



BIOTECHNI®

TTHR
REVISION AND RECONSTRUCTION
MODULAR FEMORAL STEM
SURGICAL TECHNIQUE





Design

TTHR Revision and Reconstruction femoral stem fulfils the demands of hip revision surgery as it offers the ability to customize the hip implant. Four metaphyseal diameters and more than 36 different stems options provide surgeons more than 140 hip implants combinations.

Materials

The cementless stems are manufactured from Titanium Alloy (Ti6Al4V) in compliance with 5832-3 and ASTM F136 standards. The coating used for the stem is made of Pure titanium and hydroxyapatite. Both materials are biocompatible and comply with ISO 13779-2, ASTM F 1580 and ASTM F1185 standards.

Indications

Revision of a stem from total hip prosthesis,
Revision of a stem from hemiarthroplasty.
Grades II, III, IV SOFCOT or 3a, 3b and 4 of Paprosky.
The implants are intended to be used on adult patients

Contraindications

Any local, acute, or chronic infection. Any infectious illness. Fever or leucocytosis. Systemic and metabolic disorders. Any mental or neuromuscular disorder. Deficient bone stock, osteopenia and/or severe osteoporosis. Drug, tobacco and/or alcohol addiction and/or abuse. Non terminated skeletal development. Intense physical activity. Proved or suspected sensitivity to materials. Tumor unresectable or residual. Pregnancy, obesity or overweight (BMI >25).

These contraindications are of general order and not exhaustive, and the surgeon will have to evaluate each patient, in order to determine the risks specific to the surgery and the benefit for the patient.

Sizes

The TTHR is a modular revision stem made of two components:

- 4 Metaphyseal component sizes
- 6 Diaphyseal component diameters. Each diameter size is available in 6 or 7 different stem lengths.

Preoperative planning

The procedure (with or without femorotomy) should be carefully planned. **Select the prosthesis with the aid of radiographic templates and appropriate x-rays of the hip.**

Basic surgical technique

Choose the length and diameter of the trial stem.
Choose the size of the rasp (trial metaphysis).
Assemble both, adjust the anteversion and test their work.
Assemble the final prosthesis identical to the trial prosthesis.

Set the targeting system.
Lower the targeting system / implant assembly.
Lock the trial stem.
Remove the targeting system.

Multiple surgical techniques are possible. They are described in the following sections.

A. Surgery without femorotomy and without locking

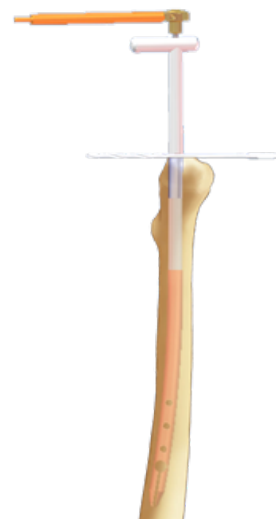
Use layers for the preparation.
Measure the length of the lower limb.
If necessary, remove cement and clean the diaphyseal shaft.

Step 1 Test of the trial stem

Take the **trial stem** (ref. QExx-yyy) with the equivalent length but a diameter size two times inferior to what was observed on the layers.
Set this trial stem on the **T-handle** (ref. C4A/250) and lock it with the **locking screw** (ref. C4A/260). The long bar of the T handle must be directed toward the posterior side of the trial stem. The locking screw can be screwed with the **locking handle** (ref. C4A/210).

Carefully, sink the trial stem, the big side of the "T" on the axis of the leg, leg bent.

The top of the polishing on the axis of the "T" is located horizontally of the future center of rotation of the standard cone (the notch at this level makes it possible to see where this center will be located with respect to the acetabulum). The bottom should be horizontal to the future metaphyseal collar.

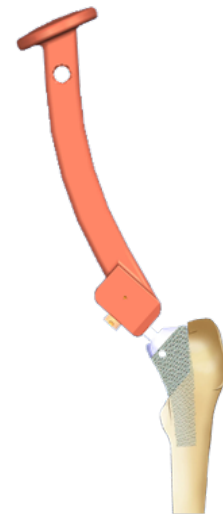


Step 2 Test of the rasp (metaphyseal part)

Set the **rasp** (ref. RA/TTHRxx) on the **rasp handle** (ref. CMA-400). The size of the rasp must be one size below the one observed on the layers.

The collar should be at the upper level of the pins.

The collar must not stop the descent of the implant but just should lean on the bone. It can remain suspended above the calcar without inconvenience.



Step 3 Rasp and trial stem setup

Assemble the rasp and the trial stem with an ante-retroversion movement according to the reference line located at the level of the junction.

Insert the **assembly screw** (ref. C4A/110) in the rasp and tighten using the **hexagonal screwdriver 3.5** (ref. C4A/160) mounted on the **I-handle** (ref. C4A/150), while keeping up the rasp with the **assembly wrench** (ref. C4A-120) to avoid any change of anteversion.

Move down this assembly very gently using the **rasp handle** (ref. CMA-400).

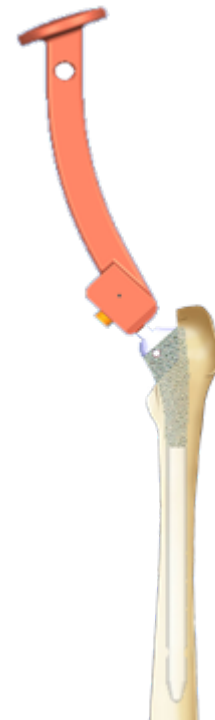
Test the stem length and stability in combination with the **trial neck** (ref. C4A-630) and **the heads** (ref. Txxxxy).

According to the results of those tests, change:

- the size of the trial rasp;
- the diameter and/or the length of the trial stem;
- the rotation between the two components.

Note the height at which the upper level of the pins in the trial stem (level of the future collar) stops in relation to the calcar.

Remove the assembly without unscrewing the assembly screw



Step 4 Assemble of the final implants

Note the rotation level between the rasp and trial stem using the rotation reference lines.

Assemble the two chosen final implants according to the rotational references.

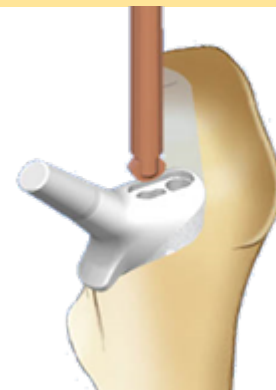
Screw the assembly using the **handle and the screw driver** (ref. C4A/150 - C4A/160) to tighten the cone as much as possible.

NOTE: The assembly screw is delivered with the final metaphyseal component



Step 5 Descent of the final implants

Lower the abovementioned assembly using the **directional impactor** (ref. C4A-500).



Step 6 Femoral head insertion

Clean and dry the cone femoral stem before implementing the final head.

Place the prosthetic femoral head on the neck taper and firmly impact with a **femoral head impactor** (ref. CA-PH00).

A small hit on the **head pusher** (ref. C4A-ETxx) is also possible to achieve the impaction of the head.

To verify fixation of the head, attempt to remove the head by hand.



Step 7 Reduction

Prior to reduction, wash correctly throughout the joint. Using the head pusher, reducing overall in the acetabulum.

Check the stability of the assembly and close the incision.

B. Surgery without femorotomy, with locking

Follow steps 1 to 4 as previously indicated.

Step 5 Setting of the viewfinder system for the locking

Assemble the **support** (ref. C4A/430 and C4A/440).

Mount the **targeting system** (ref. C4A/100) on the support by placing "ANTERIOR" / "POSTERIOR" and stabilize the final implant parallel and below the viewfinder.

Unlock the spanner number 2.

Tap lightly on the spanner n° 1 to release the cone. Tighten the spanner number 1 to tighten the implant to the maximum.

Insert the two **guides** (ref. C4A/140) through the viewfinder bar holes corresponding to the chosen implant.

Slide into those guides the two **measuring rods** (ref. C4A-220).

If the holes are not face-to-face, two fine tuning are possible:

Translational fine tuning:

- o Unscrew the spanner n°4
- o Adjust the spanner n°3
- o Lock the spanner n°4

Rotational fine tuning:

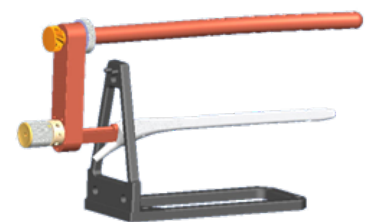
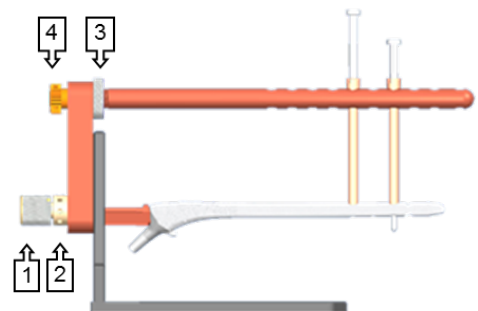
- o Unscrew the spanner N°2
- o Adjust the rotation
- o Tighten the spanner n°2

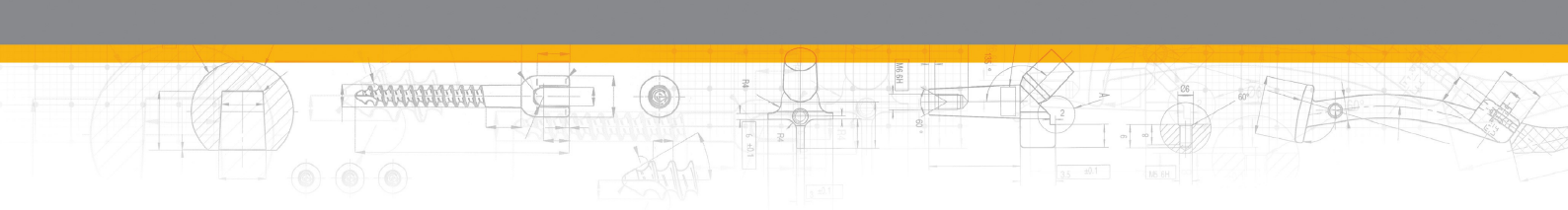
Tighten alternatively and progressively the spanners n°2 and n°4 with the **handle for locking** (ref. C4A/210) while checking that the measuring rods can turn around themselves.

Note the locking holes to use in the viewfinder bar.

Remove the measuring rods and the guides.

Spanner 1: Tightening of the implant
Spanner 2: Locking of the entire system
Spanner 3: Translation adjustment
Spanner 4: Tightening spanner





Lower gently the prosthesis to the planned height, striking the **bell support** (ref. C4A/330) mounted on the viewfinder system.

Note: Do not directly hit the spanner n°1. Do not touch the spanners during the descent of the implants.



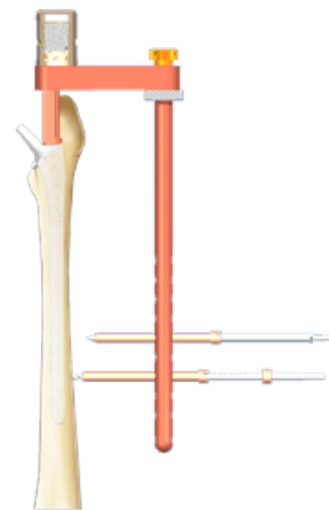
Step 6 Stabilisation of the viewfinder system

Insert the **troc ar tip** (ref. C4A/180) in a guide-barrel.

Place this guide-barrel in the most proximal hole of the viewfinder bar corresponding to the length of the diaphyseal part chosen. Insert the guide-barrel until contact with the first cortical.

Mark this cortical using the **drill for pre-hole** (ref. C4A/310) through the guide-barrel.

Drill the cortical, then the funnel to the second cortical with the **graduated drill for distal locking** (ref. C4A/190) protected by the ring.
Let the drill in place.



When the femur is stabilized, set up the two others guide-barrel using the same method.

Step 7 Locking

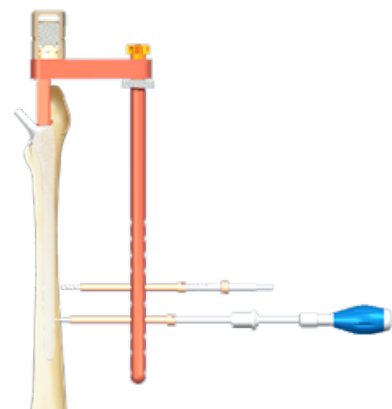
Drill the downstream hole using the same method as previously indicated, with the second drill.

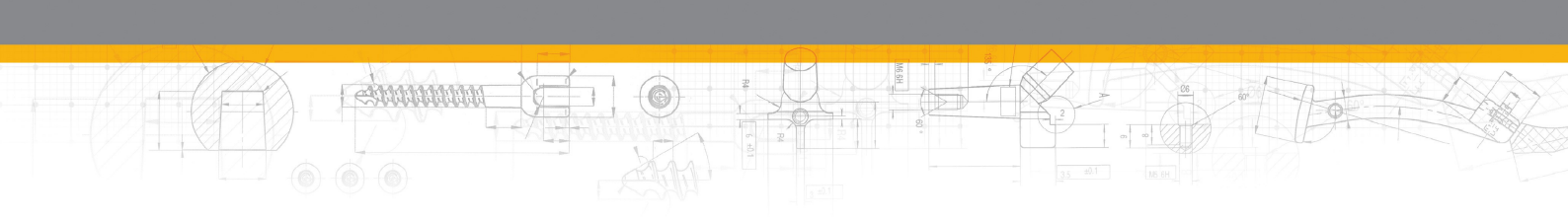
Measure the length of the locking screws using the **depth gauge** (ref. C4A/170) through the guide-barrels.

Mount the **tap for distal locking** (ref. C4A/200) on the snap handle.

Thread the first cortical.

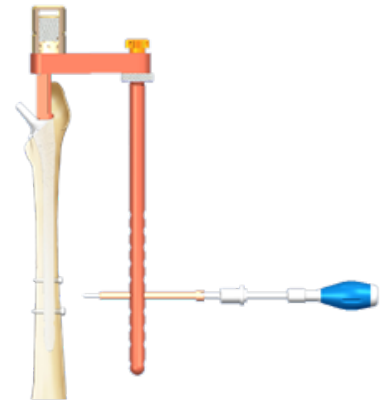
The length of the thread should be equal to the length of the polished area.





Slide the locking screws into the guide-barrel and screw it.

The length of the screw thread should be equal to the length of the polished area.



Step 8 Removal of the viewfinder system

Unscrew the spanner n°1 while holding the entire system to avoid rotational strains on the diaphyseal part.

Remove the viewfinder system.

Set and screw the assembly screw while holding the metaphyseal neck during the final screwing.

Step 9 Femoral head insertion and final reduction

The femoral head insertion and final reduction can be performed as previously indicated. (Step A6 and A7)

C. Surgery with femorotomy, without locking

Step 1 Stamp-like Femorotomy

Position the **straight rake** (ref. C4A/400).

Take out the three **drills Ø 3mm** (ref. C4A/280).

Drill a hole at the extremity of the rake using one of the drills.

Once done, let it in place.

Drill the other hole at the desired length with the second drill.

Once done, let it in place.

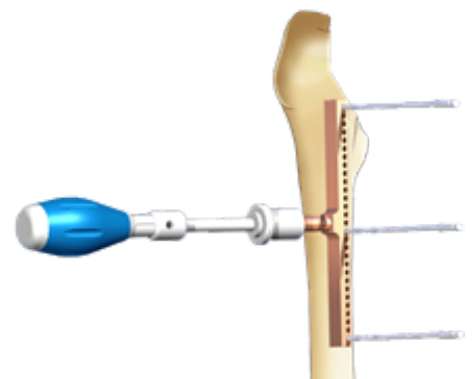
Drill the femur along the straight rake between the two extreme holes using the third drill.

Move the straight rake to a distance related to the dimension of the femur. Use again the rake and the drills to perform the drill on the other side.

Remove then the drilled femoral section.

Remove the cement.

Follow the previously indicated technique without femorotomy, without locking.

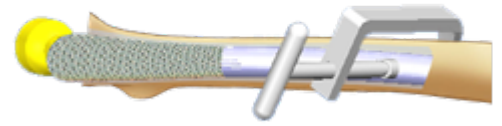




Step 2 *Trials in case of femorotomy*

During the trials, the trial stem can be stabilized in the femur using the **stabilization hook** (ref. C4A-320).

Before choosing the final implants, check the good closure of the section.



Step 3 *Section replacement*

The holes in the metaphyseal part of the TTHR (diameter: 2.5 mm) can be used for this operation, as it is usually easier to pass the cerclage wire before lowering the final stem.

This wire can pass either around the trochanteric section or through this "U" section.

Use cerclage cables or wires with a diameter inferior to 2,3 mm.

Use the **stabilization hook** (ref. C4A-320) to stabilize the whole system.



Step 4 *Femoral head insertion and final reduction*

The femoral head insertion and final reduction can be performed as previously indicated.

D. *Surgery with femorotomy, with locking*

Step 1 *Stamp-like Femorotomy*

The femorotomy can be performed as previously indicated.

The locking protocol is exactly the same as the one described in the technique without femorotomy, with locking.

Step 2 *Femoral head insertion and final reduction*

The femoral head insertion and final reduction can be performed as previously indicated.

Locking screw removal

To remove the locking screws:

Spot the screw heads using a long and thin needle.

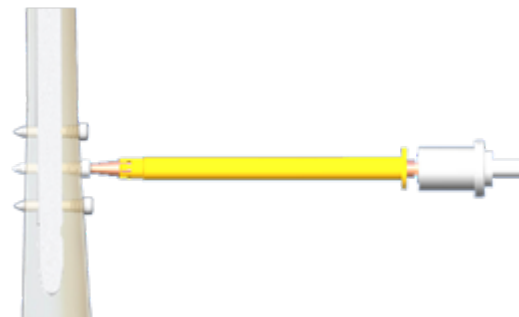
Make a skin speckle.

Lower the screwdriver mounted on the **prehensile guide** (ref. C4A/290).

Engage the hexagonal screw driver and unscrew one or two turns the screw head.

Lower and engage the prehensile guide around the screw head.

Pull up the screw.




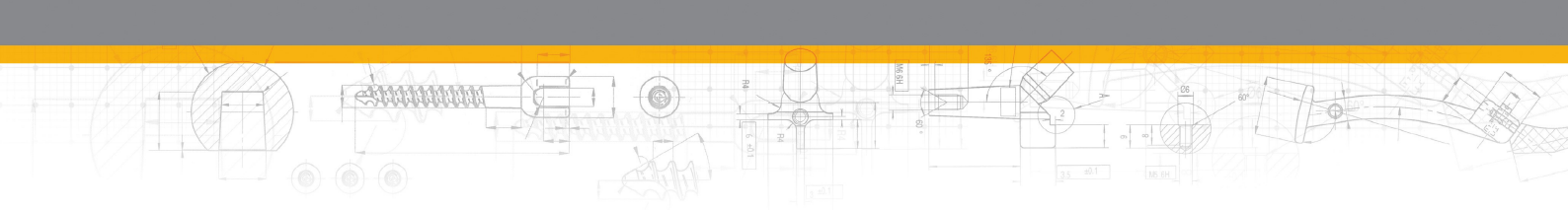
Tips and tricks


1. Side: In case of doubt about the side (right or left) of the stem, put the metaphyseal component directed toward you as the diaphyseal stem end goes up.
For right stem, the collar is directed to the right and for left stem, the collar is directed to the left.
2. During the test of the trial metaphyseal part, it is useful to assemble it with a trial keel $\varnothing 10$ to guide it.
3. During the assembly of the final implants, if they are caught in a wrong side, do not attempt to unjam them by hand. Take the **stem extractor** (ref. C4A/SE200), screw it in the screw thread closest to the neck. Put the handle of the screwdriver in the distal hole of the keel and unjam the stem.
4. Some trials (length and stability) can be performed after the descent of the final implants. If the viewfinder system disturbs those trials, it is possible to remove it by unscrewing **ONLY** the spanner n°1. After the trials put back in place the viewfinder system by screwing the spanner n°1.
5. On one side of the viewfinder bar is marked the connection holes-keel length.
On the opposite side is marked the connection holes-keel to allow the screwing of a screw in the distal hole of the stem $\varnothing 10$.
6. In the case of a hard cortical, the screwing of the locking screws can be done using the **T-handle** (ref. S2A/MTC).

When using this type of implant, it is necessary to meet the requirements for planning, surgical technique and the post-operative weight-bearing resumption in order to achieve long term fixation and function.




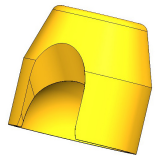






















Range

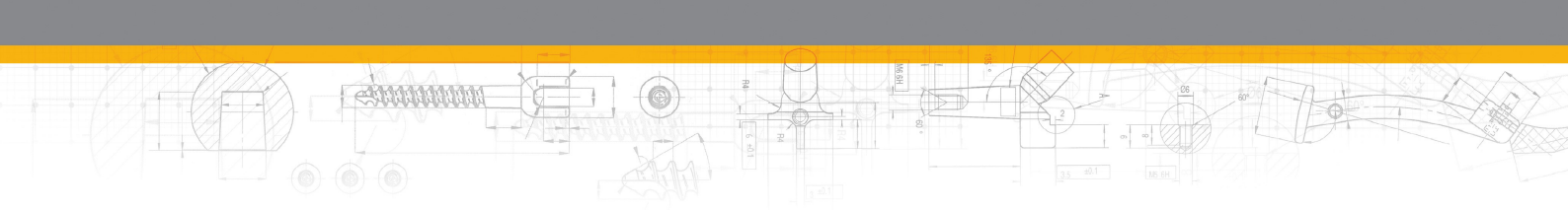
Component	Variety	Dimension	References
	Cône 12/14 (5°42'30")	Ø 14 mm	TTHR514
		Ø 16 mm	TTHR516
		Ø 18 mm	TTHR518
		Ø 20 mm	TTHR520
	Ø 10 mm	105 mm	QH10-105
		130 mm	QH10-130
		155 mm	QH10-155
		180 mm	QH10-180
		205 mm	QH10-205
	Ø 12 mm	255 mm	QH10-255
		105 mm	QH12-105
		130 mm	QH12-130
		155 mm	QH12-155
		180 mm	QH12-180
	Ø 14 mm	205 mm	QH12-205
		255 mm	QH12-255
		290 mm	QH12-290
		105 mm	QH14-105
		130 mm	QH14-130
	Ø 16 mm	155 mm	QH14-155
		180 mm	QH14-180
		205 mm	QH14-205
		255 mm	QH14-255
		290 mm	QH14-290
Ø 18 mm	105 mm	QH16-105	
	130 mm	QH16-130	
	155 mm	QH16-155	
	180 mm	QH16-180	
	205 mm	QH16-205	
Ø 18 mm	255 mm	QH16-255	
	290 mm	QH16-290	
	105 mm	QH18-105	
Ø 18 mm	130 mm	QH18-130	
	155 mm	QH18-155	



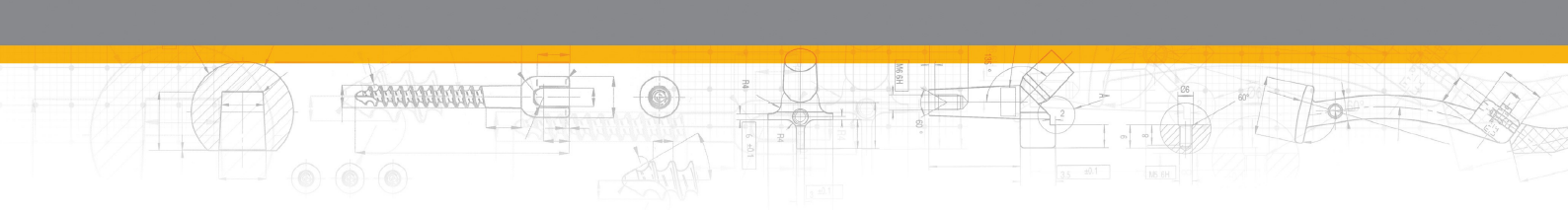
Component	Variety	Dimension	References
		180 mm	QH18-180
		205 mm	QH18-205
		255 mm	QH18-255
	∅ 20 mm	105 mm	QH20-105
		130 mm	QH20-130
		155 mm	QH20-155
		180 mm	QH20-180
		205 mm	QH20-205
		255 mm	QH20-255
			20 mm
25 mm	VC25		
30 mm	VC30		
35 mm	VC35		
40 mm	VC40		
45 mm	VC45		
50 mm	VC50		
55 mm	VC55		

Instruments

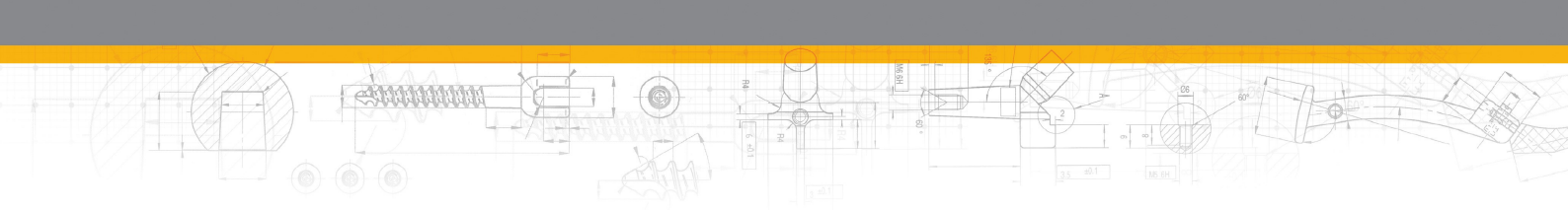
ANC-HANCHE-TTHR	Container with removable tray and lid, empty	
C4A/SE200	Extractor stem	
C4A-500	Directional impactor TTHR	
CA-PH00	Head pusher holder	
C4A-ET22	Head pusher \varnothing 22mm	
C4A-ET28	Head pusher \varnothing 28 mm	
C4A-ET32	Head pusher \varnothing 32 mm	
C4A-ET36	Head pusher \varnothing 36 mm	
C4A/100	Targeting system	
C4A/110	Assembling screw	
C4A-120	Assembly wrench	
C4A/140	Guide	
C4A/150	I-handle	
C4A/160	Hexagonal screw driver 3.5 mm	
C4A/170	Depth gauge	
C4A/180	Trocart tip	
C4A/190	Graduated drill for distal locking	
C4A/200	Tap for distal locking	
C4A/210	Handle for locking	
C4A-220	Measure rod 8x5	
C4A-230	Approach chisel	
C4A/250	T-handle	
C4A/260	Locking screw for distal system	
C4A/280	Drill \varnothing 3	
C4A/290	Prehensive guide for distal screw	
C4A/310	Drill for pre hole	
C4A-320	Stabilization hook for trial stem	
C4A/330	Bell for C4A/100	
C4A/400	Straight rake	
C4A/430	Gantry upper part	









C4A/440	Gantry lower part	
S2A/MTC	T handle	
CMA-400	Rasp handle	
RA/TTHR14	TTHR rasp - S14	
RA/TTHR16	TTHR rasp - S16	
RA/TTHR18	TTHR rasp - S18	
RA/TTHR20	TTHR rasp – S20	
C4A-630	Trial neck for rasp	
QE10-105	Trial stem Ø 10 length 105	
QE10-130	Trial stem Ø 10 length 130	
QE10-155	Trial stem Ø 10 length 155	
QE 10-180	Trial stem Ø 10 length 180	
QE10-205	Trial stem Ø 10 length 205	
QE10-255	Trial stem Ø 10 length 255	
QE12-105	Trial stem Ø 12 lengths 105	
QE12-130	Trial stem Ø 12 length 130	
QE12-155	Trial stem Ø 12 length 155	
QE 12-180	Trial stem Ø 12 length 180	
QE12-205	Trial stem Ø 12 length 205	
QE12-255	Trial stem Ø 12 length 255	
QE14-105	Trial stem Ø 14 length 105	
QE14-130	Trial stem Ø 14 length 130	
QE14-155	Trial stem Ø 14 length 155	
QE14-180	Trial stem Ø 14 length 180	
QE14-205	Trial stem Ø 14 length 205	



QE14-255	Trial stem \varnothing 14 length 255	
QE16-105	Trial stem \varnothing 16 length 105	
QE16-130	Trial stem \varnothing 16 length 130	
QE16-155	Trial stem \varnothing 16 length 155	
QE16-180	Trial stem \varnothing 16 length 180	
QE16-205	Trial stem \varnothing 16 length 205	
QE16-255	Trial stem \varnothing 16 length 255	
QE18-105	Trial stem \varnothing 18 length 105	
QE18-130	Trial stem \varnothing 18 length 130	
QE18-155	Trial stem \varnothing 18 length 155	
QE18-180	Trial stem \varnothing 18 length 180	
QE18-205	Trial stem \varnothing 18 length 205	
QE18-255	Trial stem \varnothing 18 length 255	
QE20-105	Trial stem \varnothing 20 length 105	
QE20-130	Trial stem \varnothing 20 length 130	
QE20-155	Trial stem \varnothing 20 length 155	
QE20-180	Trial stem \varnothing 20 length 180	
QE20-205	Trial stem \varnothing 20 length 205	
QE20-255	Trial stem \varnothing 20 length 255	
T225CC	Trial head 5°43'30" \varnothing 22(-4)	
T225CM	Trial head 5°43'30" \varnothing 22(0)	
T225CL	Trial head 5°43'30" \varnothing 22(+4)	
T285CC	Trial head 5°43'30" \varnothing 28(-3.5)	
T285CM	Trial head 5°43'30" \varnothing 28(0)	
T285CL	Trial head 5°43'30" \varnothing 28(+3.5)	
T285XL	Trial head 5°43'30" \varnothing 28(+7)	



T325CC	Trial head 5°43'30" Ø 32(-4)	
T325CM	Trial head 5°43'30" Ø 32(0)	
T325CL	Trial head 5°43'30" Ø 32(+4)	
T365CC	Trial head 5°43'30" Ø 36(-4)	
T365CM	Trial head 5°43'30" Ø 36(0)	
T365CL	Trial head 5°43'30" Ø 36(+4)	

Before using the device, the Orthopaedic surgeon must refer to the Instructions for Use, Package Insert and/or product label.

Thank you for sending us your suggestions to:

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