situ. This choice needs to be indicated during the reduction set-up. The reduction set-up can be selected by the use of the yellow transmitter as virtual pointer. The implantation options need to be configured as in-situ. The options are:

- Rasp or implant
- Rasp or implant size
- Standard or high offset version
- Neck length
- CCD angle for Metha® system
- VAR / STD / VAL / DYS for CoreHip®

Note | With the help of the WORKFLOW NAVIGATOR the rasp handle can be changed at any time.

11.2 | Stem only

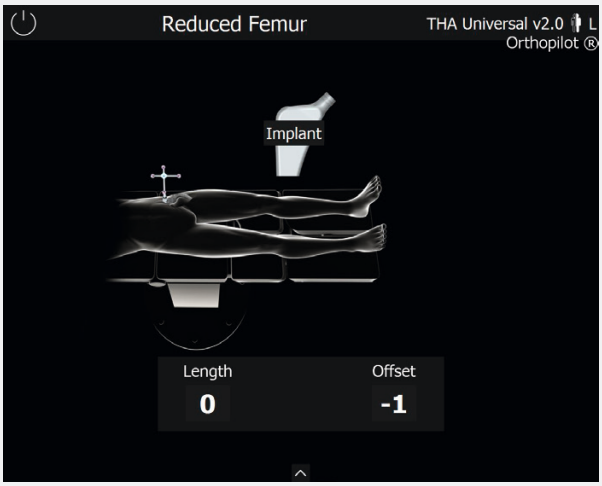
OrthoPilot® THA Universal Version 2



Acquire Reduced Femur

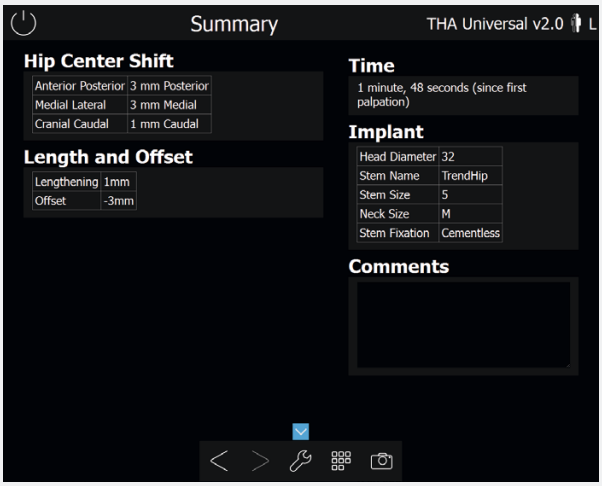
The pre-marked landmarks for offset and leg length measurement are then palpated with the femur in reduced position and the rasp or the implant in-situ. Offset and leg length changes are calculated on the basis of the trochanter landmark. The knee palpation is used to compute the femoral axis.

Note | For accurate leg length and offset measurement, it is important to palpate exactly the same landmarks as for the initial acquisition. Accuracy regarding the palpation points can be increased by putting the leg always in the same position (straight or bent) whenever it is palpated during the workflow (initial – dislocation – reduction).



Reduced Femur

The pre-marked landmarks for offset and leg length measurement are then palpated with the femur in dislocated position and the rasp in-situ. For the offset change the reference on the trochanter is re-palpated. For the leg length management the knee reference is re-palpated.



Summary

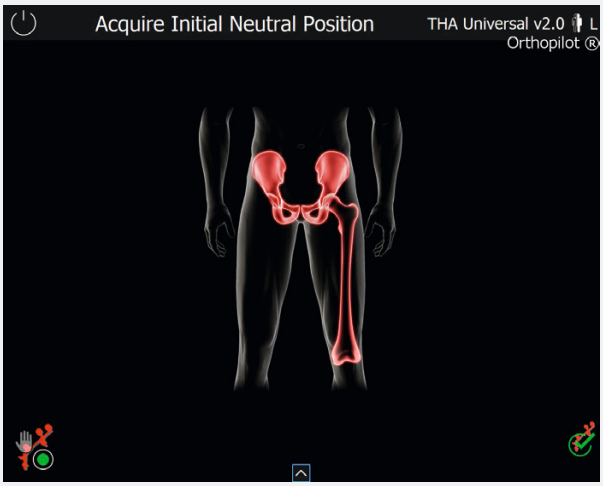
At the end of each workflow a summary report is displayed giving the following information:

- Hip center shift
- Leg length and offset
- Stem implant type
- Stem implant size
- Fixation
- Neck size
- Head component size
- CDD for Metha® system
- VAR / STD / VAL for CoreHip®
- Navigation time*

* starts at first table axis record

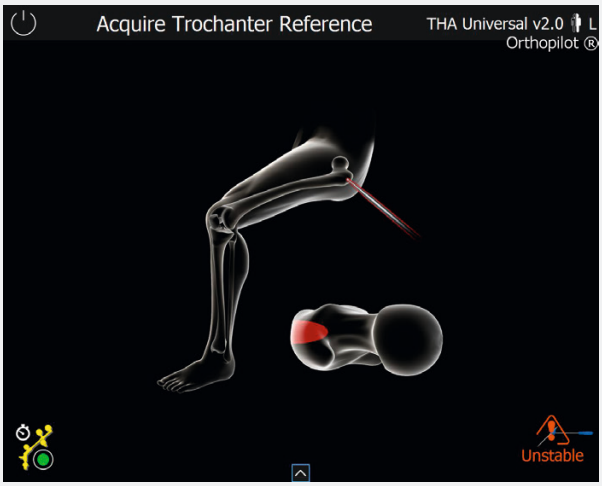
11.3 | Antetorsion & Range of Motion

OrthoPilot® THA Universal Version 2



Acquire Initial Neutral Position

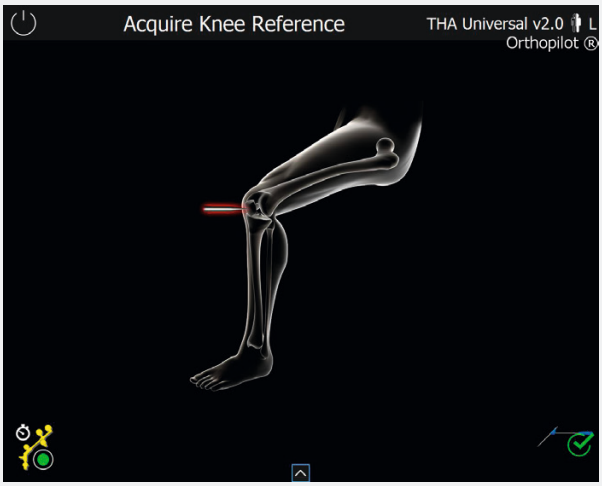
Registration of the initial situation is performed in extension and neutral position (= 0° rotation). For this, the femur should be in a roughly neutral position. The blue transmitter is affixed to the pelvis, and the red one to the femur.



Acquire Trochanter Reference

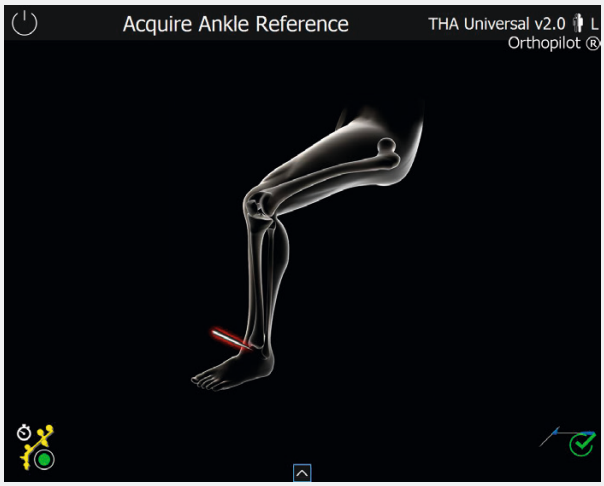
The point on the trochanter serves as a check point for the computation in the software within this Antetorsion / ROM workflow. It should be in the red marked area on the greater trochanter.

Note | It is important not to move the leg in-between the palpation of trochanter and knee references.



Acquire Knee Reference

The femoral axis is palpated with the lower leg in 90° flexion. As a rule, the point is located on the patella between the lower and the central third in cranial/caudal direction.

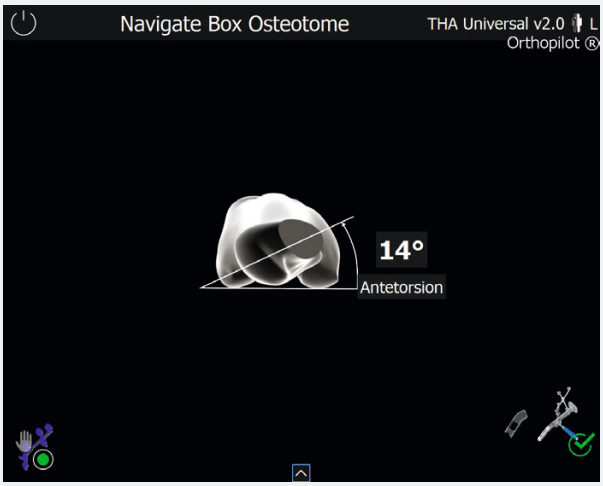


Acquire Ankle Reference

A point in the centre of the medial malleolus is palpated with the lower leg likewise in 90° flexion.

11.3 | Antetorsion & Range of Motion

OrthoPilot® THA Universal Version 2



Box Osteotome

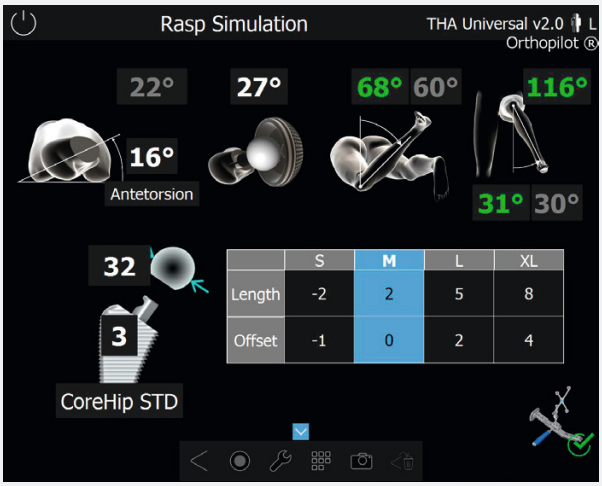
For implanting straight stem prostheses, the femoral canal can be opened up with navigation support using a box osteotome. The image on the screen shows the femur with resected femoral head.

The indicated angle value represents absolute femoral torsion. The reference for this angle is the dorsal condylar line.

Note |
Current Antetorsion:
Relies to the current hip center according to the rasp adapter in place.

Pre-Operative Antetorsion:
Refers to the initial hip center position.

Relative Antetorsion:
Takes into account the estimation of the final hip center.



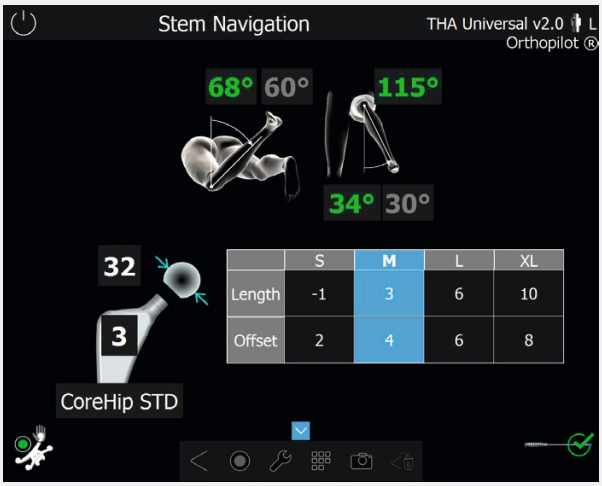
Rasp Simulation

After inserting the rasp, the adapter (either FS716R, FS718R, FS916R, FS918R) with the appropriate rasp handle and the yellow transmitter are assembled. Now the following values are displayed:

- Absolute femoral antetorsion
- Range of Motion
- Leg length and offset
- Available head sizes
- Maximum flexion.

Besides the CURRENT ANTETORSION of the femur also the PRE-OPERATIVE ANTETORSION is displayed above in grey colour.

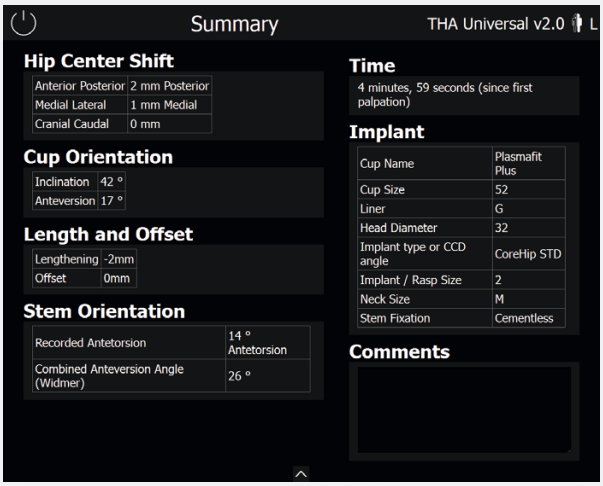
Additionally, when the cursor is hovering over the PRE-OPERATIVE ANTETORSION value, another value is appearing representing the RELATIVE ANTETORSION. This shows how the profiler should be aligned in order to meet the implanted cup while at the same time retaining the pre-operative relation between femur and acetabulum.



Stem Navigation

In order to detect the position of the implanted stem, the THA handle recorder (FS912R) with the yellow transmitter and the appropriate adapter (FS981 or FS982) is attached to the taper.

Note | The effects on leg length and offset are displayed in relation to the head-neck length.



Summary

At the end of each workflow a summary report is displayed giving the following information:

- Hip center shift
- Cup angles
- Cup implant type & size
- Navigation time*

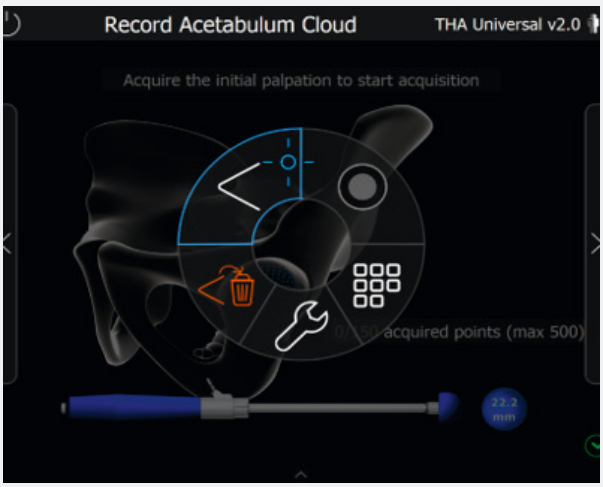
If the stem is also navigated:

- Leg length and offset
- Antetorsion / Combined anteversion
- Stem implant type
- Stem implant size
- Fixation
- Neck size
- Head component size
- CDD for Metha® system

* starts at first table axis record or first palpation record depending on the workflow

12 | Optional Navigation Tools

OrthoPilot® THA Universal Version 2

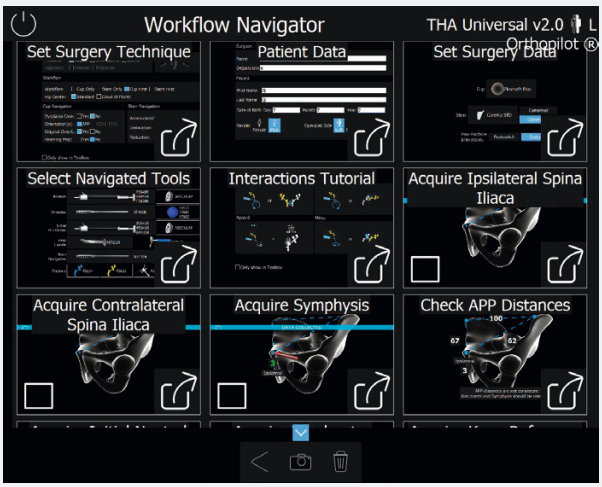


Pie Menu

The PIE MENU allows the user to execute available step controls by using a virtual pointer or the selected Man Machine Interaction (MMI). It opens with a short center press on the footswitch or a circular horizontal gesture.

It displays the current step controls as a circular buttons menu that the user can click using the virtual pointer in combination with the chosen main MMI.

The user can automatically exit the PIE MENU by hovering over the cross with a virtual pointer.



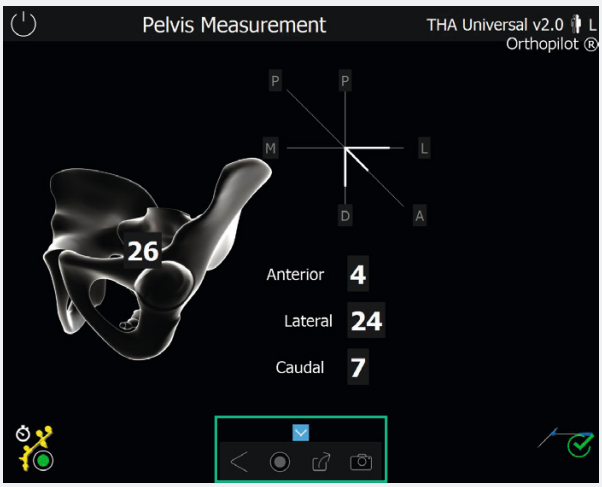
Workflow Navigator

The WORKFLOW NAVIGATOR step provides the following functionalities:

- Quick navigation to previous workflow steps
- Erase single or multiple data steps.

Interacting with the WORKFLOW NAVIGATOR is possible using the virtual pointer or the touch screen.

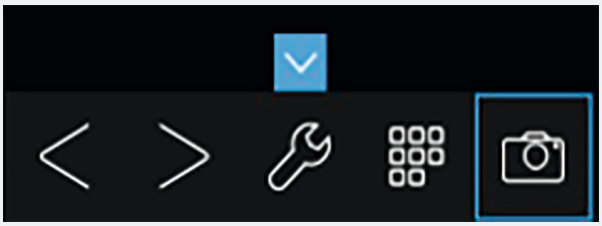
The WORKFLOW NAVIGATOR is accessible via the PIE MENU or the TOOLBAR.

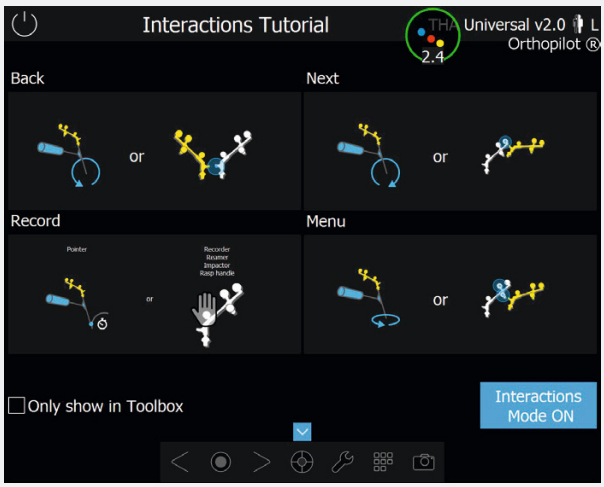


Toolbar

The small blue arrow on the bottom of the screen allows the user to display or hide the control TOOLBAR. The TOOLBAR is always accessible using the touch screen and in defined steps with the virtual pointer. It contains most of the step controls and displays them as buttons.

Note | In order to save the tool screens into the report files the right foot pedal needs to be pressed shortly. In order to leave the tool screens and to get back to the navigation workflow the right foot pedal needs to be pressed long.





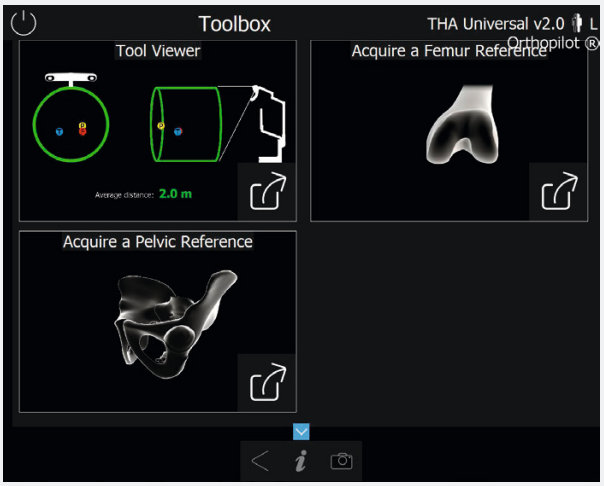
Interaction Tutorial

The INTERACTION TUTORIAL allows the user to test the available gesture in the THA Universal Version 2 application.

Reminder images explain the different gestures. The button INTERACTIONS MODE has to be set to ON to try and practice the gestures.

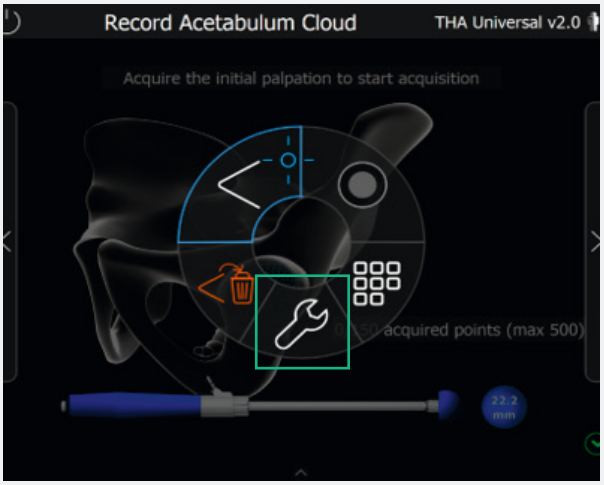
12 | Optional Navigation Tools

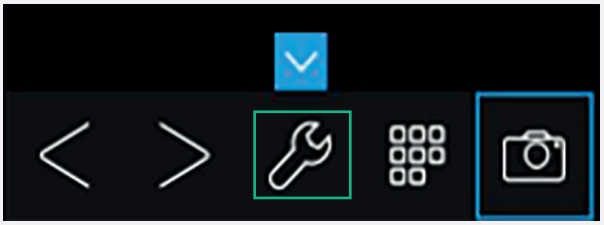
OrthoPilot® THA Universal Version 2

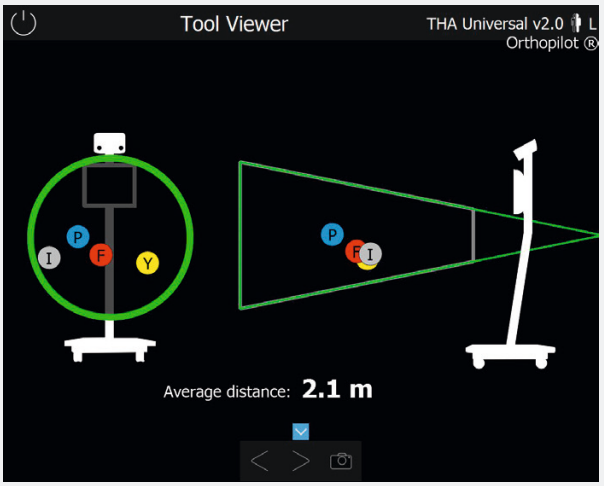


Toolbox

The TOOLBOX is accessible from the PIE MENU and the TOOLBAR.





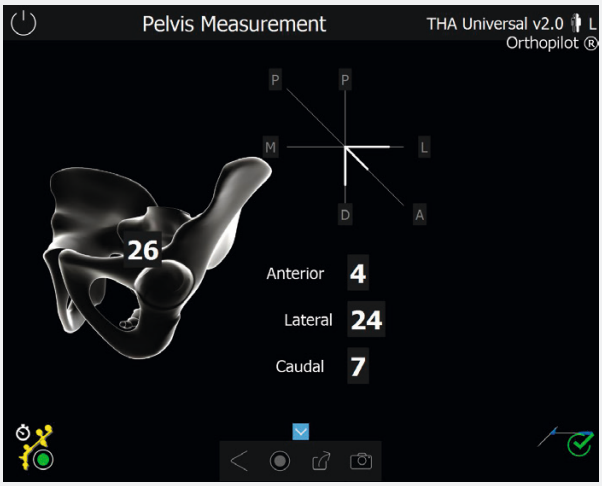


Camera Adjustment

THA Universal Version 2 provides the possibility to adjust the camera to the surgical field. The field of view of the camera is shown on the screen as a cylindrical volume.

The transmitters within the field are displayed as colored balls corresponding to their color coding. When both transmitters are at an optimal distance from the camera, the camera field of view is bordered in green on the screen. The distance from the camera to the transmitters is given in meters, the desired distance is 1.7-2.2 meter. The screen for positioning the camera can be accessed at any time via the TOOLBOX in the upper left corner of the screen.

Note | When aligning the camera take into account that the leg is extended, abducted or adducted during the surgery. The camera must be set up in such a way that it can register the transmitters in every position. The camera can be adjusted during the surgery at any time – except during the registration of the table axis and the initial femur palpation.

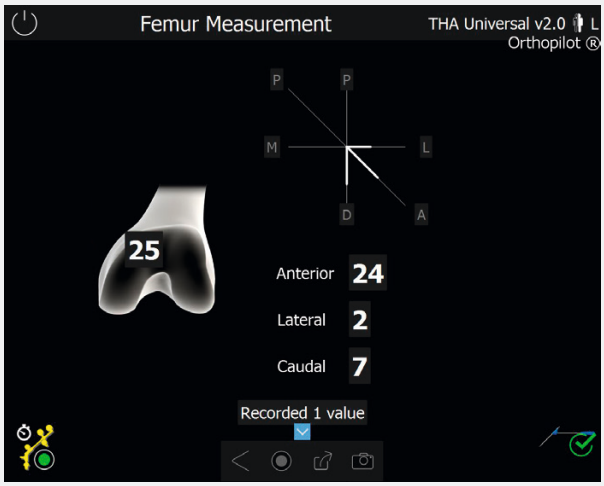


Pelvis Measurement

The PELVIS MEASUREMENT tool provided in the TOOLBOX gives the opportunity to measure the distance between two palpated points on the pelvis.

In the first step the reference point on the pelvis is acquired with the pointer (FS934). As soon as the next point is palpated the information on the distance to the first point in anterior / posterior, medial / lateral as well as cranial / caudal direction is displayed on the screen. Additionally, the average distance from the second point palpated to the first point palpated is displayed on the pelvis image.

Note | In order to save the tool screens into the report files the right foot pedal needs to be pressed shortly. In order to leave the tool screens and to get back to the navigation workflow the right foot pedal needs to be pressed long, for OrthoPilot® *Elite* it is central long.

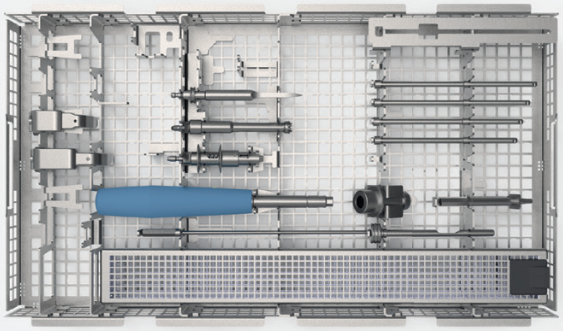


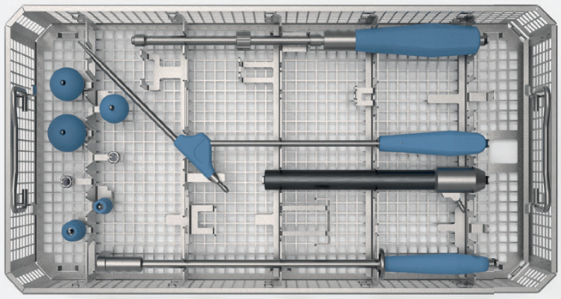
Femur Measurement

The FEMUR MEASUREMENT step is only available in a workflow, when the ANTETORSION / RoM option is selected.

13 | Article Overview

OrthoPilot® THA Universal Version 2



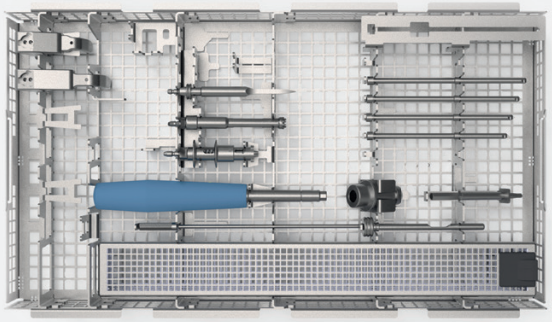


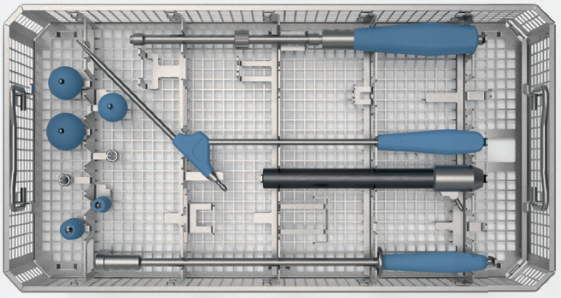
Lateral Patient Position

Anterior Approach

FS704	
OrthoPilot® Rigid Body adapter for screw	NP619R
OrthoPilot® bicort. RB holding screw 35 mm	NP621R
OrthoPilot® bicort. RB holding screw 40 mm	NP622R
OrthoPilot® bicort. RB holding screw 45 mm	NP623R
OrthoPilot® bicort. RB holding screw 50 mm	NP624R
Acculan II hex-chuck (Targon®)	GB413R
Manual screw-in tool for attachment pins	NP614R
Screw driver A/F 3.5 Torx motor-driven	NE358R
OrthoPilot® THA, extension for c-clamp 60 mm	FS908R
OrthoPilot® THA, pelvic nail, lateral pos. 95 mm	FS985R
OrthoPilot® THA, c-clamp for lateral pos., anterior	FS901R
OrthoPilot® THA, c-clamp for lateral pos., anterior, large	FS898R
Tray lid 489 x 257 mm	JH217R

FS704	
OrthoPilot® THA positioning for FS702-FS705	FS706R
Graphics template for FS706R (FS703-FS705)	TE917
OrthoPilot® THA recorder handle	FS912R
OrthoPilot® THA in/out impactor for nails	FS936R
OrthoPilot® THA glove protector	FS939
OrthoPilot® THA active pointer, angled 45°	FS934
OrthoPilot® THA pivoting sphere, Ø 28 mm	FS979
OrthoPilot® THA pivoting sphere, Ø 32 mm	FS980
OrthoPilot® THA pivoting sphere, Ø 36 mm	FS983
OrthoPilot® THA taper adapter 8/10 mm	FS981
OrthoPilot® THA taper adapter 12/14 mm	FS982





Lateral Patient Position

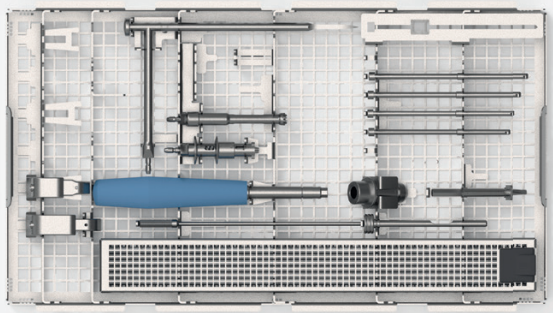
Posterior Approach

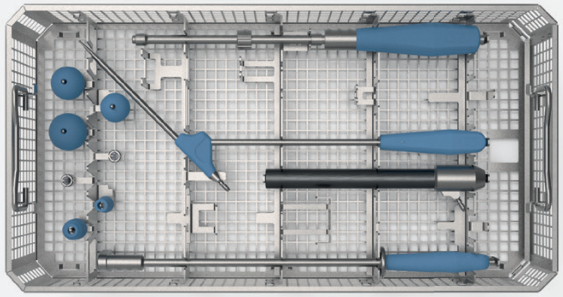
FS705	
OrthoPilot® Rigid Body adapter for screw	NP619R
OrthoPilot® bicort. RB holding screw 35 mm	NP621R
OrthoPilot® bicort. RB holding screw 40 mm	NP622R
OrthoPilot® bicort. RB holding screw 45 mm	NP623R
OrthoPilot® bicort. RB holding screw 50 mm	NP624R
Acculan II 6-KT chuck (Targon®)	GB413R
Manual screw-in tool for attachment pins	NP614R
Screw driver A/F 3.5 Torx, motor-driven	NE358R
OrthoPilot® THA, extension for c-clamp 60 mm	FS908R
OrthoPilot® THA, pelvic nail, lateral pos. 95 mm	FS985R
1/1 Sieve tray lid, large perforat. 489 x 257 mm	JH217R
OrthoPilot® THA, c-clamp for lateral pos., post.	FS907R
OrthoPilot® THA c-clamp for lateral pos., post., small	FS899R
Tray lid 489 x 257 mm	JH217R

FS705	
OrthoPilot® THA positioning for FS702-FS705	FS706R
Graphics template for FS706R (FS703-FS705)	TE917
OrthoPilot® THA recorder handle	FS912R
OrthoPilot® THA in/out impactor for nails	FS936R
OrthoPilot® THA glove protector	FS939
OrthoPilot® THA active pointer, angled 45°	FS934
OrthoPilot® THA pivoting sphere, Ø 28 mm	FS979
OrthoPilot® THA pivoting sphere, Ø 32 mm	FS980
OrthoPilot® THA taper adapter 8/10 mm	FS981
OrthoPilot® THA taper adapter 12/14 mm	FS982
OrthoPilot® THA pivoting sphere, Ø 36 mm	FS983

13 | Article Overview

OrthoPilot® THA Universal Version 2

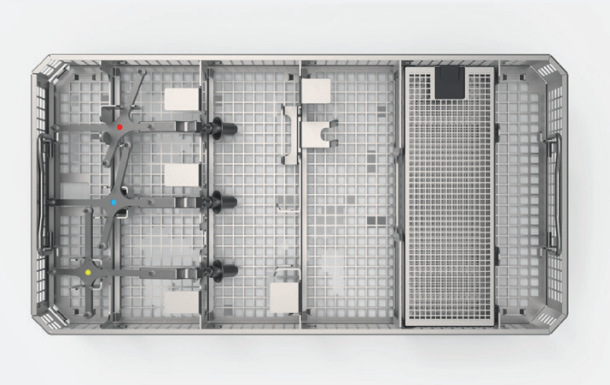




Supine Patient Position

FS703	
OrthoPilot® Rigid Body adapter for screw	NP619R
OrthoPilot® bicort. RB holding screw 35 mm	NP621R
OrthoPilot® bicort. RB holding screw 40 mm	NP622R
OrthoPilot® bicort. RB holding screw 45 mm	NP623R
OrthoPilot® bicort. RB holding screw 50 mm	NP624R
Acculan II hex-chuck (Targon®)	GB413R
Manual screw-in tool for attachment pins	NP614R
Screw driver A/F 3.5 Torx, motor-driven	NE358R
OrthoPilot® THA, extension for c-clamp 60 mm	FS908R
OrthoPilot® THA pelvic nail, supine pos.	FS984R
OrthoPilot® THA, c-clamp for supine position	FS906R
OrthoPilot® THA, c-clamp for supine position, small	FS897R
Tray lid 489 x 257 mm	JH217R

FS703	
OrthoPilot® THA positioning for FS702-FS705	FS706R
Graphics template for FS706R (FS703-FS705)	TE917
OrthoPilot® THA recorder handle	FS912R
OrthoPilot® THA in/out impactor for nails	FS936R
OrthoPilot® THA glove protector	FS939
OrthoPilot® THA active pointer, angled 45°	FS934
OrthoPilot® THA pivoting sphere, Ø 28 mm	FS979
OrthoPilot® THA pivoting sphere, Ø 32 mm	FS980
OrthoPilot® THA pivoting sphere, Ø 36 mm	FS983
OrthoPilot® THA taper adapter 8/10 mm	FS981
OrthoPilot® THA taper adapter 12/14 mm	FS982



Passive Transmitter

FS926	
OrthoPilot® THA passive transmitter positioning	FS919R
OrthoPilot® passive Rigid Body, yellow	FS633
OrthoPilot® passive Rigid Body, blue	FS634
OrthoPilot® passive Rigid Body, red	FS635

Sterile Marker

Please order separately	
3 x 4 units NDI single-use passive markers	FS616
3 x 4 units CAP single-use passive markers	FS618SU
4 x 4 units NDI single-use passive markers*	FS617
4 x 4 units CAP single-use passive markers*	FS619SU

Note | *4 x 4 passive markers are only necessary for the navigation of anteversion and range of motion with the additional red femur rigid body.

Software

Please order separately	
THA Universal Version 2	FS239

Instruments

Please order separately	
Bicortical screw drill bit Ø 3.2 mm	NP615R
Bicortical screw drill guide 3.2/100 mm	NP616R
OrthoPilot® bicort. RB holding screw 30 mm	NP620R
OrthoPilot® bicort. RB holding screw 35 mm	NP625R
OrthoPilot® THA pelvic nail, lateral pos. 150 mm	FS986R
OrthoPilot® THA pelvis nail lat. pos. 150 mm angled	FS987R
OrthoPilot® THA pelvis nail lat. pos. 150 mm modular	FS937R
OrthoPilot® THA pelvis nail supine pos. modular	FS938R
OrthoPilot® THA, extension for c-clamp 95 mm	FS909R
OrthoPilot® THA RB adapter supine position	FS716R
OrthoPilot® THA RB adapter lateral position	FS718R
OrthoPilot® THA RB adapter for Metha® supine position	FS916R
OrthoPilot® THA RB adapter for Metha® lateral position	FS918R
OrthoPilot® THA passive RB Plasmafit®	FS609
PE-Cup positioning plate Ø 28 mm	FS740-FS745
PE-Cup positioning plate Ø 32 mm	FS751-FS754
Hammer pointer**	FS869R
Hook pointer**	FS865M

Note | ** For Dysplasia workflows only.

Instructions for Use

Please order separately	
THA Universal Version 2 FS239	TA016215

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