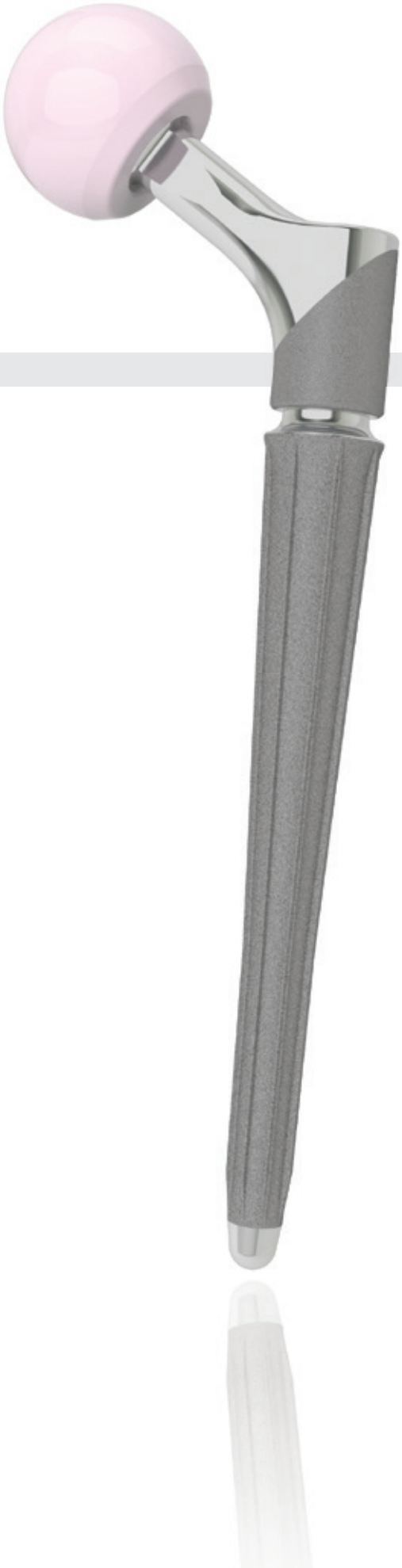
MODULUS-R

FEMORAL STEM

SURGICAL TECHNIQUE



Lima Corporate
Orthopaedic motion

MODULUS-R FEMORAL STEM SURGICAL TECHNIQUE

Index

Limacorporate spa, as manufacturer of prosthetic devices, does not practice medicine. This surgical technique has been developed in consultation with an experienced surgeon team and provides the surgeon with general guidance when implanting the MODULUS-R. Proper surgical procedures and techniques are necessarily the responsibility of the medical professional. Each surgeon must evaluate the appropriateness of the surgical technique used based on personal medical training, experience and clinical evaluation of each individual patient.

LEONARDO DA VINCI: Vitruvian Man. Study of the proportions of the human body (1490).

INDICATIONS

MODULUS-R (not available in US) is indicated for use in partial or total hip arthroplasty for reduction or relief of pain and/or improved hip function in skeletally mature patients with following conditions:

- non-inflammatory degenerative joint disease such as osteoarthritis, avascular necrosis and hip dysplasia;
- rheumatoid arthritis;
- osteoarthritis after femoral heads fractures;
- correction of functional deformity;
- revision in cases of good remaining femoral bone stock.

The MODULUS-R femoral stem (not available in US) is also indicated for patients with high levels of dysplasia where a femoral osteotomy is required.

Please follow the instructions for use enclosed in the product packaging.

CONTRAINDICATIONS

Absolute contraindications include:

- local or systemic infection;
- septicaemia;
- persistent acute or chronic osteomyelitis;
- confirmed nerve or muscle lesion compromising hip joint function.

Relative contraindications include:

- vascular or nerve diseases affecting the concerned limb;
- poor bone stock (for example due to osteoporosis) compromising the stability of the implant;
- metabolic disorders which may impair fixation and stability of the implant;
- any concomitant disease and dependence that might affect the implanted prosthesis;
- metal hypersensitivity to implant materials.

RISK FACTORS

The following risk factors may result in poor results with this prosthesis:

- overweight (BMI> 25 Kg/m^2);
- strenuous physical activities (active sports, heavy physical work);
- fretting on modular junctions;
- incorrect implant positioning (e.g.:varus positioning);
- medical disabilities which can lead to an unnatural gait and loading of the hip joint;
- muscle deficiencies;
- multiple joint disabilities;
- refusal to modify postoperative physical activities;
- patient's history of infections or falls;
- systemic diseases and metabolic disorders;
- local or disseminated neoplastic diseases;
- drug therapies that adversely affect bone quality, healing, or resistance to infection;
- drug use or alcoholism;
- marked osteoporosis or osteomalacia;
- patient's resistance to disease generally weakened (HIV, tumour, infections);
- severe deformity leading to impaired anchorage or improper positioning of implants.

MODULUS-R FEMORAL STEM SURGICAL TECHNIQUE

Indications and Contraindications

PRE-OPERATIVE PLANNING

Pre-operative planning, through radiographic templates in different formats, provides essential information regarding the type and size of components to be used and the correct combination of devices required based on the anatomy and specific conditions of each patient. Inadequate pre-operative planning can lead to improper selection of the implants and/or incorrect implant positioning.

Surgeon should carefully plan the surgery considering that **complications or failures of the total hip replacement may occur in heavy and highly active patients and high offset combinations**.

The surgeon should perform a careful evaluation of the patient's clinical condition and level of physical activity before performing hip replacement.

Patients who are overweight and/or have high activity levels may not be candidates for hip replacement with modular stems.

Alternative devices, such as monoblock hip stems, should be used, when possible, in these patients.

COMBINATIONS ALLOWED/NOT ALLOWED

Allowed combination between Limacorporate femoral head and femoral necks:

- only the head sizes S, M and L can be coupled with femoral necks #L (125° and 135°);
- only the head sizes S, M, L and XL can be coupled with femoral necks #S (125° and 135°).

Use of femoral heads with greater neck lengths may result in failure of the hip stem (e.g.: breakage due to fatigue).

Allowed combination between MODULUS-R stems (not available in US) and femoral necks:

- MODULUS-R stems can be combined only with "taper B" femoral necks;
- the use of "B-Large" necks is suggested for stems with a diameter greater than 20 mm.

STEM SIZES

MODULUS-R is comprised of 11 sizes distal components. Stems diameter increases of 1 mm per incrementing size. The two necks options, B and B-Large differing in diameter, have an optimal fill of the reamered diaphisis related to the stems sizes.

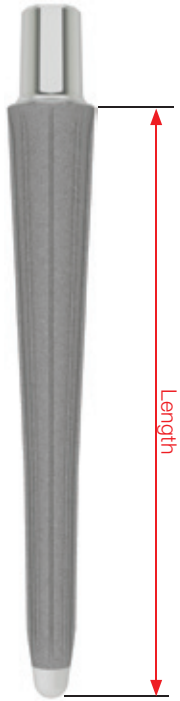
All MODULUS-R stems are compatible with B and B-Large modular necks.
Suggested combinations:

- stems #16 - #20 with B modular necks;
- stems #21 - #26 with B-Large modular necks.

The standard version modular necks, short and long, has neck-shaft angle of 135°, while the lateralizing version has neck-shaft angle of 125° (+ 5 mm offset).

MODULUS-R STEMS

SIZE (Ø)	LENGTH	TAPER	MODULAR NECKS
16 mm	120 mm	B	B
17 mm	120 mm	B	B
18 mm	120 mm	B	B
19 mm	140 mm	B	B
20 mm	140 mm	B	B
21 mm	140 mm	B	B - Large
22 mm	140 mm	B	B – Large
23 mm	140 mm	B	B – Large
24 mm	140 mm	B	B – Large
25 mm	140 mm	B	B – Large
26 mm	140 mm	B	B - Large



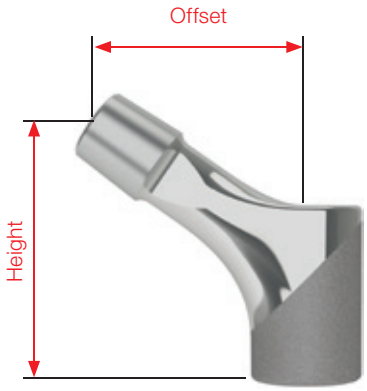
MODULUS-R FEMORAL STEM SURGICAL TECHNIQUE

Stem Sizes

MODULUS NECKS

B modular necks with Head M (+0 mm)

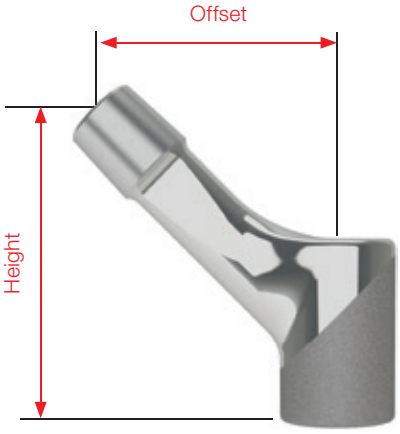
CCD	SIZE	Ø	OFFSET	HEIGHT
135°	S	19 mm	28 mm	42 mm
135°	L	19 mm	36 mm	48 mm
125°	S	19 mm	33 mm	42 mm
125°	L	19 mm	41 mm	48 mm



Neck Taper B – CCD 135°

B – Large modular necks with Head M (+0 mm)

CCD	SIZE	Ø	OFFSET	HEIGHT
135°	S	23 mm	28 mm	42 mm
135°	L	23 mm	36 mm	48 mm
125°	S	23 mm	33 mm	42 mm
125°	L	23 mm	41 mm	48 mm



Neck Taper B – CCD 125°

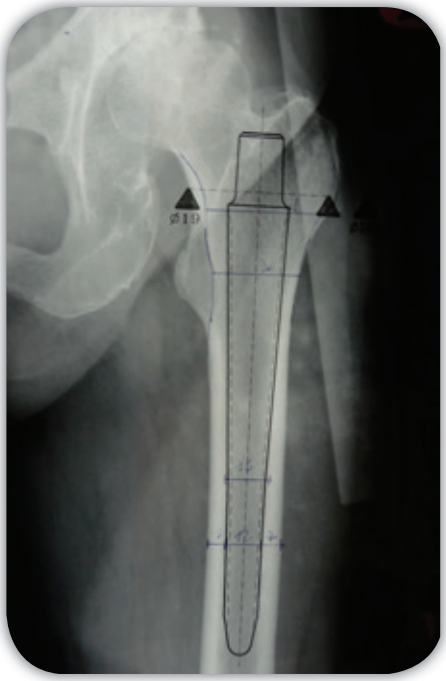


Figure 1

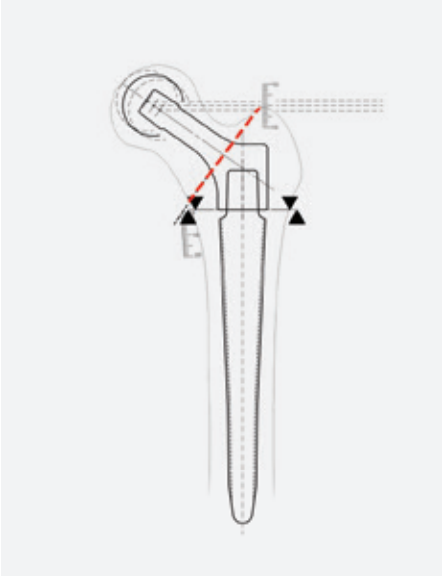


Figure 2

PRE-OPERATIVE PLANNING

Important. *Pre-operative planning provides useful information for determining probable implant size, for both primary and revision THR, and for identifying accurate femoral neck osteotomy level for primary THR only.*
The level of osteotomy should be carefully planned especially in the outcomes of previous osteotomy.

Note. *The correct stem size must be determined during surgery.*
Where it is possible to match the size planned, the height of the positioning has to consider the soft tissue tension during trial reduction, and the quality of the bone.

To achieve the best results, pre-operative planning using special templates (showing 15% larger profiles) is always advisable.

Good quality frontal and an axial X-Ray with adequate contrast should be used; it should cover the entire length of the pre-operative clear films of the stem profile *(Fig.1)*.
Instead of conventional templates, a digital version compatible with most surgical planning software is also available. However, the main feature of the conical modular stem is the possibility to create the location for the stem itself, distally or proximally in the femoral shaft according to the needs of the anatomy of the case addressed, specifically in the dysplastic hip, where either a shortening or a lengthening of the limb could be advised. In the planning, the location can be decided.

For primary THR, when suitable, determine the neck resection level by matching the apex of the greater trochanter to the centre of the medium femoral head *(Fig. 2)*. For revision THR position the templates over the X-rays of the implant to be revised, in frontal view, so that the longitudinal ribs overlap the inner outline of the cortex. The lateral view should also be considered during templating in order to check any possible conflict of the tip of the longer stem of MODULUS-R with the anterior cortex in case of bowed femur.

Note. *Templates are used to identify the resection plane in the pre-operative planning stage.*

Neck Resection

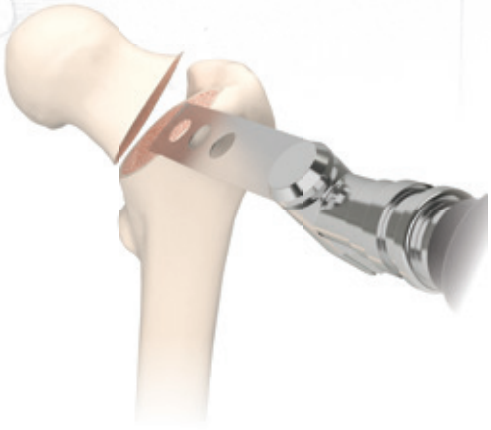


Figure 3

NECK RESECTION

Primary THR

After dislocating the femur, femoral head resection *(Fig.3)* is made by using the anatomical landmarks referenced during pre – operative planning.

Revision THR

Remove the femoral component.

FEMORAL CANAL PREPARATION

Primary THR

Start opening the medullary cavity with the box osteotome. *(Fig.4)*

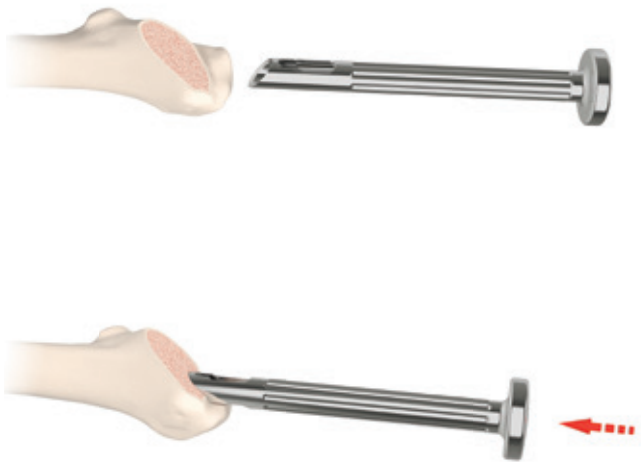


Figure 4

Femoral Reaming

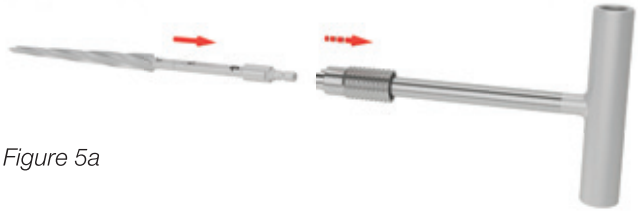


Figure 5a

FEMORAL REAMING

Assemble the smallest reamer, size 14, to the T-wrench *(Fig.5a)* and start reaming *(Fig.5b)*.
Widen the medullary canal with incrementing size reamers until noticeable resistance is felt.

Check for etch/witness marks alignment corresponding to the apex of the greater trochanter *(Fig.6)*.
Note: if the greater trochanter is damaged please select a different reference point in the anatomy.

Note. *Etch/witness marks on the reamer handle allow size (diameter) adjustment of 1 mm depending on the depth of the final seated reamer (Fig.7).*

Figure 5b

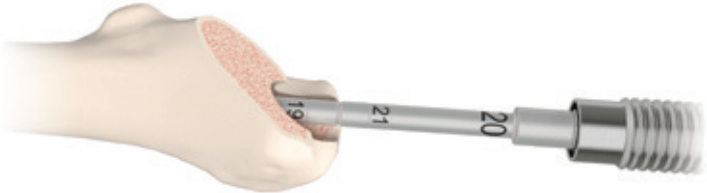


Figure 6

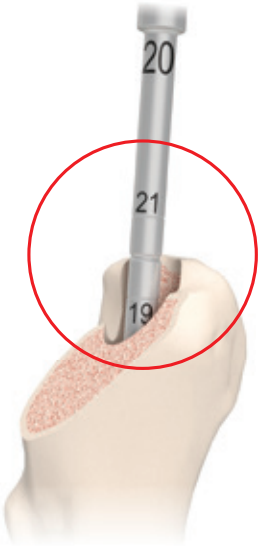


Figure 7

STEM TRIAL

Figure 8

When reaming is complete, select the stem trial of the same diameter as the final reamer.

Note. *Remove the sliding hammer from the manual impactor (Fig.8).*

Thread the manual impactor into the stem trial *(Fig.9*). Insert the stem trial into the femur *(Fig.10)* until the depth mark '0' is aligned to the apex of the greater trochanter *(Fig.11a, b)*. Hammer blows should be of moderate strength.

Check for axial and rotational (clockwise) stability.

Figure 9

Note. *The under-dimensioned fins and the polished finish render the stem trial less stable than the definitive stem.*

If the stem trial is not stable, use the next size up trial (equivalent to the +10 mark on the handle). If needed ream again.

Note. *Due to local anatomical anomaly, the tip of the greater trochanter may stick out interfering medially with the insertion. Check for correct femoral/medullary canal alignment, avoiding tilting in varus.*

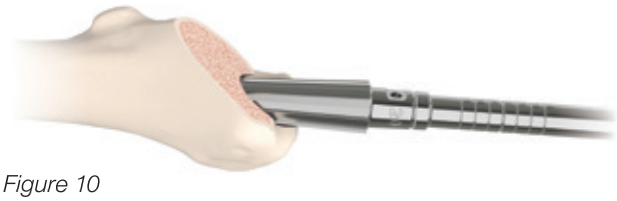


Figure 10

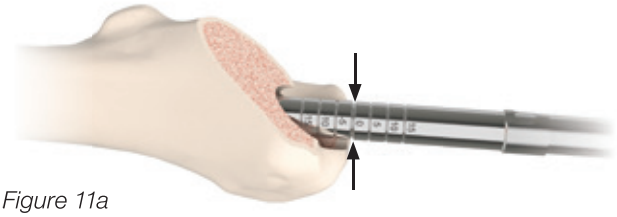


Figure 11a

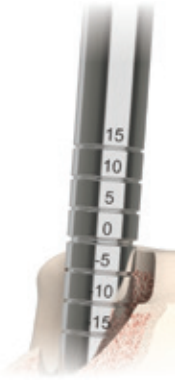


Figure 11b

Neck Site Preparation

Figure 12a

Figure 12b

NECK SITE PREPARATION

Unthread the manual impactor. Thread the neck guide rod onto the trial stem to properly ream over the taper junction. *(Fig.12a, b)*.

The reamer guide sets the trajectory and depth for neck reaming. Select the neck reamer based on the stem taper *(Fig.13a, b)*.

FIGS.	SIZE (Ø)	MODULAR NECK	VISUAL LEGEND
13a	16 – 20	B	Single groove
13b	21 – 26	B – Large	Double groove

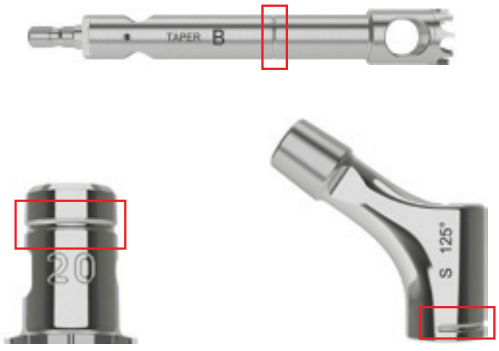


Figure 13a

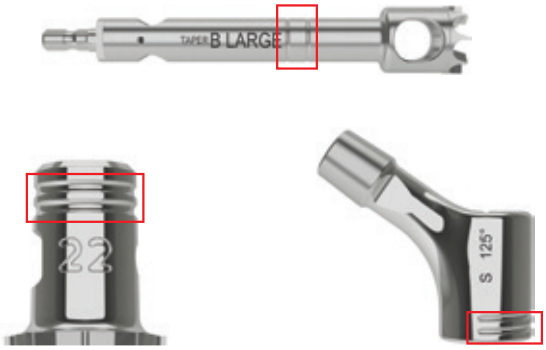


Figure 13b

Figure 14

Neck Site Preparation

Figure 15

Assemble the selected reamer with the T-Handle *(Fig.14)* and start reaming the metaphysis *(Fig.15)* until it no longer advances.

To verify that the reamer is fully seated and the proper reaming depth is obtained insert a Kirschner wire through the proximal (pin) hole:

a) if it does go through continue reaming *(Fig.16a)*,

b) if it does not go through stop reaming *(Fig.16b)*.

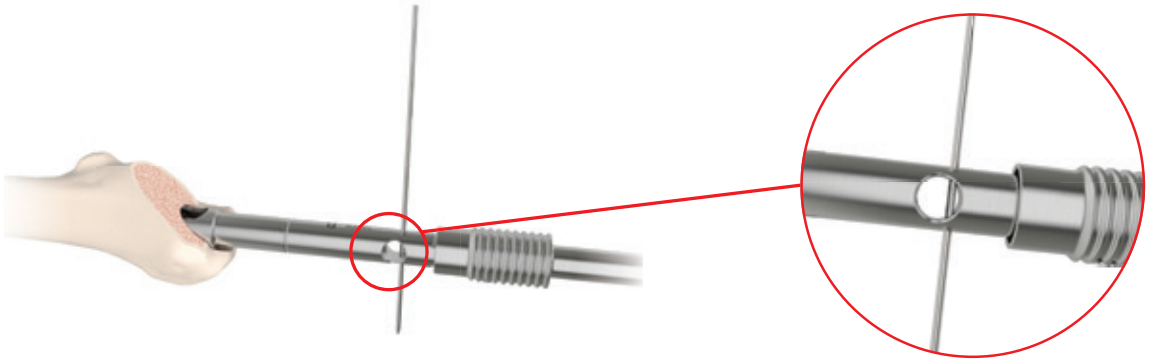


Figure 16a: WRONG, need to ream more.

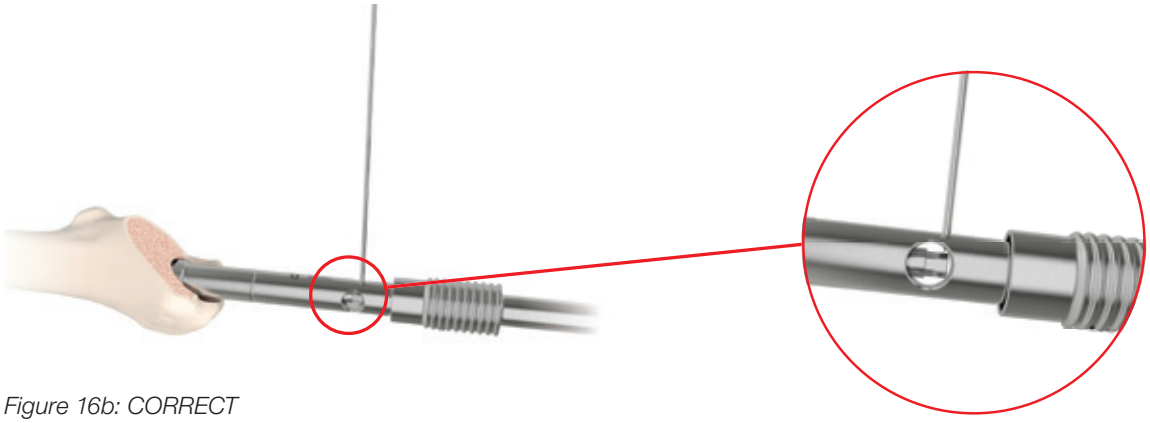


Figure 16b: CORRECT

Trial Reduction

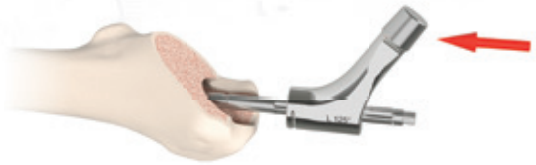


Figure 17

Figure 18a

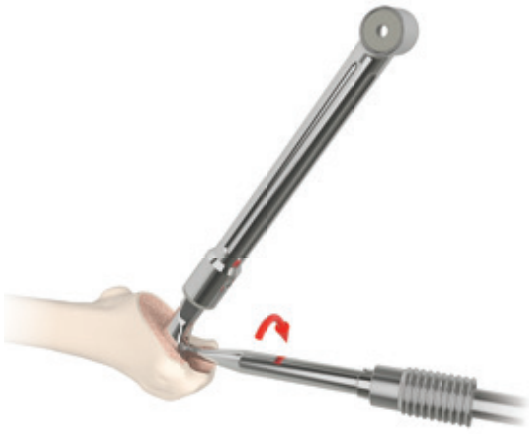


Figure 18b

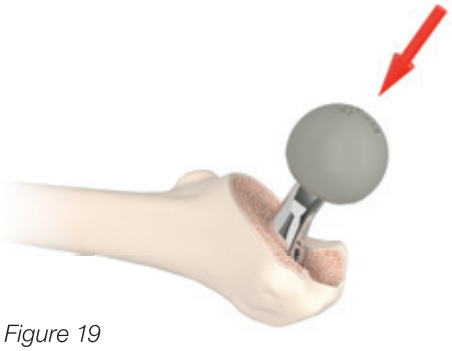


Figure 19

TRIAL REDUCTION

Acetabular preparation must be completed.

Clean and dry the taper junction of the distal stem.
Place the neck trial, through the guide, onto the trial stem taper junction *(Fig.17)*. Remove the neck guide rod by turning the hex key counter-clockwise.
Lock the neck trial with the locking screw trial *(Fig.18a)* while maintaining correct anteversion with the neck stopper *(Fig.18b)*.

Utilizing modular trial heads, perform a trial reduction *(Fig.19)*. Component position, joint stability, range-of-motion and leg length are checked. Assess what adjustments, if any, are required to ensure stability through a full range of motion check. When stability is achieved, use the neck trial reference mark to mark the bone, to achieve exact definitive neck positioning.

Remove neck and stem trials.

STEM INSERTION

Select the stem size that corresponds to the stem trial.

Thread the impactor onto the MODULUS-R distal body *(Fig.20)*. Insert the stem into the femur *(Fig.21)* until the depth mark '0' is aligned to the apex of the greater trochanter (or to the anatomical point selected as reference), complete seating and appropriate primary stability of the stem are achieved *(Fig.22)*. Hammer blows should be of moderate strength.

Check stem trial axial and rotational (clockwise) stability.

Further trial reduction, with the neck and head trials, can be performed following the same procedure described before

Figure 20

Figure 21

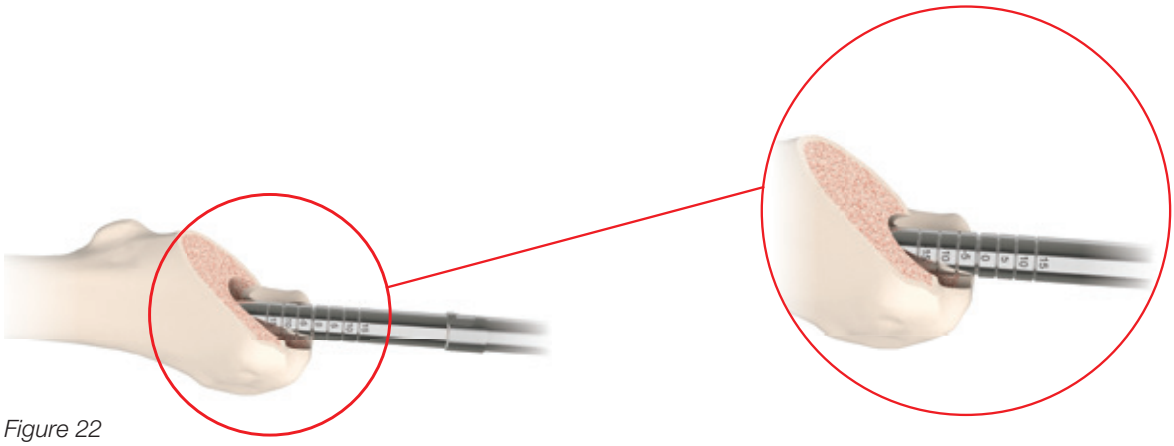


Figure 22

Figure 23

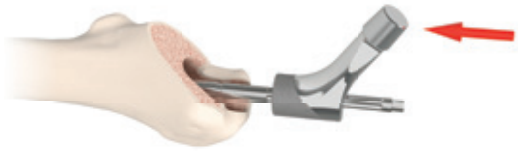


Figure 24

Figure 25

Figure 26

NECK INSERTION

Important. *Carefully clean and dry the taper junction of the distal stem ensuring it is free of debris.*

Thread the neck guide rod onto the MODULUS stem (*Fig.23)*.

Place the MODULUS neck, through the guide, onto the stem taper junction carefully cleaned *(Fig.24)*. Neck position, especially anteversion, should follow the previously marked anatomical landmark.
Achieve a steady neck-stem coupling by hammering the definitive neck with the apposite impactor *(Fig.25)*, slid onto the neck guide.

Note. *The correct position of the neck impactor is with the reduced part of the impactor tip in correspondence with the medial part of the neck.*

Remove the neck guide rod by turning the hex key counter-clockwise.

To grant an accurate Morse taper coupling, reducing possible occurrence of fretting phenomena and minimizing the risk of improper safety screw tightening, a Torque Wrench must be used.

Connect the Torque Wrench T-handle (code 9095.11.753) to the Allen Wrech (code 9095.10.134) via the Zimmer connection *(Fig.26)*.

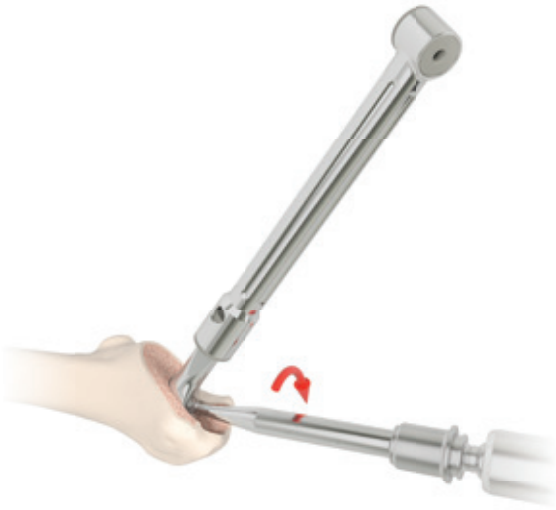


Figure 27

Lock the safety screw turning the T-handle of the Torque Wrench clockwise, while maintaining the desired anteversion with the aid of the neck stopper, until the T-handle clicks *(Fig.27)*.

This ensures that the appropriate torque has been applied and the safety screw has been fully seated.

Repeat the torque application until a second click can be heard.

Note. *Before using the Torque Wrench make sure that the calibration date has not expired. The calibration date expiration is marked on the Torque Wrench T-handle.*

FEMORAL HEAD INSERTION

Clean and dry the taper thoroughly, ensuring it is free of debris. Place the appropriate femoral head onto the taper; engage it by pushing and twisting *(Fig.28)*. Then strike the definitive head with the apposite impactor *(Fig.29)*.

Note. *The head impactor has an internal double concavity, allowing its use with all head diameters (28, 32, 36 and 40 mm).*

Clean the bearing surfaces and reduce the hip *(Fig.30)*.

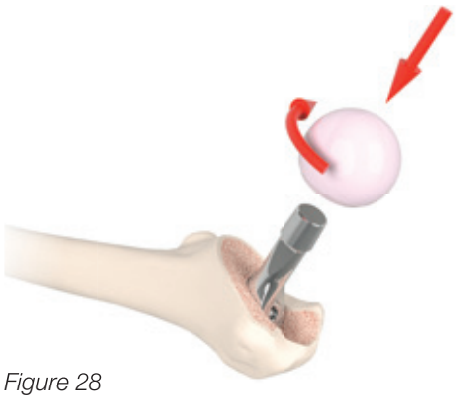


Figure 28

Figure 29

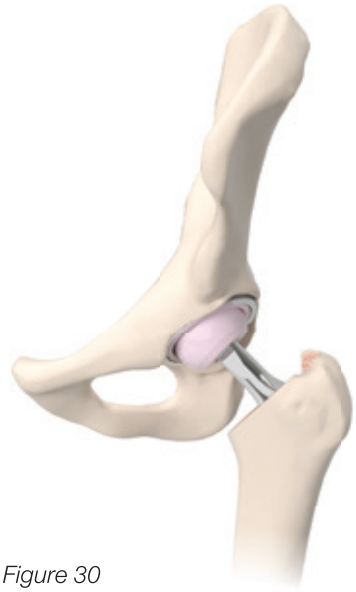


Figure 30

Figure 31

Figure 32

Figure 33

Figure 34

Figure 35

COMPONENTS REMOVAL

If necessary the various prosthetic components can be removed. The femoral head can be removed by simply tapping the base of the head axially using an impactor.

IMPORTANT. *If only the head needs removing and replacing with a ceramic head, always use ceramic revision heads (on request only) which have a Titanium safety taper/sleeve.*

DISENGAGING THE TAPER JUNCTION

1. Unscrew the safety screw *(Fig.31)*.
2. Disassemble the neck extractor's two components *(Fig.32)*.
3. Thread and tighten the outer sleeve into the Modulus neck *(Fig.33)*.
4. With the aid of the T- wrench, screw the pushing rod (of the neck extractor) into the outer sleeve *(Fig.34)*, holding in place the latter.
5. Remove the T-wrench *(Fig.35)*.
6. Hammer onto the pushing rod, while keeping steady the outer sleeve.
7. Reassemble the T-wrench onto the pushing rod and tighten the rod again.
8. If the neck is still engaged, continue the iterative process, from step 4, until the taper junction disengages.

Note. *Hammering on the T-wrench, producing vibrations, can ease the removal process.*

Figure 36

REMOVING THE MODULUS-R DISTAL COMPONENT

Make sure the slap hammer is mounted on the manual impactor *(Fig.36)*.

Thread the manual impactor onto the MODULUS-R distal component and, with upward movements of the slap hammer, extract the stem *(Fig.37)*.

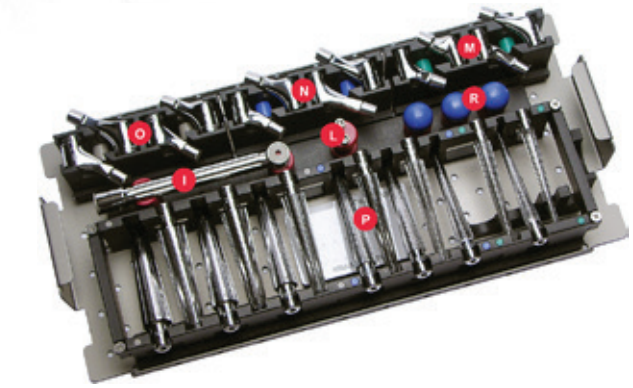
IMPORTANT. *This method may be used in cases where biological fixation is absent or weak; otherwise it is necessary to separate the integrated surfaces of the bone using suitable small scalpels or Kirschner wires. In some cases a Wagner femoral osteotomy may be required.*

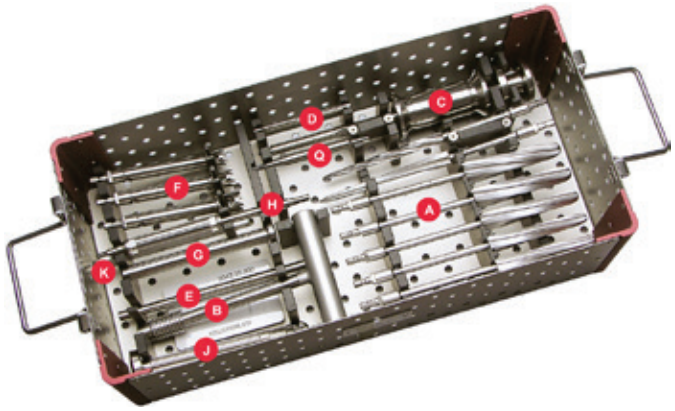
Figure 37

MODULUS-R FEMORAL STEM SURGICAL TECHNIQUE

Instrument Set

▼ 9043.20.000 Instrument set for MODULUS femoral stem





Ref.	CODE	DESCRIPTION	Qty.
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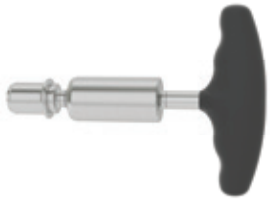
A	9043.10.160	Reamer Dia. 16mm	1
A	9043.10.180	Reamer Dia. 18mm	1
A	9043.10.200	Reamer Dia. 20mm	1
A	9043.10.220	Reamer Dia. 22mm	1
A	9043.10.240	Reamer Dia. 24mm	1
A	9043.10.260	Reamer Dia. 26mm	1
B	9095.10.131	H210 Wrench for Zimmer Connection	1
C	9043.10.310	Manual Impactor	1
D	9043.10.315	Neck Reamer Guide	1
E	9043.10.320	Allen Wrench	1
F	9043.10.330	Neck Reamer A	1
F	9043.10.340	Neck Reamer B	1
F	9043.10.345	Large Neck Reamer B	1
G	9043.10.350	Neck Impactor	1
H	9043.10.360	Neck Extractor	1
I	9043.10.370	Neck Stopper	1
J	9043.10.380	Canal Chisel	1
K	9043.10.390	Dia. 16mm Wrench	1
L	9043.10.400	Trial Locking Screw for Neck-Stem	2
M	9043.10.410	Trial Neck Short 125° Taper A	1
M	9043.10.420	Trial Neck Long 125° Taper A	1
M	9043.10.500	Trial Neck Short 135° Taper A	1
M	9043.10.510	Trial Neck Long 135° Taper A	1
N	9043.10.430	Trial Neck Short 125° Taper B	1
N	9043.10.440	Trial Neck Long 125° Taper B	1
N	9043.10.520	Trial Neck Short 135° Taper B	1
N	9043.10.530	Trial Neck Long 135° Taper B	1
O	9043.10.450	Trial Neck Short 125° Large Taper B	1
O	9043.10.460	Trial Neck Long125° Large Taper B	1
O	9043.10.540	Trial Neck Short 135° Large Taper B	1
O	9043.10.550	Trial Neck Long 135° Large Taper B	1
P	9043.10.600	Trial Stem Dia. 13mm Taper A	1
P	9043.10.610	Trial Stem Dia. 14mm Taper A	1
P	9043.10.620	Trial Stem Dia. 15mm Taper A	1
P	9043.10.650	Trial Stem Dia. 16mm Taper B	1
P	9043.10.660	Trial Stem Dia. 17mm Taper B	1
P	9043.10.670	Trial Stem Dia. 18mm Taper B	1
P	9043.10.680	Trial Stem Dia. 19mm Taper B	1
P	9043.10.690	Trial Stem Dia. 20mm Taper B	1
P	9043.10.700	Trial Stem Dia. 21mm Taper B	1
P	9043.10.710	Trial Stem Dia. 22mm Taper B	1
P	9043.10.720	Trial Stem Dia. 23mm Taper B	1
P	9043.10.730	Trial Stem Dia. 24mm Taper B	1
P	9043.10.740	Trial Stem Dia. 25mm Taper B	1
P	9043.10.750	Trial Stem Dia. 26mm Taper B	1
Q	9095.10.134	Allen Wrench for Zimmer Connection	1
R	9095.10.711	Trial Head Taper 12/14 Dia. 28mm S	1
R	9095.10.712	Trial Head Taper 12/14 Dia. 28mm M	1
R	9095.10.713	Trial Head Taper 12/14 Dia. 28mm L	1
	9043.20.950	Sterilizable Box	1

9095.11.753 Torque Wrench T-handle



CODE	DESCRIPTION
9095.11.753	Torque Wrench T-handle

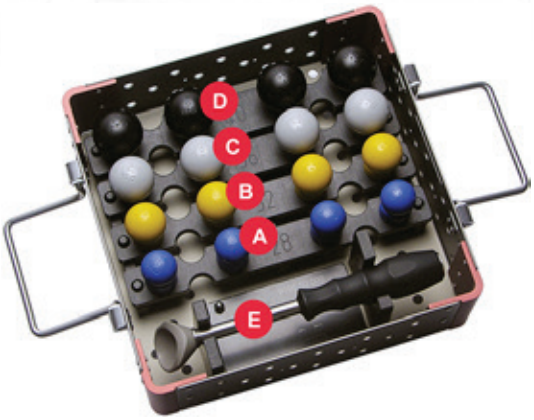
9043.30.000 Instrument set MODULUS-R femoral stem

Ref.	COD.	DESCRIPTION	Qty.
A	9043.30.016	Reamer Dia. 16mm	1
A	9043.30.017	Reamer Dia. 17mm	1
A	9043.30.018	Reamer Dia. 18mm	1
A	9043.30.019	Reamer Dia. 19mm	1
A	9043.30.020	Reamer Dia. 20mm	1
A	9043.30.021	Reamer Dia. 21mm	1
A	9043.30.022	Reamer Dia. 22mm	1
A	9043.30.023	Reamer Dia. 23mm	1
A	9043.30.024	Reamer Dia. 24mm	1
A	9043.30.025	Reamer Dia. 25mm	1
A	9043.30.026	Reamer Dia. 26mm	1
B	9043.30.160	Trial Stem Dia. 16mm	1
B	9043.30.170	Trial Stem Dia. 17mm	1
B	9043.30.180	Trial Stem Dia. 18mm	1
B	9043.30.190	Trial Stem Dia. 19mm	1
B	9043.30.200	Trial Stem Dia. 20mm	1
B	9043.30.210	Trial Stem Dia. 21mm	1
B	9043.30.220	Trial Stem Dia. 22mm	1
B	9043.30.230	Trial Stem Dia. 23mm	1
B	9043.30.240	Trial Stem Dia. 24mm	1
B	9043.30.250	Trial Stem Dia. 25mm	1
B	9043.30.260	Trial Stem Dia. 26mm	1
	9043.30.950	Sterilizable Box	1

MODULUS-R FEMORAL STEM SURGICAL TECHNIQUE

Additional Instrument Set

9095.50.000 Instrument set for trial heads



Ref.	CODE	DESCRIPTION	Qty.
A	9095.10.711	Trial Head Dia. 28mm S	1
A	9095.10.712	Trial Head Dia. 28mm M	1
A	9095.10.713	Trial Head Dia. 28mm L	1
A	9095.10.714	Trial Head Dia. 28mm XL	1
B	9095.10.721	Trial Head Dia. 32mm S	1
B	9095.10.722	Trial Head Dia. 32mm M	1
B	9095.10.723	Trial Head Dia. 32mm L	1
B	9095.10.724	Trial Head Dia. 32mm XL	1
C	9095.10.731	Trial Head Dia. 36mm S	1
C	9095.10.732	Trial Head Dia. 36mm M	1
C	9095.10.733	Trial Head Dia. 36mm L	1
C	9095.10.734	Trial Head Dia. 36mm XL	1
D	9095.10.741	Trial Head Dia. 40mm S	1
D	9095.10.742	Trial Head Dia. 40mm M	1
D	9095.10.743	Trial Head Dia. 40mm L	1
D	9095.10.744	Trial Head Dia. 40mm XL	1
E	9095.11.110	Femoral Head Impactor	1
	9095.50.950	Sterilizable Box	1

ADDITIONAL INSTRUMENTS

Femoral Shortening Cutting Guide

Left & Right Ruler

	CODE	DESCRIPTION	Qty.
■	9095.11.131	Femoral Shortening Cutting Guide	1
■	9095.11.132	Left Ruler	1
■	9095.11.133	Right Ruler	1

■ Upon request

Product Codes

MODULUS-R Stem - Size (Ø) 20 mm

MODULUS-R STEMS

CODE	SIZE (Ø)	TAPER	NECKS
4330.15.160	16 mm	B	B
4330.15.170	17 mm	B	B
4330.15.180	18 mm	B	B
4330.15.190	19 mm	B	B
4330.15.200	20 mm	B	B
4330.15.210	21 mm	B	B-Large
4330.15.220	22 mm	B	B-Large
4330.15.230	23 mm	B	B-Large
4330.15.240	24 mm	B	B-Large
4330.15.250	25 mm	B	B-Large
4330.15.260	26 mm	B	B-Large

Neck Taper B – CCD 135° short/ long

MODULUS NECKS

STANDARD – 135°

CODE	TAPER	NECK	SIZE
7595.15.030	B	B	S
7595.15.040	B	B	L
7595.15.050	B	B-Large	S
7595.15.060	B	B-Large	L

Neck Taper B – CCD 125° short/long

LATERALIZED – 125°

CODE	TAPER	NECK	SIZE
7590.15.030	B	B	S
7590.15.040	B	B	L
7590.15.050	B	B-Large	S
7590.15.060	B	B-Large	L

Note. In order to better identify correspondence between stem and neck a coloured pink label ( ) will identify the taper B and a white label ( ) will identify the B-Large necks.

APPENDIX
Femur Shortening Cutting Guide

Figure 1

FEMUR SHORTENING CUTTING GUIDE

The use of the femur shortening cutting guide is suggested in the following cases:

- Leg length shortening;
- Proximal Femur version correction;
- Femur axis correction (in case of very severe femur deformation when it is necessary to re-align proximal and distal femoral axis).

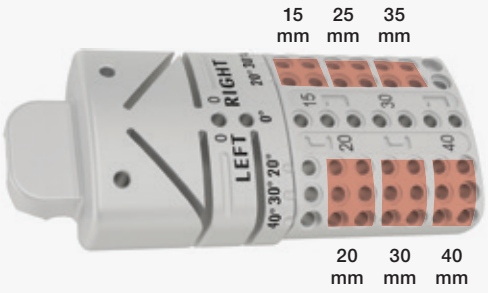
Femur shortening cutting guide is composed of two parts: proximal and distal body joined by magnets and pins *(Fig. 1)*.

The proximal body allows the selection of three types of cutting:

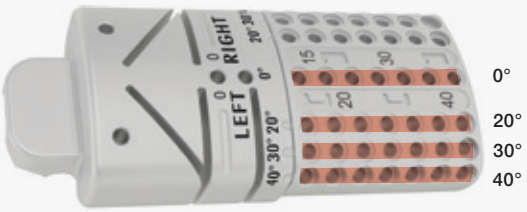
- V-shaped (double chevron): using the two sloped slots;
- Z-shaped (step-cut): using two horizontal slots (top right and bottom left);
- Transverse shape: using the two horizontal slots at the same level.

The distal body features a series of holes for Kirschner wires and allows the selection of the shortening length and/or the neck derotation predetermined.

Shortening Lengths: 15, 20, 25, 30, 35, 40 mm



Neck Derotations: 0° (no correction), 20°, 30°, 40°



The selection of shortening level and version correction is made inserting 2 K-wires at the desired cutting distance (5 mm steps) and derotation (10° steps).

NOTE: *minimum 3 Kirschner wires (2.5 mm Ø) are required.*

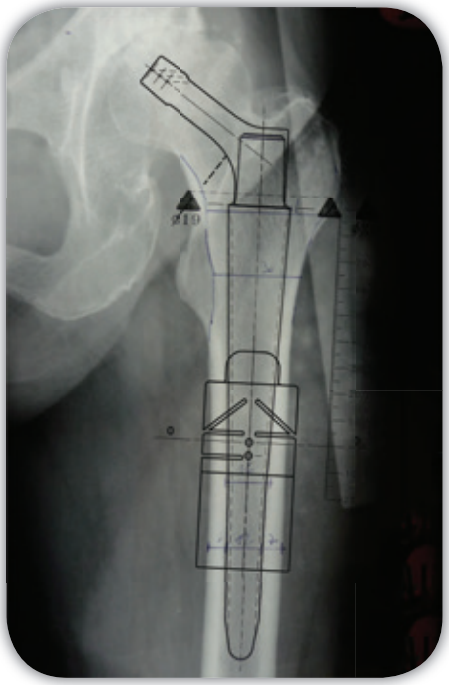


Figure 2

PRE-OPERATIVE PLANNING

During preoperative planning define the shortening level and/or the neck version correction with the use of templates showing a 15% magnified image of the profiles.

Good quality frontal X-Ray with adequate contrast should be used; it should cover the entire length of the pre-operative clear films of the stem and the femur shortening cutting guide profile.

Instead of conventional templates, a digital version compatible with most surgical planning software is also available.

APPENDIX
Femur Shortening Cutting Guide

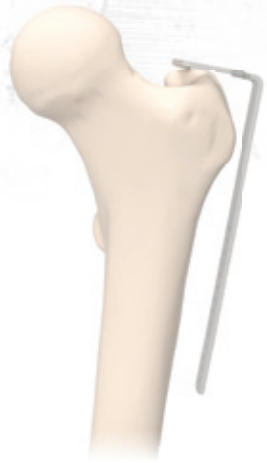


Figure 3

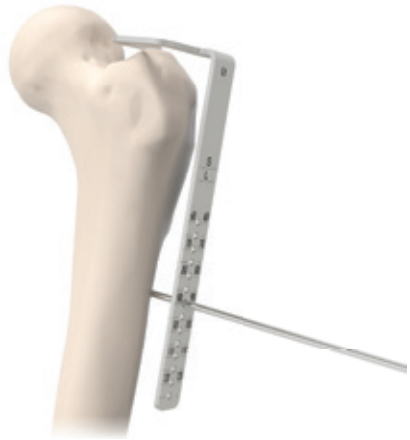


Figure 4

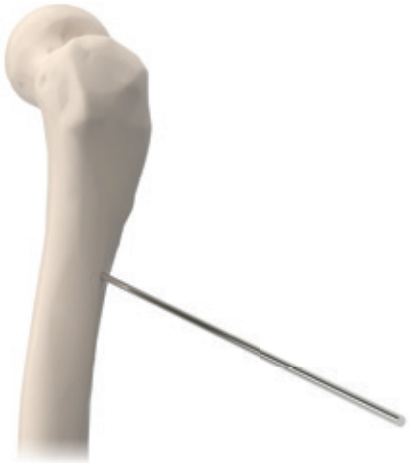


Figure 5

SURGICAL TECHNIQUE

Place the ruler upper extremity on the Greater Trochanter as shown in figure. Left and right rulers are available *(Fig. 3)*.

Using the GT as a reference point, insert a Kirschner wire in one of the holes along the ruler axis, matching the osteotomy level determined in the preoperative planning *(Fig. 4)*.

Remove the ruler leaving in place the K-wire *(Fig. 5)*.

APPENDIX
Femur Shortening Cutting Guide

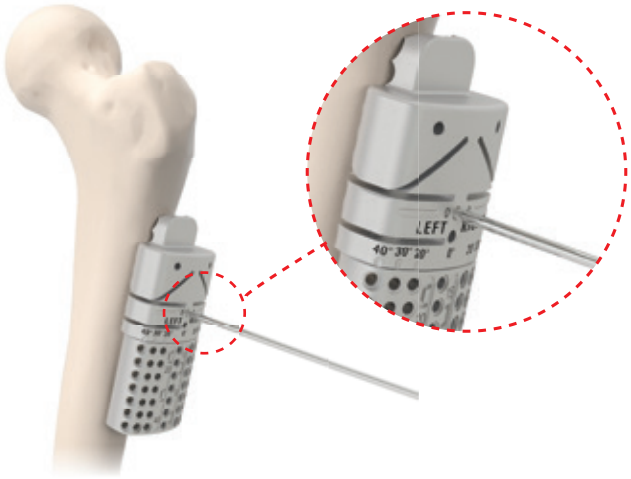


Figure 6

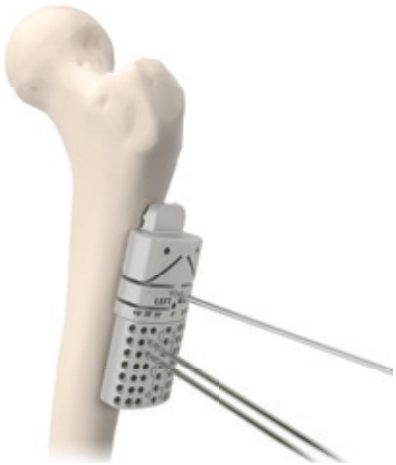


Figure 7

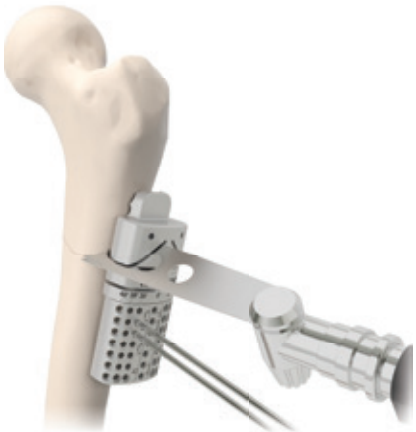


Figure 8

Insert the femur shortening cutting guide into the k-wire in correspondence of the 0 reference point *(Fig. 6)*.

The two upper holes can be used to stabilize the cutting guide on the femur by means of other one/two K-wires.

Insert two K-wires in the selected distal holes according to the shortening length and neck derotation chosen in the pre-operative planning *(Fig. 7)*.

Remove the first K-wire inserted into the 0 reference hole.

Perform the proximal osteotomy using the slots of the cutting guide for saw blade alignment *(Fig. 8)*.

APPENDIX

Femur Shortening Cutting Guide

Figure 9a

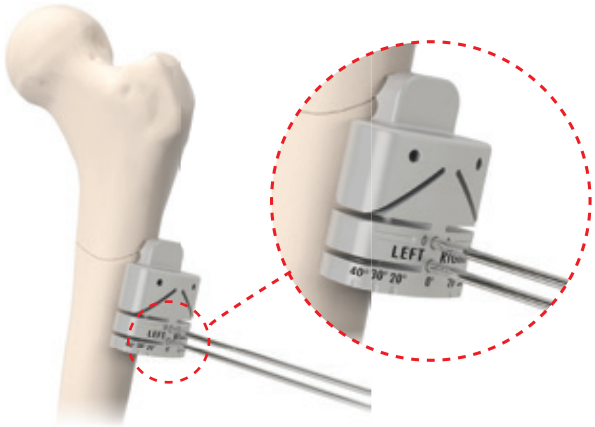


Figure 9b

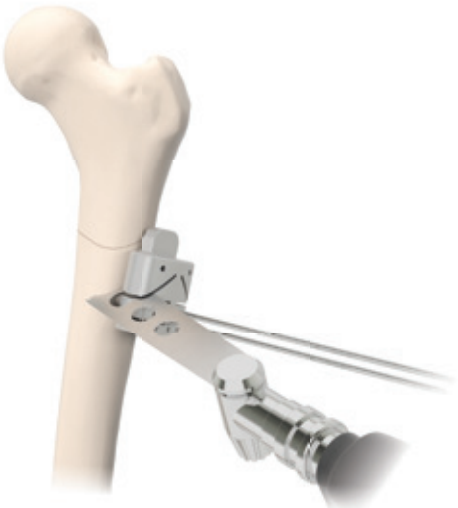


Figure 10

Remove the femoral cutting guide, separate the two parts and re-insert only the proximal body on the two K-wires left in place on the femur *(Fig. 9a, 9b)*.

Perform the distal osteotomy *(Fig. 10)*.

Remove the proximal body of the cutting guide and the two K-wires.
Proceed with the prefered surgical technique for restoring the joint anatomy and desired biomechanical parameters.

Lima Corporate
Orthopaedic motion

Limacorporate spa
Via Nazionale, 52
33038 Villanova di San Daniele
Udine - Italy
Tel.: +39 0432 945511
Fax: +39 0432 945512
E-mail: info@limacorporate.com
www.limacorporate.com

Lima Implantes slu
Fontsanta, 46 5ª planta
08970 Sant Joan Despí - Barcelona
Tel.: 93 480 85 05
Fax: 93 419 65 27

Lima France sas
Les Espaces de la Sainte Baume
Parc d' Activité de Gemenos - Bât.A5
30 Avenue du Château de Jouques
13420 Gemenos - France
Tel: +33 (0) 4 42 01 63 12
Fax: +33 (0) 4 42 04 17 25
E-mail: info@limafrance.com

Lima O.I. doo
Ante Kovacic, 3
10000 Zagreb - Croatia
Tel.: +385 (0) 1 2361 740
Fax: +385 (0) 1 2361 745
E-mail: lima-oi@lima-oi.hr

Lima Switzerland sa
Birkenstrasse, 49
CH-6343 Rotkreuz - Zug
Switzerland
Tel: +41 (0) 41 747 06 60
Fax: +41 (0) 41 747 06 69
E-mail: info@lima-switzerland.ch

Lima Japan kk
Shinjuku Center Building, 29th floor
1-25-1, Nishi-shinjuku, Shinjuku,
Tokyo 163-0629 - Japan
Tel.: +81 3 5322 1115
Fax: +81 3 5322 1175

Lima CZ sro
Do Zahrádek I., 157/5
155 21 Praha 5 – Zli□ín –
Czech Republic
Tel.: +420 222 720 011
Fax: +420 222 723 568
E-mail: info@limacz.cz

Lima Deutschland GmbH
Kapstadtring 10
22297 Hamburg - Germany
Tel.: +49 40 6378 4640
Fax: +49 40 6378 4649
E-mail: info@lima-deutschland.com

Lima Austria GmbH
Seestadtstrasse 27 / Top 6-7
1220 Wien - Austria
Tel.: +43 (1) 2712 469
Fax: +43 (1) 2712 469 100
E-mail: office@lima-austria.at

Lima SK s.r.o.
Zvolenská cesta 14
97405 Banská Bystrica - Slovakia
Tel.: +421 484 161 133
Fax.: +421 484 161 138
E-mail: info@lima-sk.sk

Lima Netherlands
Havenstraat 30
3115 HD Schiedam
The Netherlands
Tel: +31 (0) 10 246 26 60
Fax: +31 (0) 10 246 26 61
info@limanderland.nl
www.limanederland.nl

Lima Implantes Portugal S.U. Lda
Rua Olavo D'Eça Leal Nº6 Loja-1
1600-306 Lisboa - Portugal
Tel : +35 121 727 233 7

Lima Orthopaedics Australia Pty Ltd
Unit 1, 40 Ricketts Rd
Mt Waverley 3149
Victoria Australia
Tel.: +61 (03) 9550 0200
Fax: +61 (03) 9543 4003
www.limaortho.com.au

Lima Orthopaedics New Zealand Ltd
Zone 23, Unit 102, Edwin Street, Mt Eden
Auckland 1024
New Zealand
Tel.: +64 (09) 531 5522
Fax: +64 (09) 522 3380

Lima Orthopaedics UK Limited
Unit 2, Campus 5
Third Avenue
Letchworth Garden City
Herts. SG6 2JF
United Kingdom
Tel.: 0844 332 0661
Fax: 0844 332 0662

Lima USA Inc.
2106 W. Pioneer Parkway, Suite 126
Arlington, TX 76013
Tel.: +1 817-342-0240 / 800-962-2578
Fax: +1 817-342-0241 / 800-962-2579

Lima Sweden AB
Företagsallén 14 B
SE-184 40 ÅKERSBERGA
Sweden
Tel.: +46 8 544 103 87
Fax.: +46 8 540 862 68
www.linksweden.se

Lima Italy
Centro Direzionale Milanofiori
Strada 1 – Palazzo F1
20090 Assago - Milano - Italy
Tel.: +39 02 57791301

Lima Korea Co. Ltd
Trade Tower 27th Fl.
511 Yeongdongdae-ro Gangnam-Gu,
Seoul, 135-729, Korea
Tel.: +82-2-6007-2230
Fax: +82-2-6007-2703

Lima SM spa
Strada Borrana 38
47899 Serravalle, Republic of San Marino
Tel.: +378 0549 961911
Fax: +378 0549 961912
E-mail: info@lima-sm.com

www.limacorporate.com

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