

**The Centronail
Titanium Universal
Femoral Nailing System**



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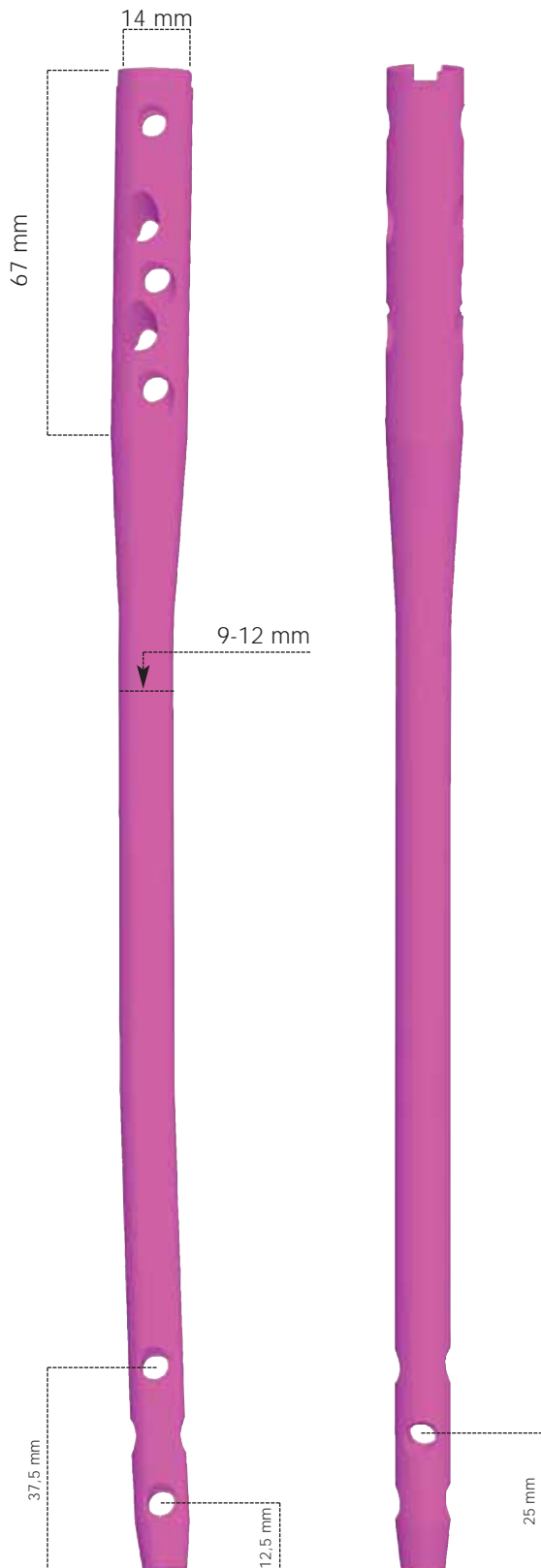
Orthofix wishes to thank
the following surgeons for their contribution
to the development of the technique:

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FEATURES AND BENEFITS

Titanium nail and locking screws
Allows MRI investigation, if necessary

14 mm proximal diameter

9-12 mm distal diameter
9 mm is solid

One design for Left and Right femur

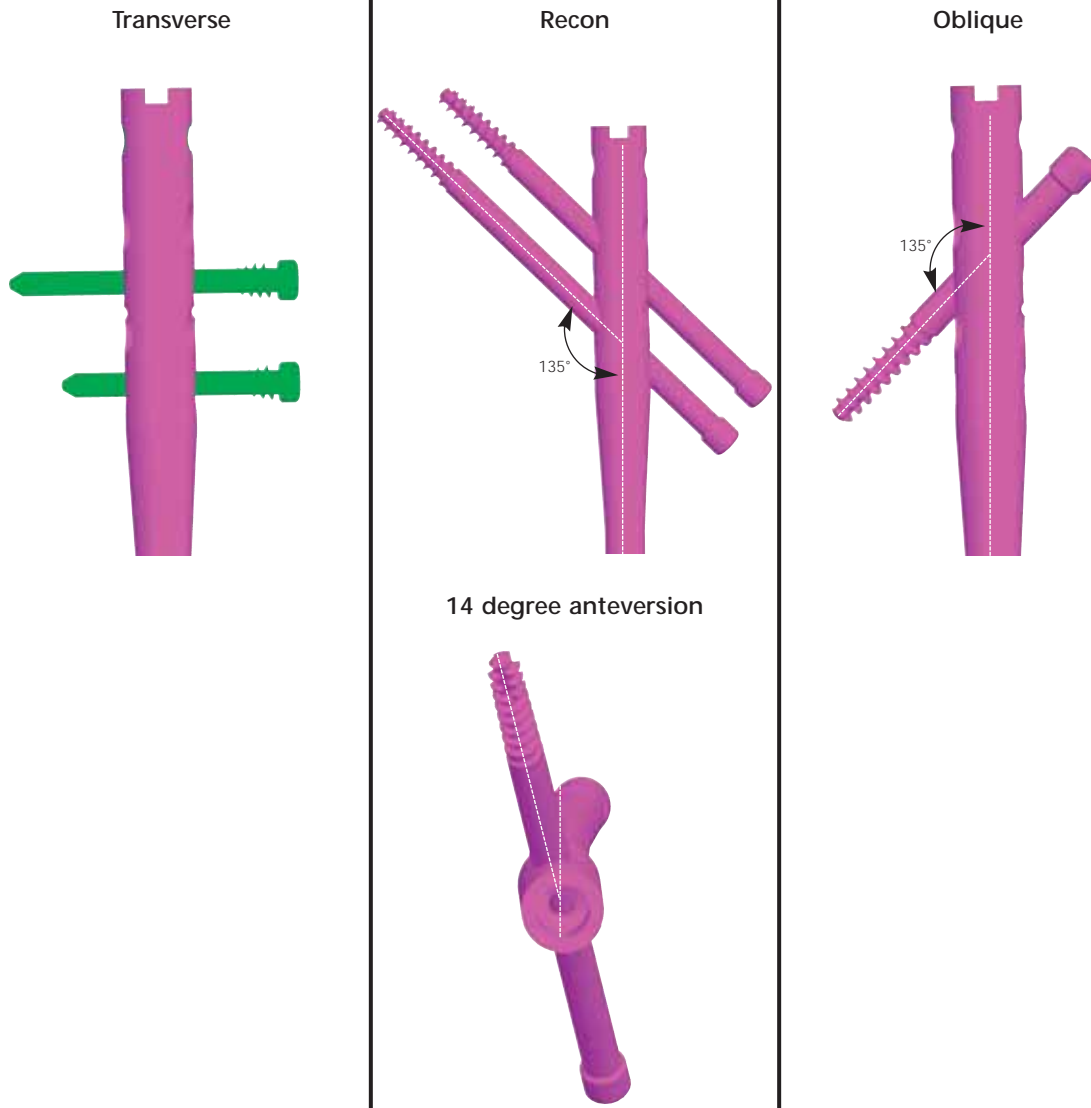
Antegrade and retrograde insertion

275-475 mm (25 mm increments)

Radius of curve 2500 mm

Proximal locking

Three possible configurations:



Locking screws

TITANIUM STANDARD LOCKING SCREWS

6.8 mm thread diameter
4.8 mm shaft diameter



Smooth diameter, unthreaded shaft: maximises fatigue strength
Reverse thread on screw head: easy screw removal.
Conical tip: helps insertion.

TITANIUM REVISION LOCKING SCREWS

8 mm thread diameter
Better purchase in poor quality bone
4.8 mm shaft diameter



TITANIUM RECON/OBLIQUE SCREWS

6.5-5.7 mm thread diameter
6.5 mm shaft diameter



Solid: maximises fatigue strength.

Reverse thread on screw head: easy screw removal.

TITANIUM CONDYLAR COMPRESSION SCREWS

4.8 mm diameter

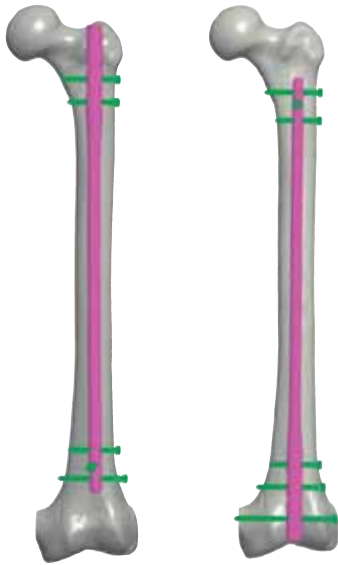


Cannulated: easy placement of condylar washer and nut over a K-wire.

Cloverleaf washer design: adapts to contour of bone surface and permits excellent compression.

INDICATIONS

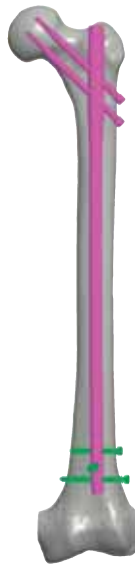
Transverse
Diaphyseal fractures



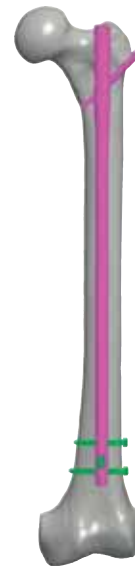
Retrograde insertion is indicated in patients:

- obese
- pregnant
- with proximal femoral implants or total hip joints
- polytraumatized
- with bilateral femoral shaft fractures

Recon
Neck and diaphyseal fractures
Petrochanteric fractures
Subtrochanteric fractures



Oblique
Subtrochanteric fractures
Shaft fractures



EQUIPMENT REQUIRED

Centronail Titanium Femoral Intramedullary Nails		
Ø 9 L 275 mm	Solid	99-T739275
Ø 9 L 300 mm	Solid	99-T739300
Ø 9 L 325 mm	Solid	99-T739325
Ø 9 L 350 mm	Solid	99-T739350
Ø 9 L 375 mm	Solid	99-T739375
Ø 9 L 400 mm	Solid	99-T739400
Ø 9 L 425 mm	Solid	99-T739425
Ø 10 L 275 mm	Cannulated	99-T730275
Ø 10 L 300 mm	Cannulated	99-T730300
Ø 10 L 325 mm	Cannulated	99-T730325
Ø 10 L 350 mm	Cannulated	99-T730350
Ø 10 L 375 mm	Cannulated	99-T730375
Ø 10 L 400 mm	Cannulated	99-T730400
Ø 10 L 425 mm	Cannulated	99-T730425
Ø 11 L 325 mm	Cannulated	99-T731325
Ø 11 L 350 mm	Cannulated	99-T731350
Ø 11 L 375 mm	Cannulated	99-T731375
Ø 11 L 400 mm	Cannulated	99-T731400
Ø 11 L 425 mm	Cannulated	99-T731425
Ø 11 L 450 mm	Cannulated	99-T731450
Ø 11 L 475 mm	Cannulated	99-T731475
Ø 12 L 325 mm	Cannulated	99-T732325
Ø 12 L 350 mm	Cannulated	99-T732350
Ø 12 L 375 mm	Cannulated	99-T732375
Ø 12 L 400 mm	Cannulated	99-T732400
Ø 12 L 425 mm	Cannulated	99-T732425
Ø 12 L 450 mm	Cannulated	99-T732450
Ø 12 L 475 mm	Cannulated	99-T732475

End Caps

L 0 mm	99-T730000
L 10 mm	99-T730010
L 20 mm	99-T730020

4.8 mm Titanium
Standard Locking Screws

Code	Length (mm)
99-T79925	25
99-T79930	30
99-T79935	35
99-T79940	40
99-T79945	45
99-T79950	50
99-T79955	55
99-T79960	60
99-T79965	65
99-T79970	70
99-T79975	75
99-T79980	80
99-T79985	85
99-T79990	90
99-T79995	95
99-T79900	100
99-T79905	105
99-T79910	110

4.8 mm Titanium
Revision Locking Screws

Code	Length (mm)
99-T74530	30
99-T74535	35
99-T74540	40
99-T74545	45
99-T74550	50
99-T74555	55
99-T74560	60
99-T74565	65
99-T74570	70
99-T74575	75
99-T74580	80
99-T74585	85
99-T74590	90
99-T74595	95
99-T74500	100
99-T74505	105
99-T74510	110

6.5 mm Titanium
Recon-Oblique Screws

Code	Length (mm)
99-T736050	50
99-T736055	55
99-T736060	60
99-T736065	65
99-T736070	70
99-T736075	75
99-T736080	80
99-T736085	85
99-T736090	90
99-T736095	95
99-T736100	100
99-T736105	105
99-T736110	110
99-T736115	115
99-T736120	120

4.8 mm Titanium
Condylar Screw Kit

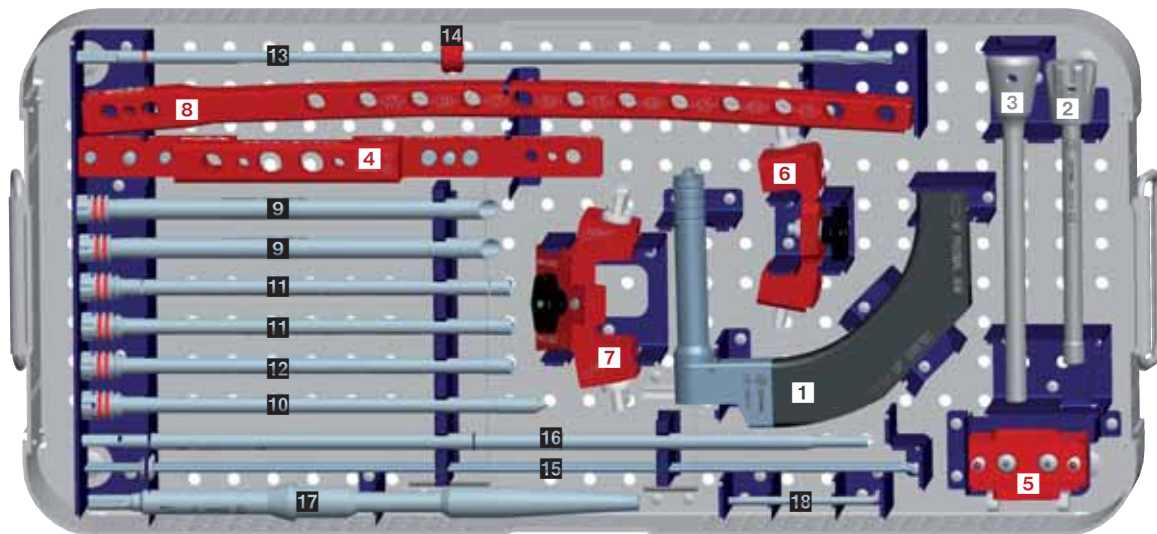
Code	Length (mm)
99-T766060	60
99-T766065	65
99-T766070	70
99-T766075	75
99-T766080	80
99-T766085	85
99-T766090	90
99-T766095	95
99-T766100	100
99-T766105	105
99-T766110	110
99-T766115	115
99-T766120	120

Cleaning, disinfection, sterilisation
and maintenance of instrumentation

Orthofix supplies the Centronail Titanium Universal Femoral Nail, locking screws and end caps in a STERILE package, while the instruments are supplied NON-STERILE. Please check the sterility of each device on the product label.

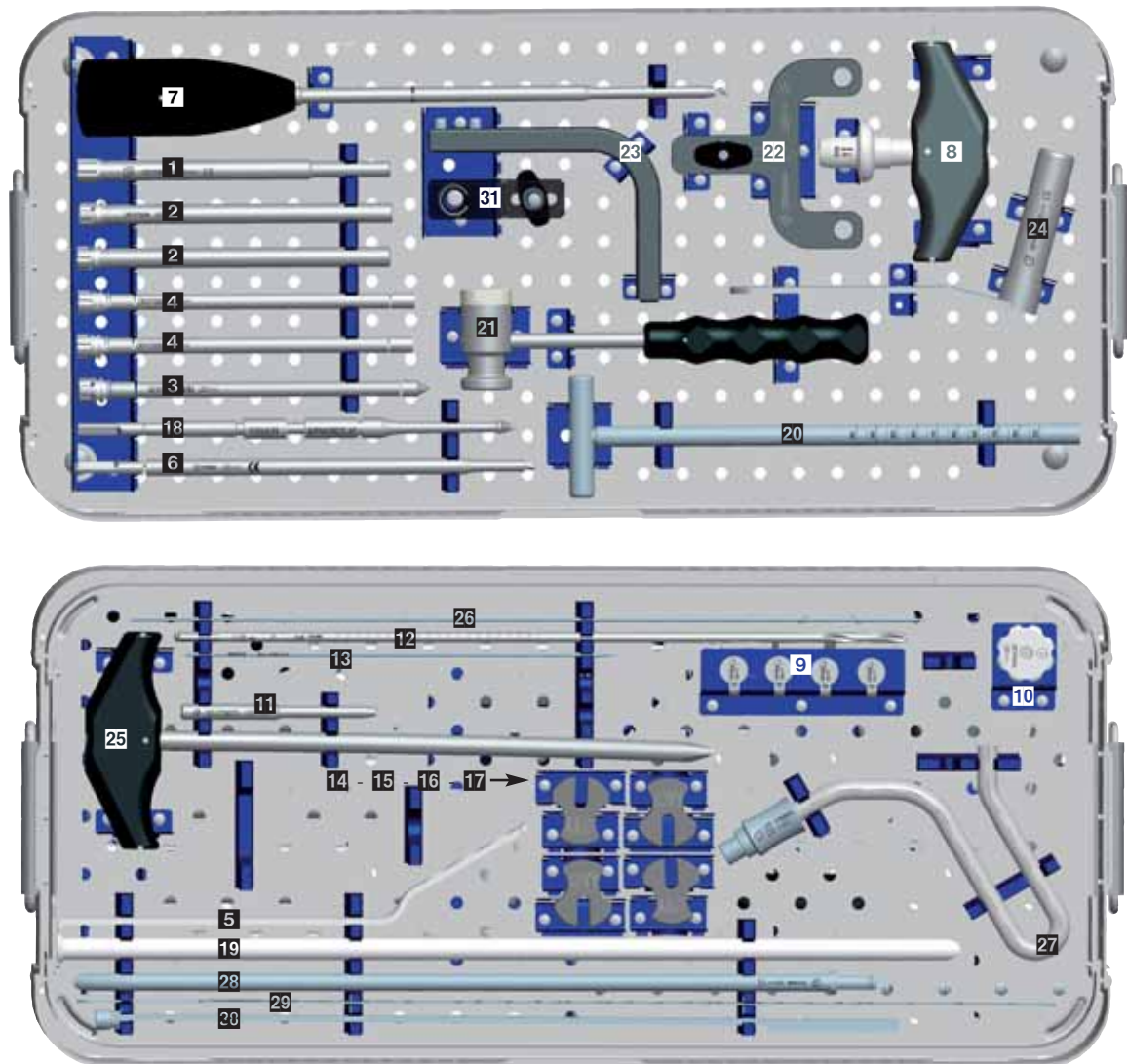
The surgeon must check that the package has not been damaged and has not expired. The sterilised instruments used during the operation may be cleaned, disinfected and re-sterilised in an autoclave, as described in the instructions for use PQ TNS-s that accompany the product. If the package is damaged, or if there are doubts about its sterility, the implant may be re-sterilised in an autoclave, using a validated sterilisation protocol. The instruments are supplied in a non-sterile state and therefore must be cleaned before use, as described for new products. The whole cleaning, disinfection and sterilisation cycle must be followed before each use, as described in the instructions for use PQ TNS-s.

NB: Disassemble all instruments for thorough cleaning and disinfection prior to sterilization.



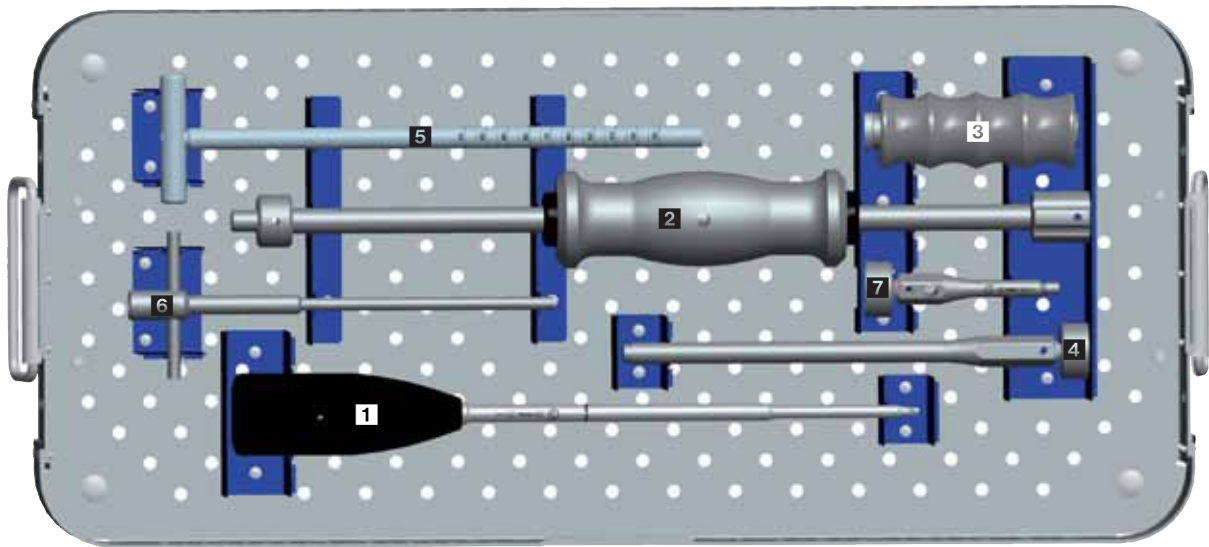
FEMORAL SPECIFIC INSTRUMENTS BOX

1) Handle	173100	10) Recon Trocar	173222
2) Locking Rod	173110	11) Recon Wire Guide	173223
3) Insertion Knob	173115	12) Recon Drill Guide	173224
4) UF Proximal Arm	173120	13) Recon Drill Bit	173283
5) Transverse Jig	173130	14) Recon Drill Bit Stop	173295
6) Oblique Jig	173140	15) Threaded Wire 3x400 mm	173288
7) Recon Jig	173150	16) Long Screw Wrench	173304
8) UF Distal Arm	173161	17) Cannulated Rigid Reamer	173270
9) Recon Screw Guide	173221	18) 3 mm Allen Wrench	10012

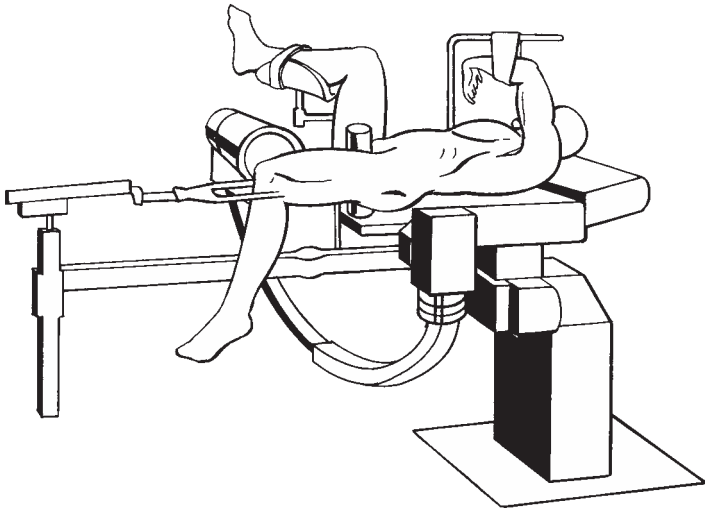


GENERAL INSTRUMENTS BOX			
1) Stabilizing Sleeve	173201	17) Spacer 12 mm	173055
2) Screw Guide	173211	18) Stabilizing Rod	173031
3) Trocar	173212	19) Guide Wire Exchange Tube	17353
4) Drill Guide	173213	20) Locking Screw Extractor	17652
5) Screw Scale	173301	21) Hammer	173380
6) Cannulated Screw Wrench	173302	22) AP Arm Connector	173170
7) Cannulated Screw Driver	173320	23) AP Arm	173180
8) T Handle	173350	24) Femoral Reamer Sleeve	173230
9) Locking Cam	173026	25) Awl	173260
10) Locking Nut	173032	26) XWire d. 2x400 mm	80122
11) Impactor	173071	27) Reduction Tool Handle	173264
12) Drill Bit d. 4.8x365 mm	173286	28) Reduction Tool	173265
13) K-Wire 2 mm	173287	29) Ruler	173275
14) Spacer 9 mm	173052	30) Ruler Support	173276
15) Spacer 10 mm	173053	31) AP Centering Jig	173185
16) Spacer 11 mm	173054		

STERILE PACKAGED INSTRUMENTS	
Cannulated Drill Bit 6 mm	99-173285
Guide Wire with olive d. 3x980 mm	99-173281
Guide Wire without olive d. 2.5x980 mm	99-176281

**EXTRACTION INSTRUMENTS BOX**

1) Cannulated Screw Driver	173320	5) Locking Screw Extractor	17652
2) Sliding Hammer	173370	6) Tibial Nail Extractor	174220
3) Extractor Handle	170035	7) Humeral Nail Extractor	178390
4) Femoral Nail Extractor	17391		

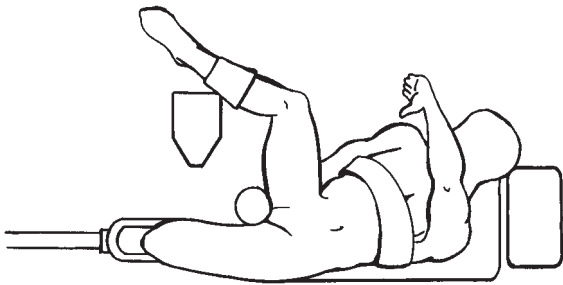


Whenever possible, femoral fractures should be stabilized within the first 24 hours following injury, provided the patient's condition will allow it. Do not start surgery unless the fracture is well reduced.

ANTEGRADE INSERTION

Fracture reduction and patient positioning

All nail insertions in acute cases should be performed using a traction table or a reduction device. This serves not only to reduce the fracture, but also permits free access to the greater trochanter. The patient is positioned supine on the traction table. Access is improved by inclining the trunk towards the uninjured side by about 25°. The position of the trunk is secured by supports mounted on the side of the operating table. The uninjured limb is positioned on a gynecological leg rest to allow the Image Intensifier free access to the whole of the fractured femur. The Image Intensifier should have free access to the entire femur in both planes.





Fracture reduction in the sagittal plane with the "PORD" device

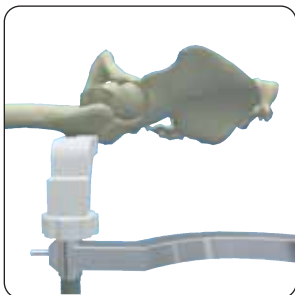
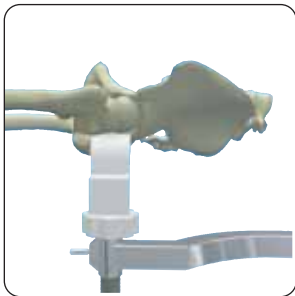
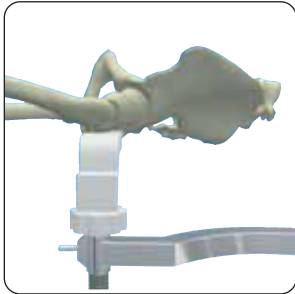
Any posterior sagging at the fracture site should now be corrected and maintained using the dedicated Posterior Reduction Device (PORD™). This device is easily attached to most fracture tables.

- ❶ Slide the Clark Attachment on to the side rail of the fracture table. Insert the vertical post of the Box Bracket into the Clark Attachment from beneath and tighten the clamp on the post so that the bracket is held securely.
- ❷ Assemble the PORD™ device in the following way: Slide the Horizontal Bar through the Box Bracket with its curved portion facing the fracture table. This curved section is designed to allow for unobstructed multiple plane imaging using the C-arm of the Image Intensifier.
- ❸ The Screw Jack of the Limb Support should be positioned in the housing at the end of the horizontal bar, with the nut under the radiolucent support. Turning the nut clockwise will then raise the support.

INSTRUMENTATION



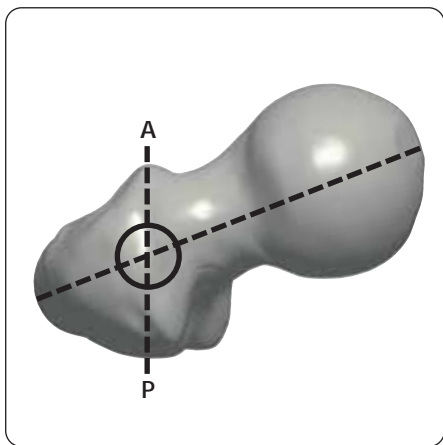
110000
PORD Device



The Limb Support is positioned beneath that portion of the fracture which requires elevating. The correct position of the support is confirmed on the AP view (the shadow of the support can be seen). Using the lateral view, the limb support is raised by turning the nut (a) clockwise until exact posterior reduction has been achieved. The position of the Support is now maintained by tightening the Lug Screw on the housing (b - see image below). There is tendency for the Limb Support to rotate when its position is being adjusted, due to the conical cross-section of the thigh. It should therefore be held firmly during this procedure, and while tightening the Lug Screw.

The PORD device will now remain in position throughout surgery. It can be draped and therefore does not require sterilization. It may be cleaned following surgery using a detergent solution and dried thoroughly.





Entry Portal

The patient is prepped and draped in the normal manner. A skin incision of about 2-3 cm is made proximal to the greater trochanter.

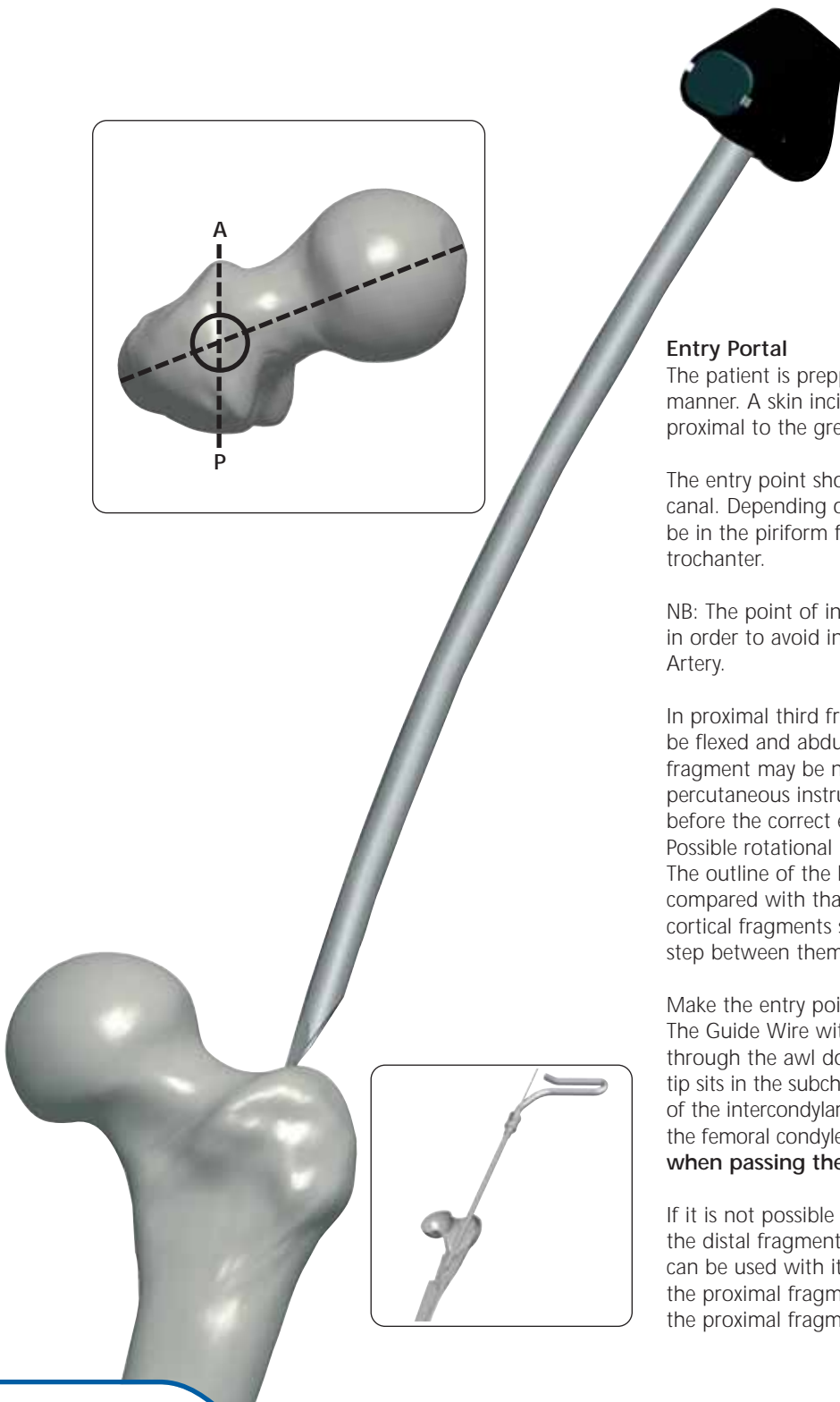
The entry point should be in line with the medullary canal. Depending on the individual anatomy this may be in the piriform fossa or on the apex of the greater trochanter.

NB: The point of insertion should never be too medial, in order to avoid injury to the Circumflex Femoral Artery.

In proximal third fractures the proximal fragment may be flexed and abducted. Direct manipulation of this fragment may be necessary with a suitable percutaneous instrument such as a Steinmann pin, before the correct entry point becomes accessible. Possible rotational malalignment must be considered. The outline of the lesser trochanter should be compared with that of the opposite side, and the two cortical fragments should have a similar shape with no step between them.

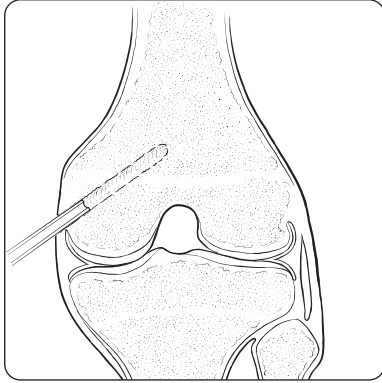
Make the entry point with the Awl (173260). The Guide Wire with Olive (99-173281) is inserted through the awl down the medullary canal, until its tip sits in the subchondral bone exactly on the roof of the intercondylar notch, midway between the femoral condyles. **Use image intensification when passing the fracture.**

If it is not possible to pass the guide wire into the distal fragment, the Reduction Tool (173265) can be used with its Handle (173264) to manipulate the proximal fragment. Before it can be used, the proximal fragment must be reamed to 10 mm.



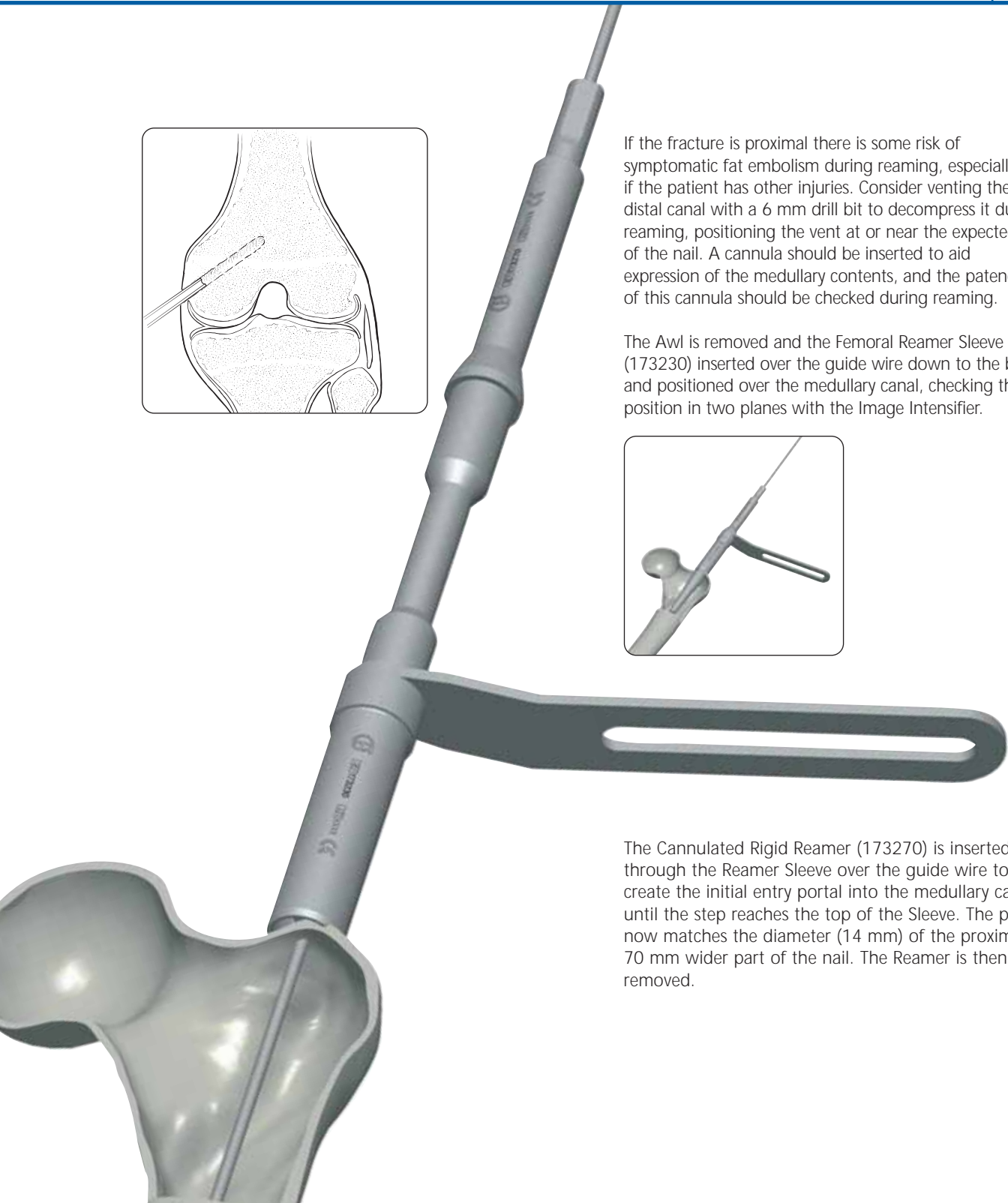
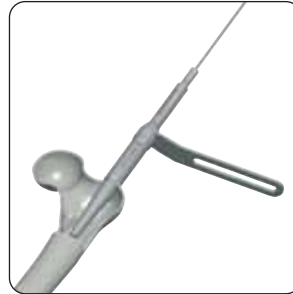
INSTRUMENTATION





If the fracture is proximal there is some risk of symptomatic fat embolism during reaming, especially if the patient has other injuries. Consider venting the distal canal with a 6 mm drill bit to decompress it during reaming, positioning the vent at or near the expected tip of the nail. A cannula should be inserted to aid expression of the medullary contents, and the patency of this cannula should be checked during reaming.

The Awl is removed and the Femoral Reamer Sleeve (173230) inserted over the guide wire down to the bone and positioned over the medullary canal, checking the position in two planes with the Image Intensifier.



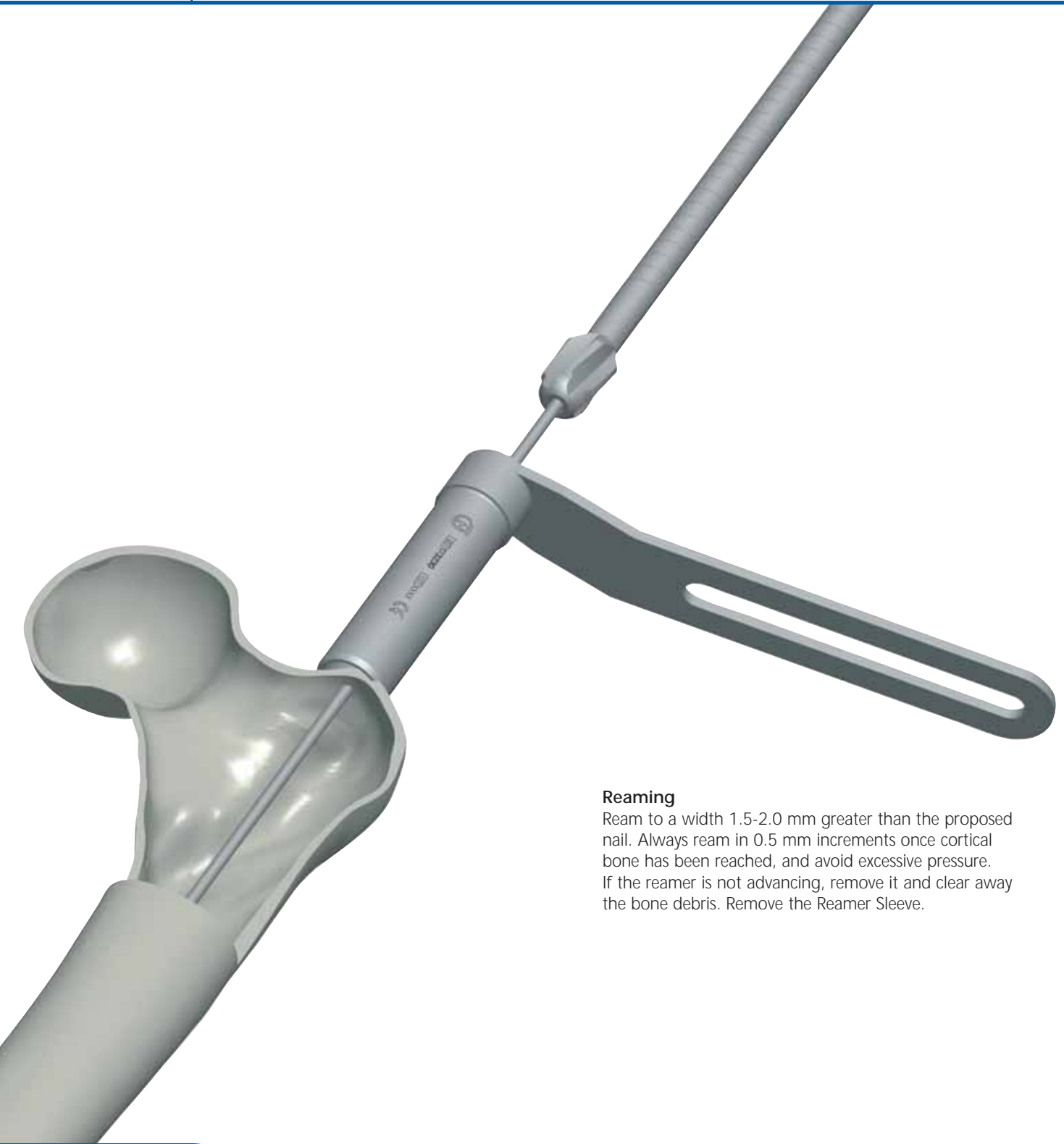
The Cannulated Rigid Reamer (173270) is inserted through the Reamer Sleeve over the guide wire to create the initial entry portal into the medullary canal, until the step reaches the top of the Sleeve. The portal now matches the diameter (14 mm) of the proximal 70 mm wider part of the nail. The Reamer is then removed.



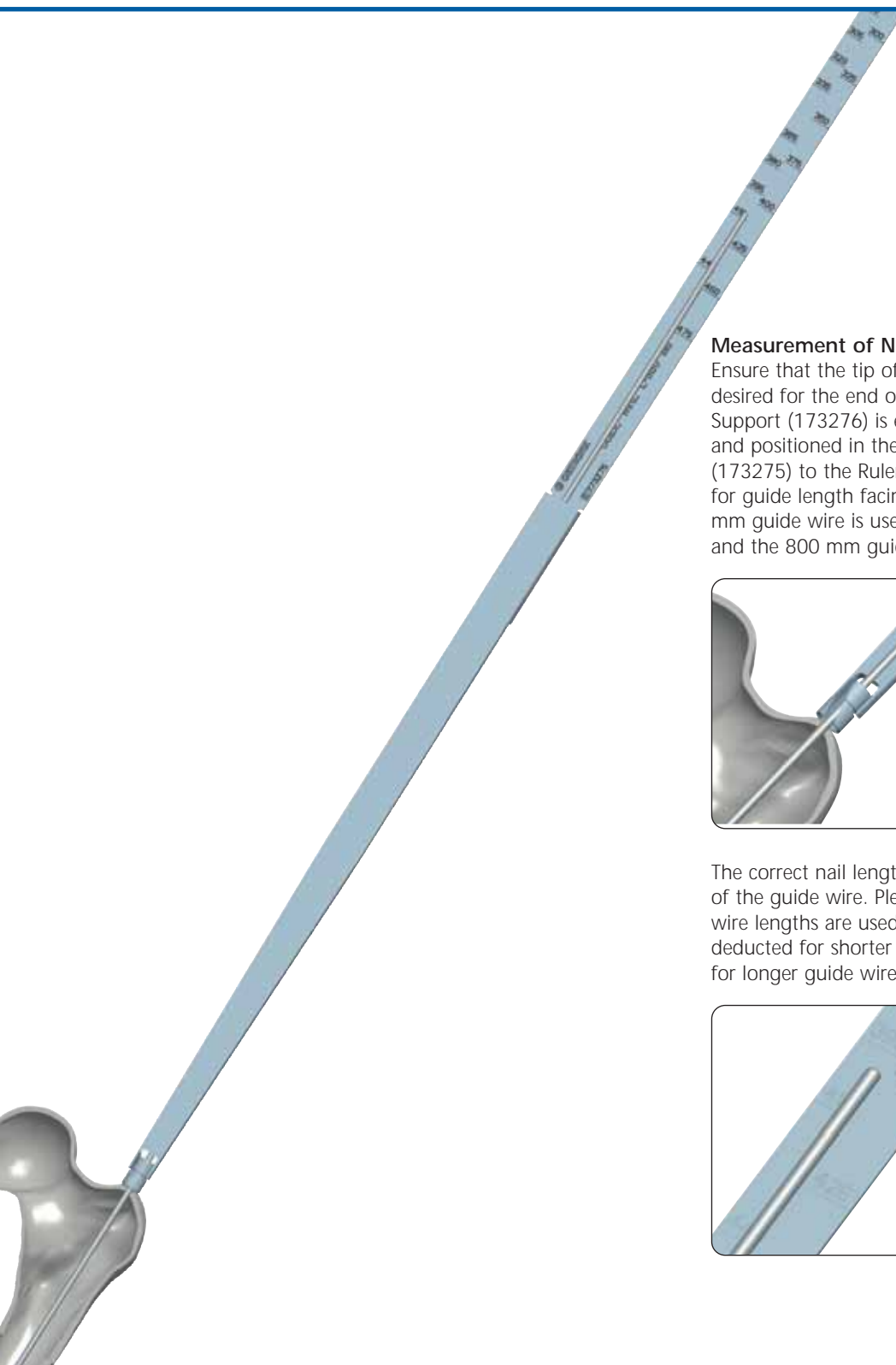
173230
Femoral
Reamer Sleeve



173270
Cannulated
Rigid Reamer

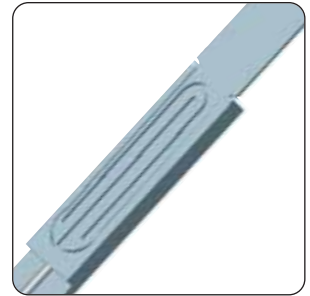
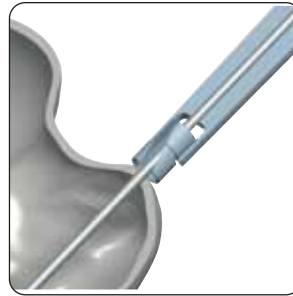
**Reaming**

Ream to a width 1.5-2.0 mm greater than the proposed nail. Always ream in 0.5 mm increments once cortical bone has been reached, and avoid excessive pressure. If the reamer is not advancing, remove it and clear away the bone debris. Remove the Reamer Sleeve.



Measurement of Nail Length

Ensure that the tip of the guide wire is at the level desired for the end of the nail. The tip of the Ruler Support (173276) is engaged over the guide wire and positioned in the entry portal. Attach the Ruler (173275) to the Ruler Support with the correct side for guide length facing forwards (normally the 980 mm guide wire is used for femoral and tibial nailing, and the 800 mm guide wire used for the humerus).



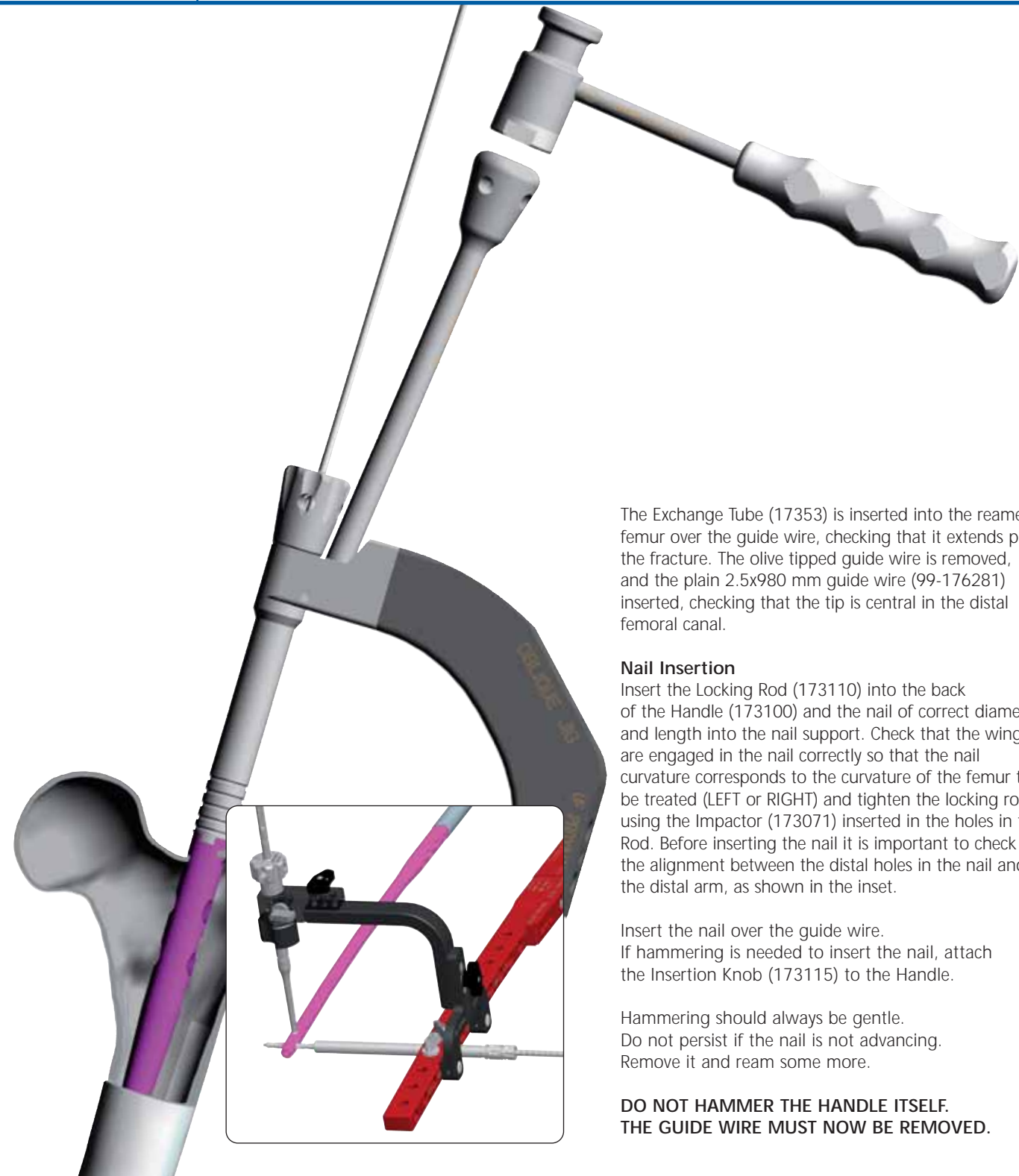
The correct nail length is read at the proximal tip of the guide wire. Please note, that if different guide wire lengths are used, the difference must be deducted for shorter guide wires or added for longer guide wires to the measured length.



173276
Ruler Support



173275
Ruler



The Exchange Tube (17353) is inserted into the reamed femur over the guide wire, checking that it extends past the fracture. The olive tipped guide wire is removed, and the plain 2.5x980 mm guide wire (99-176281) inserted, checking that the tip is central in the distal femoral canal.

Nail Insertion

Insert the Locking Rod (173110) into the back of the Handle (173100) and the nail of correct diameter and length into the nail support. Check that the wings are engaged in the nail correctly so that the nail curvature corresponds to the curvature of the femur to be treated (LEFT or RIGHT) and tighten the locking rod using the Impactor (173071) inserted in the holes in the Rod. Before inserting the nail it is important to check the alignment between the distal holes in the nail and the distal arm, as shown in the inset.

Insert the nail over the guide wire.
If hammering is needed to insert the nail, attach the Insertion Knob (173115) to the Handle.

Hammering should always be gentle.
Do not persist if the nail is not advancing.
Remove it and ream some more.

**DO NOT HAMMER THE HANDLE ITSELF.
THE GUIDE WIRE MUST NOW BE REMOVED.**

INSTRUMENTATION



173110
Locking Rod



173100
Handle



173071
Impactor



173115
Insertion Knob



173380
Hammer

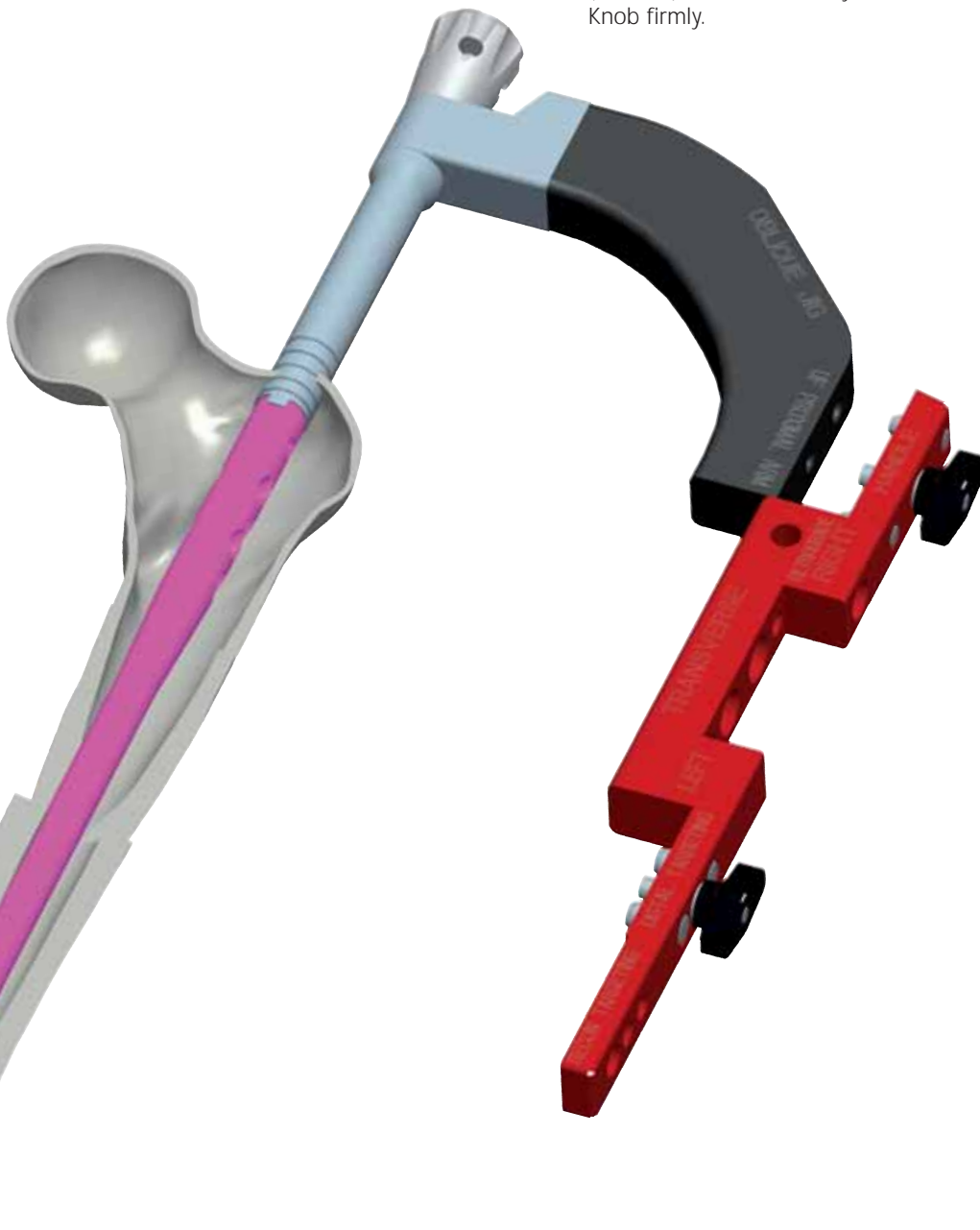


17353
Exchange Tube

Transverse Proximal Screws

Proximal Locking

Attach the Universal Femur (UF) Proximal Arm (173120) to the Handle by the short end. Tighten Knob firmly.



173120
UF Proximal Arm

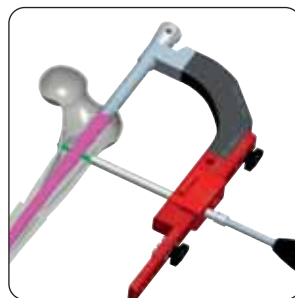
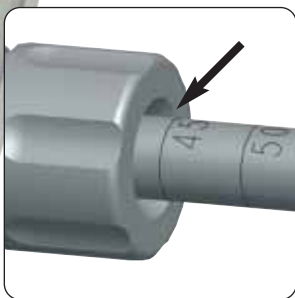


If standard proximal locking is to be used, it is possible to do the distal locking first (see next page). If Recon locking is required proximally, this must be done first (see page 28).

Add the Transverse Jig (173130) with the writing "TRANSVERSE" facing upwards. Make a stab incision at the level of one of the two holes in the guide bar and extend it down to the bone with blunt dissection. Screw the Trocar (173212) into the Screw Guide (173211) and insert them through the hole in the Jig, down to the bone. Unscrew the Trocar and push the Screw Guide until it is sitting flush against the bone surface. Lock the Screw Guide into position.

Remove the Trocar and, using a 4.8 mm Drill Bit (173286) with the Drill Guide (173213) inserted into the Screw Guide, drill the first hole until the drill tip is against the second cortex. Use the Image Intensifier if there is any doubt about the position of the tip of the drill bit. The screw length required is read from the scale on the Drill Bit immediately above the top of the Drill Guide (see inset: if the position is between graduations, choose the longer value). Drill the second cortex. Insert the screw using the 3.5 mm Cannulated Screw Driver (173320) until the mark on the shaft of the screw driver reaches the top of the screw guide. One more full turn should be made to tighten the screw fully.

Repeat the procedure for the second proximal locking screw.



INSTRUMENTATION



173130
Transverse Jig



173212
Trocar



173211
Screw Guide



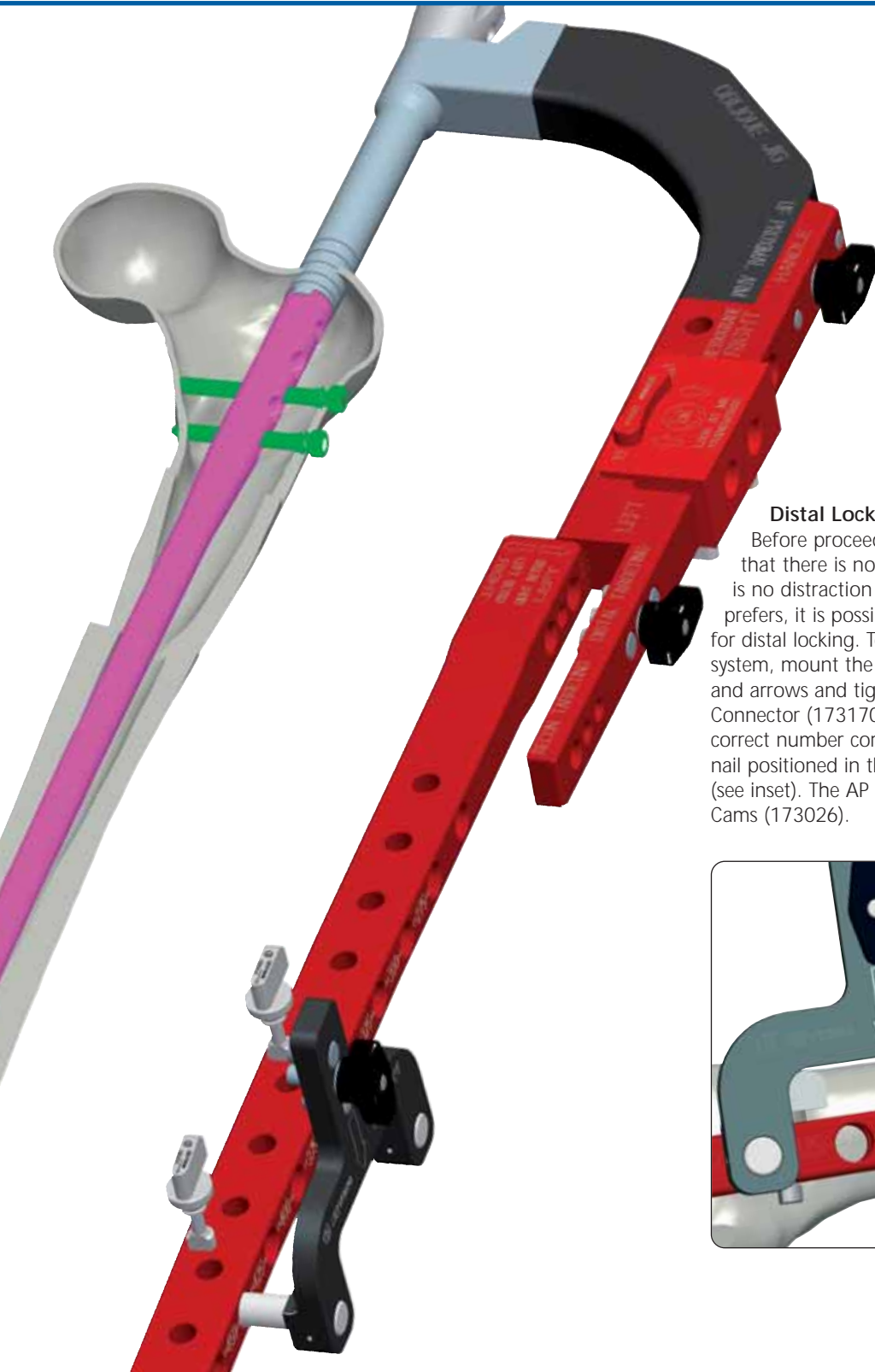
173286
4.8 mm Drill Bit



173213
Drill Guide

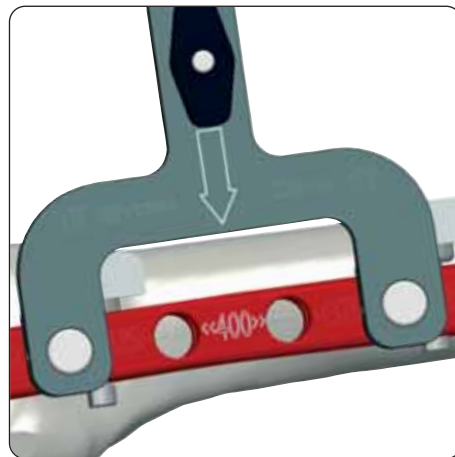


173320
3.5 mm Cannulated
Screw Driver



Distal Locking

Before proceeding with distal locking, check that there is no rotational deformity, and that there is no distraction of the fracture site. If the surgeon prefers, it is possible to use the freehand technique for distal locking. To use the mechanical distal targeting system, mount the UF Distal Arm (173161) (note text and arrows and tighten knob firmly) with the AP Arm Connector (173170) already in position, with the correct number corresponding to the length of the nail positioned in the middle of the Connector (see inset). The AP Arm is secured using two Locking Cams (173026).



173161
UF Distal Arm



173170
AP Arm
Connector



173026
Locking Cam



Mount the AP Arm (173180) with the AP Centering Jig (173185). The hole in the centering jig has two targeting rings to enable it to be centred over the nail. The Image Intensifier is positioned over the Jig so that the two rings appear as one ring. If the rings are not central over the nail hole the Jig is moved medially or laterally until they are centered.



Not aligned



Aligned

INSTRUMENTATION



173180
AP Arm



173185
AP Centering Jig



Insert the Stabilizing Sleeve (173201) through the hole in the Jig down to the skin anteriorly. Make a 20-25 mm incision and extend it down through the deep fascia. Split the muscles longitudinally down to the bone, and check that no soft tissues remain. Insert the Stabilising Sleeve down to the bone, if necessary using small retractors to stop soft tissue impingement. Lock the Sleeve in place.

Insert the Cannulated Drill Bit 6 mm (99-173285) and the K-wire 2 mm (173287), and tap it with the Hammer (173380) and Impactor (173071), until it is flush with the top of the Cannulated Drill Bit. Drill the anterior cortex only.

NB: The Cannulated Drill Bit is SINGLE USE ONLY.



173201
Stabilizing
Sleeve



99-173285
Cannulated
Drill Bit 6 mm



173287
K-wire 2 mm



173380
Hammer



173071
Impactor

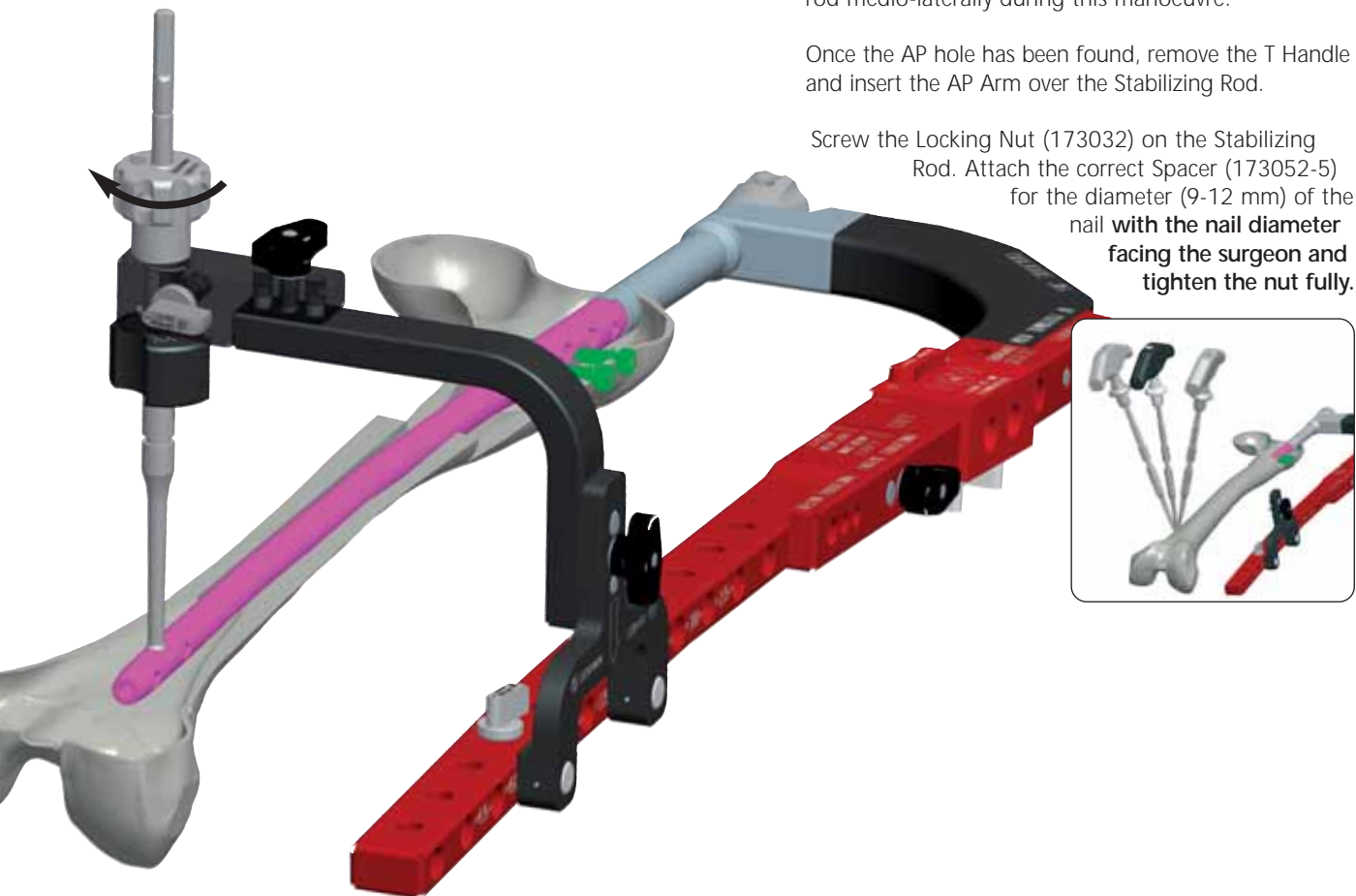


Remove the Cannulated Drill Bit, K-wire and Stabilizing Sleeve. Attach the T Handle (173350) to the Stabilizing Rod (173031) and insert it into the AP hole in the nail. Screw it in fully.

If there is difficulty in finding the hole in the nail with the AP Arm in place, it can be removed, so that a probing technique can be used to find the hole in the nail. This can often be done quickly by feel, but in case of difficulty it may be useful to use the Image Intensifier in an AP view to position the tip of the stabilizing rod over the hole in the nail. NB: Provided that the AP arm connector has been positioned over the correct length on the guide bar, it should only be necessary to move the stabilizing rod medio-laterally during this manoeuvre.

Once the AP hole has been found, remove the T Handle and insert the AP Arm over the Stabilizing Rod.

Screw the Locking Nut (173032) on the Stabilizing Rod. Attach the correct Spacer (173052-5) for the diameter (9-12 mm) of the nail **with the nail diameter facing the surgeon and tighten the nut fully.**



INSTRUMENTATION



173350
T Handle



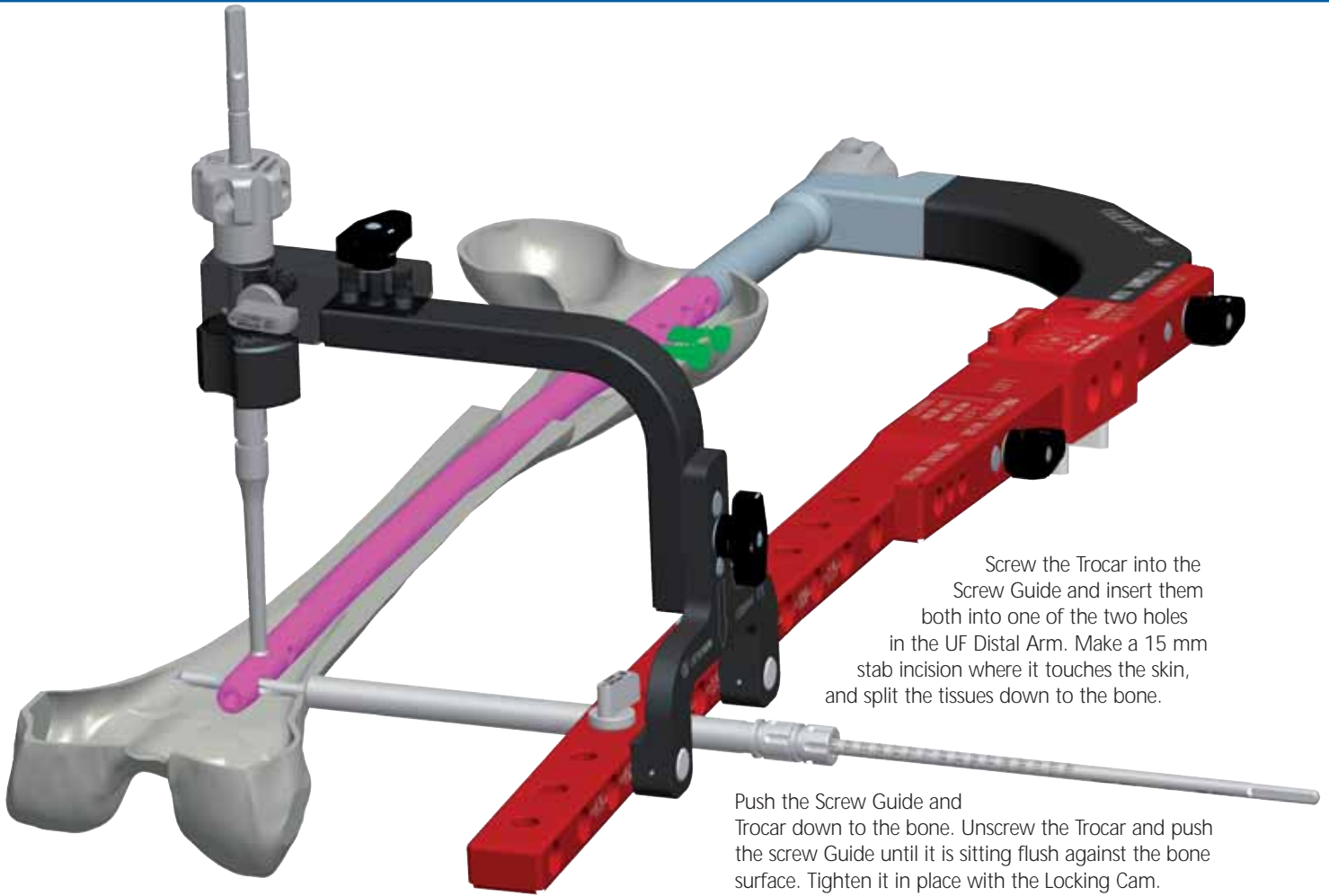
173031
Stabilizing Rod



173032
Locking Nut



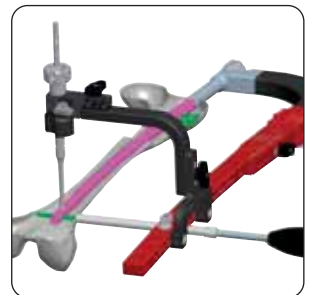
173052-5
Spacer



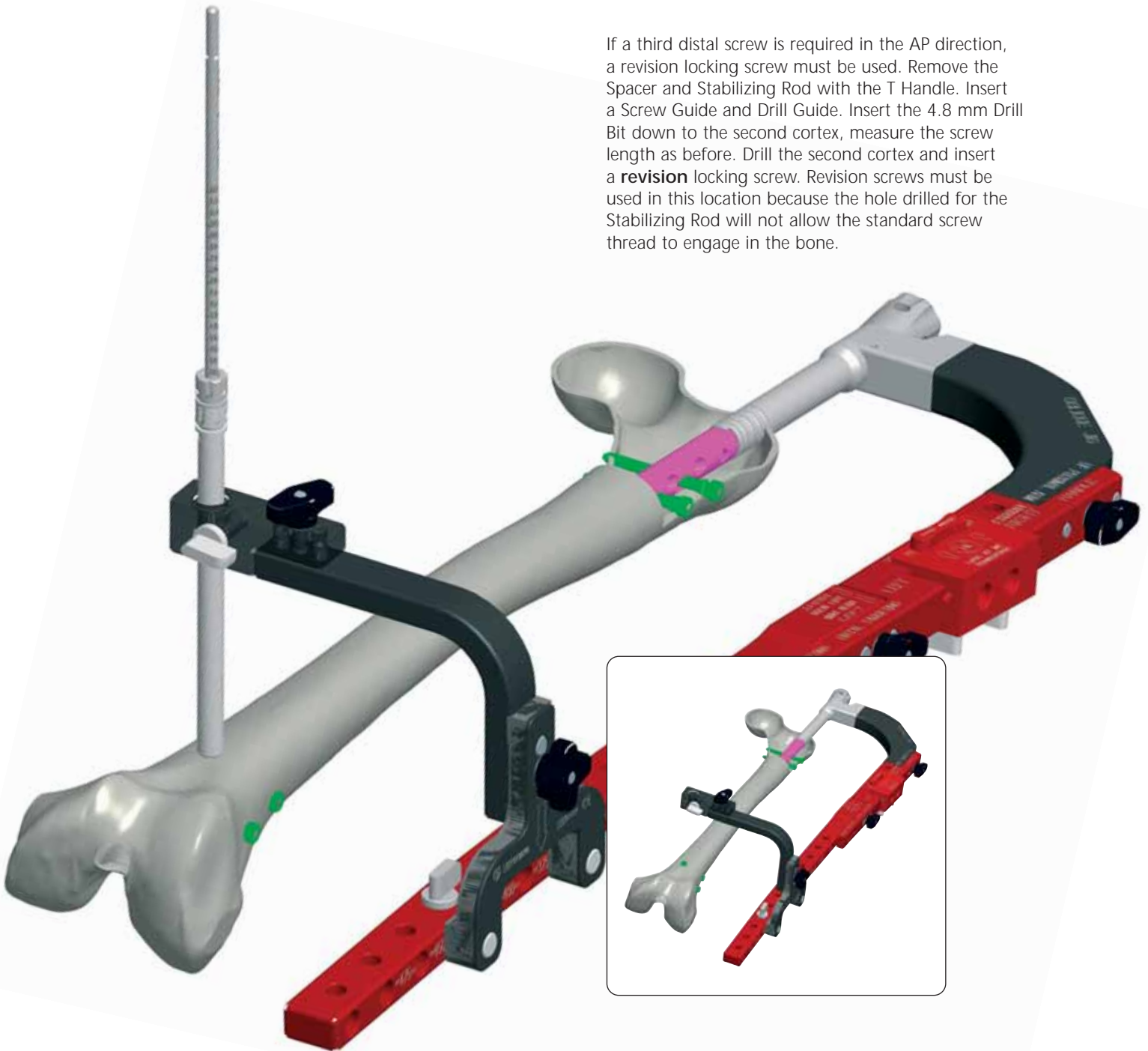
Screw the Trocar into the Screw Guide and insert them both into one of the two holes in the UF Distal Arm. Make a 15 mm stab incision where it touches the skin, and split the tissues down to the bone.

Push the Screw Guide and Trocar down to the bone. Unscrew the Trocar and push the screw Guide until it is sitting flush against the bone surface. Tighten it in place with the Locking Cam.

Remove the Trocar and screw the Drill Guide into the Screw Guide. Drill with the 4.8 mm Drill Bit as before. Stop at the second cortex and measure the screw length using the scale on the Drill Bit. Complete drilling, and insert the screw using the 3.5 mm Cannulated Screw Driver. Repeat the procedure for the second hole.



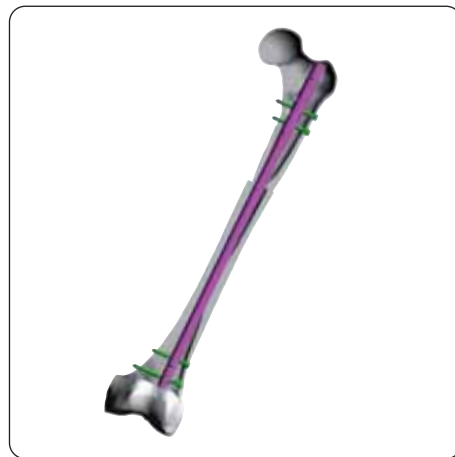
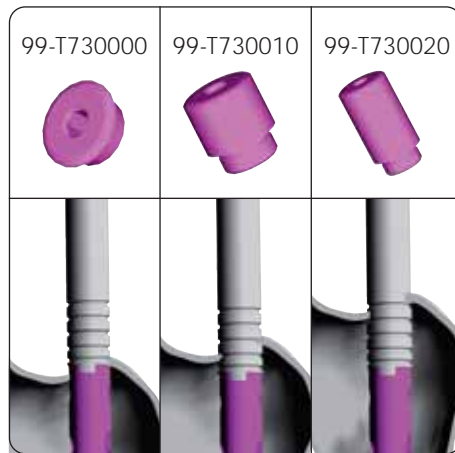
If a third distal screw is required in the AP direction, a revision locking screw must be used. Remove the Spacer and Stabilizing Rod with the T Handle. Insert a Screw Guide and Drill Guide. Insert the 4.8 mm Drill Bit down to the second cortex, measure the screw length as before. Drill the second cortex and insert a **revision** locking screw. Revision screws must be used in this location because the hole drilled for the Stabilizing Rod will not allow the standard screw thread to engage in the bone.



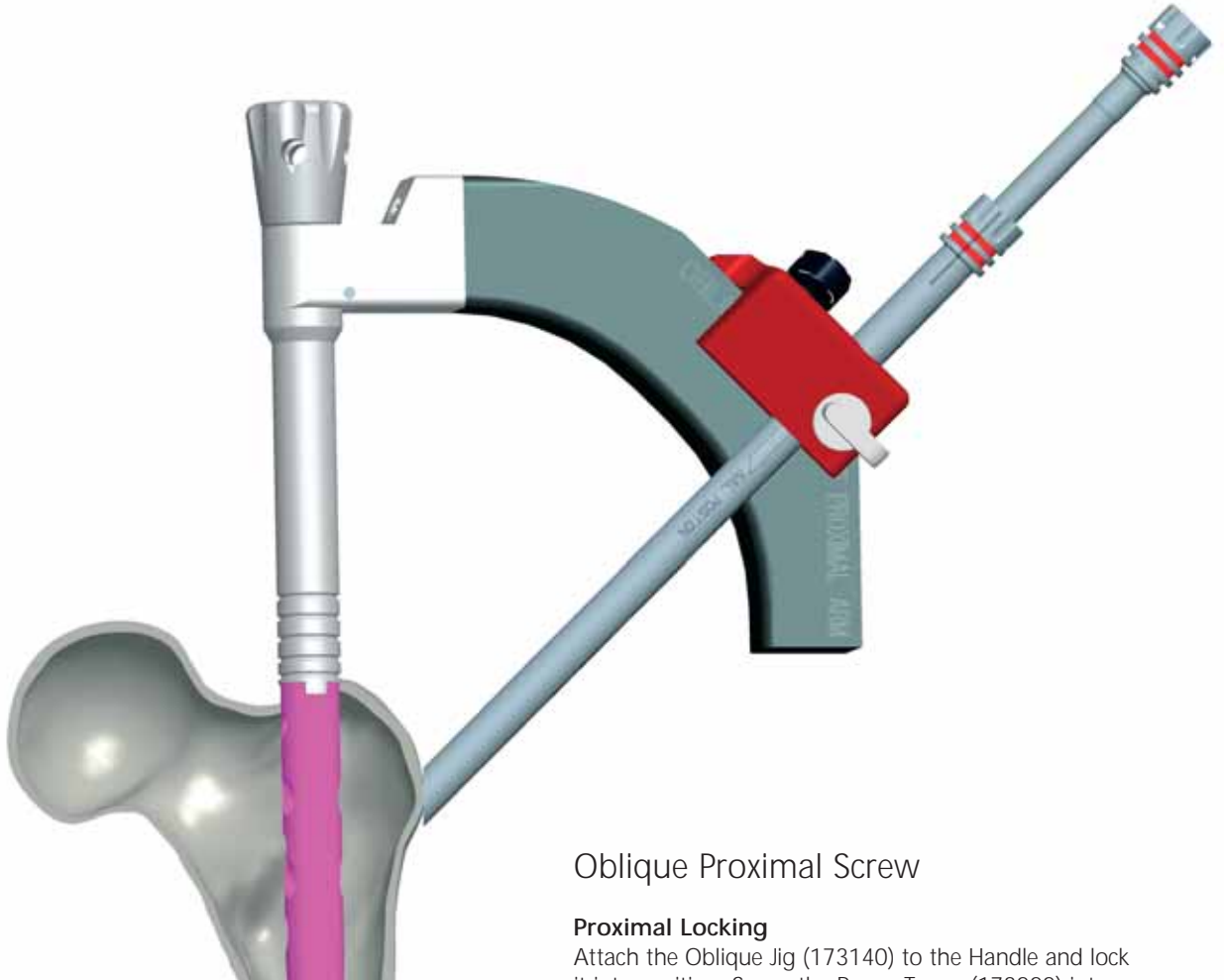


Removal of the Handle and Closure

Before removing the Handle from the nail, check correct insertion of locking screws both in the AP and lateral planes. Remove the Handle and the Locking Rod and, using the 3.5 mm Cannulated Screw Driver, insert the nail end cap over a K-wire (99-T730000, 99-T730010, 99-T730020), choosing the correct length (0, 10, 20) to leave the top of the nail end cap flush with, or just above, the tip of the greater trochanter.



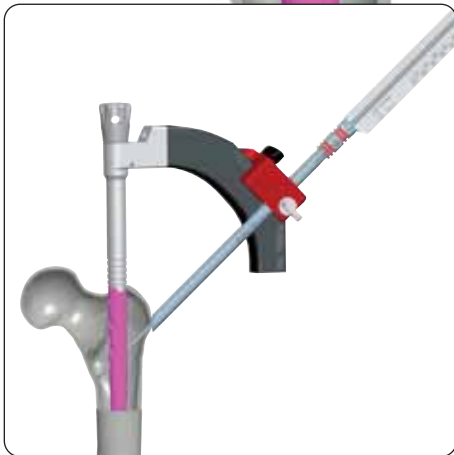
173320
3.5 mm Cannulated
Screw Driver



Oblique Proximal Screw

Proximal Locking

Attach the Oblique Jig (173140) to the Handle and lock it into position. Screw the Recon Trocar (173222) into the Recon Screw Guide (173221) (with two grooves) and insert them into the LEFT or RIGHT hole as appropriate. The correct hole will be anterior to the Handle. Push them down to the bone through a small stab incision. The Recon Screw Guide is rotated so that the "NAIL POSITION" profile and the marks on the Screw Guide show that the tip of the Screw Guide is correctly orientated to go flat against the bone. The Trocar must be unscrewed and the Screw Guide pushed until it is flush with the bone surface. Lock the Screw Guide in place. Remove the Trocar and screw the Recon Wire Guide (173223) into the Screw Guide. Insert the Threaded Wire 3x400 mm (173288) just through the second cortex. Measure the correct screw length with the Screw Scale (173301).



INSTRUMENTATION



173140
Oblique Jig



173222
Recon Trocar



173221
Recon
Screw Guide



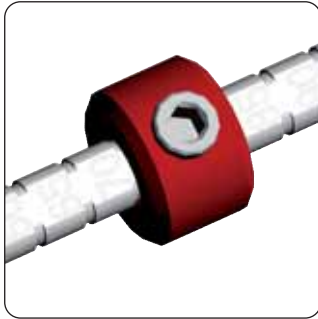
173223
Recon
Wire Guide



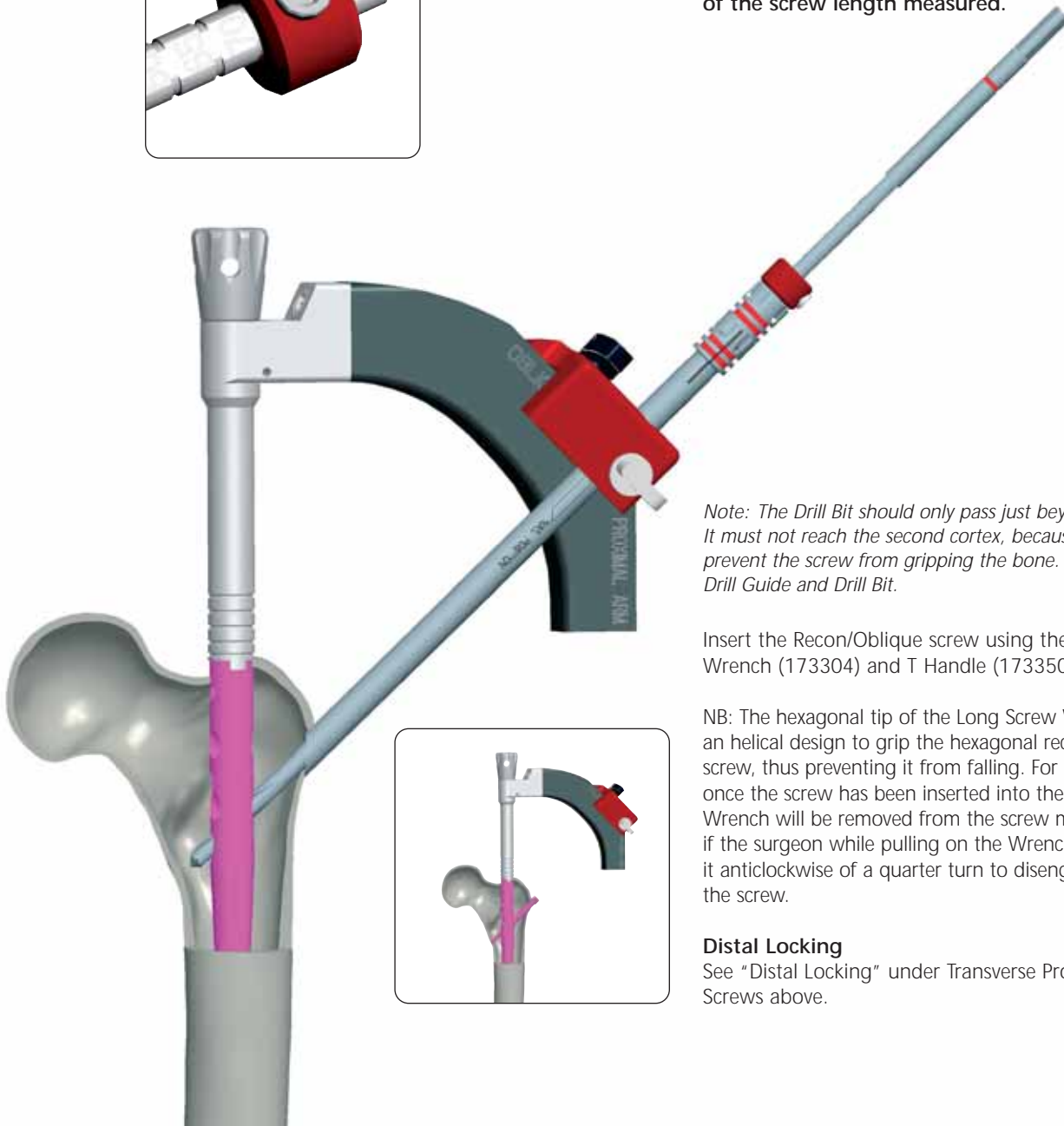
173288
Threaded Wire
3x400 mm



173301
Screw Scale



Remove the K-wire and Recon Wire Guide and screw in the Recon Drill Guide (173224). Drill with the Recon Drill Bit (173283), **after positioning the Recon Drill Bit Stop (173295) on the drill scale at the level of the screw length measured.**



Note: The Drill Bit should only pass just beyond the nail. It must not reach the second cortex, because this would prevent the screw from gripping the bone. Remove the Drill Guide and Drill Bit.

Insert the Recon/Oblique screw using the Long Screw Wrench (173304) and T Handle (173350).

NB: The hexagonal tip of the Long Screw Wrench has an helical design to grip the hexagonal recess of the screw, thus preventing it from falling. For this reason, once the screw has been inserted into the bone, the Wrench will be removed from the screw more easily if the surgeon while pulling on the Wrench rotates it anticlockwise of a quarter turn to disengage it from the screw.

Distal Locking

See "Distal Locking" under Transverse Proximal Screws above.



173224
Recon
Drill Guide



173283
Recon
Drill Bit



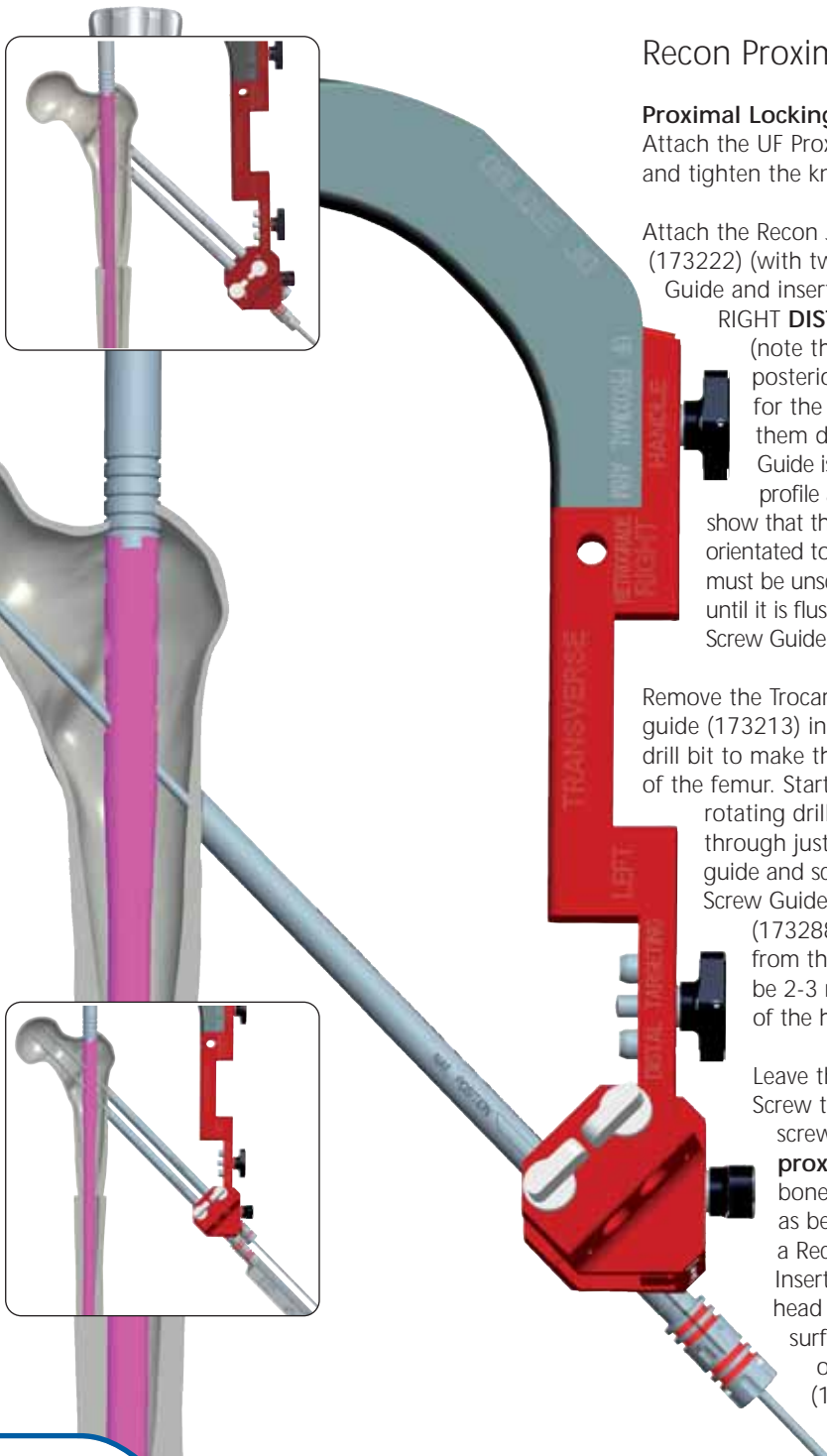
173295
Recon Drill
Bit Stop



173304
Long Screw
Wrench



173350
T Handle



Recon Proximal Screws

Proximal Locking

Attach the UF Proximal Arm (173120) to the Handle and tighten the knob firmly.

Attach the Recon Jig (173150), screw the Recon Trocar (173222) (with two grooves) into the Recon Screw Guide and insert them both in either the LEFT or RIGHT **DISTAL** locking hole as appropriate (note that the correct holes in the jig will be posterior to the UF Proximal Arm, to allow for the femoral neck anteversion). Push them down to the bone. The Recon Screw Guide is rotated so that the "NAIL POSITION" profile and the marks on the Screw Guide show that the tip of the Screw Guide is correctly orientated to go flat against the bone. The Trocar must be unscrewed and the Screw Guide pushed until it is flush with the bone surface. Lock the Screw Guide in place.

Remove the Trocar and screw a standard 4.8 mm drill guide (173213) into the Screw Guide. Use a 4.8 mm drill bit to make the initial hole in the lateral wall of the femur. Start the power unit and advance the rotating drill bit gently until it has passed through just the first cortex. Remove the drill guide and screw the Recon Wire Guide into the Screw Guide. Insert the Threaded Wire 3x400 mm (173288) into the femoral head up to 1 cm from the articular surface. The wire should be 2-3 mm from the calcar, and in the centre of the head in the lateral view.

Leave the K-wire and Wire Guide in place. Screw the Recon Trocar into a second Recon screw guide and insert them into the **proximal** hole. Push them down to the bone and lock the Screw Guide in place as before. Remove the Trocar and screw a Recon Wire Guide into the Screw Guide. Insert the 3 mm K-wire into the femoral head up to 1 cm from the articular surface. Measure the correct length of both screws using the Screw Scale (173301).

INSTRUMENTATION



173120
UF Proximal Arm



173150
Recon Jig



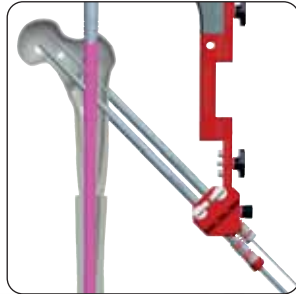
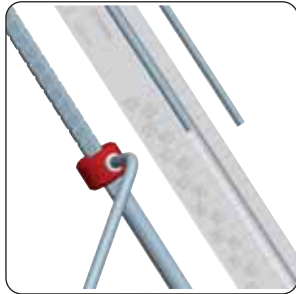
173222
Recon Trocar



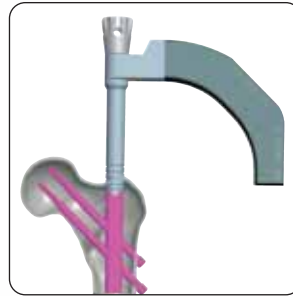
173288
Threaded Wire
3x400 mm



173301
Screw Scale

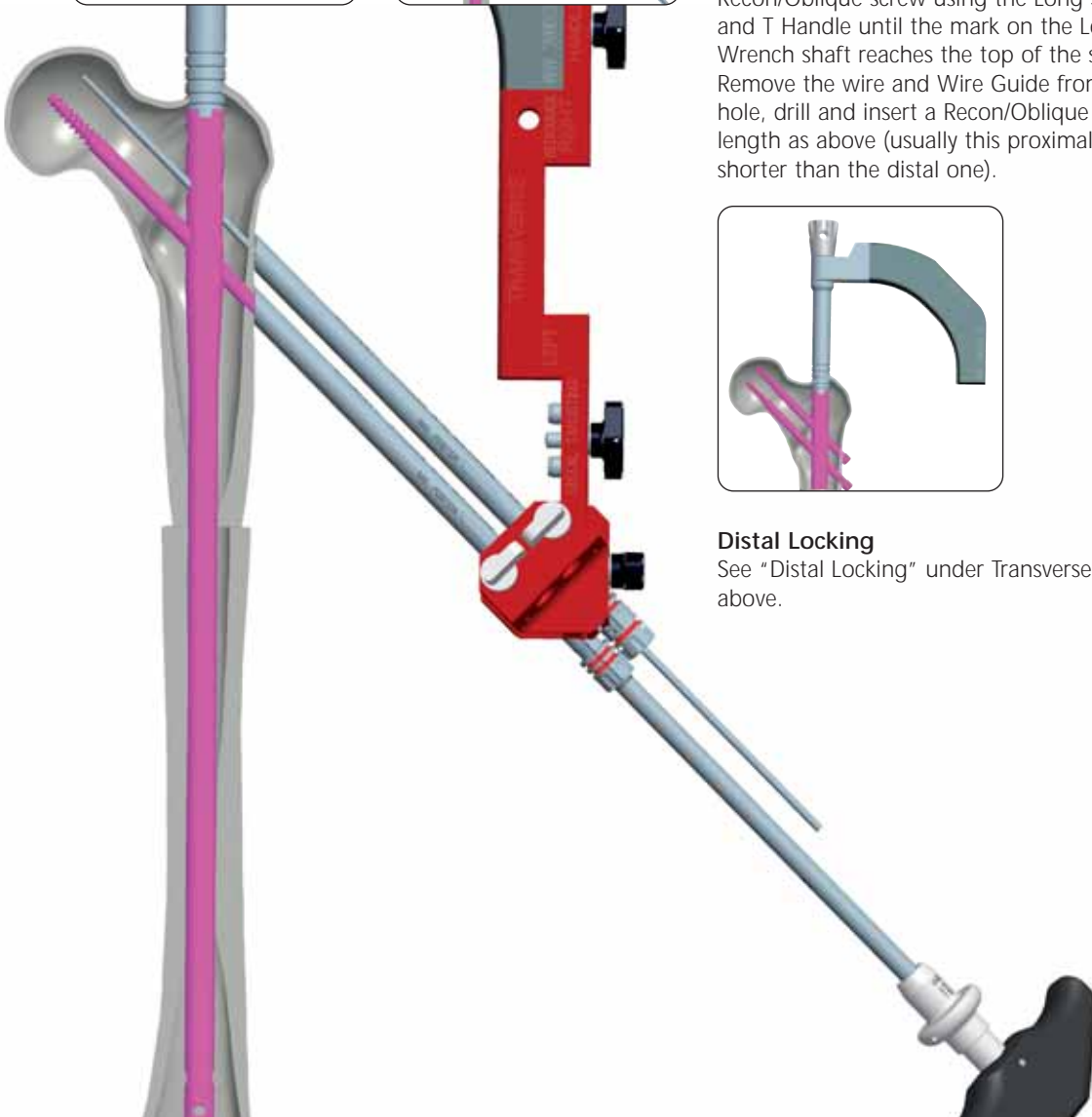


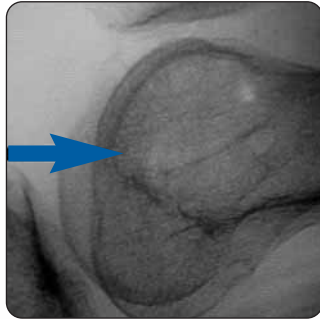
Remove the K-wire and Wire Guide from the distal hole. Screw in the Recon Drill Guide (173224) and drill with the Recon Drill Bit (173283), **after positioning the Recon Drill Bit Stop (173295) on the drill scale at the level of the screw length measured.** Note: The Drill Bit should only reach just beyond the nail. It must not be inserted into the femoral head, because this would prevent the screws gripping the bone. Insert the correct length of Recon/Oblique screw using the Long Screw Wrench and T Handle until the mark on the Long Screw Wrench shaft reaches the top of the screw guide. Remove the wire and Wire Guide from the proximal hole, drill and insert a Recon/Oblique screw of correct length as above (usually this proximal screw is 1 cm shorter than the distal one).



Distal Locking

See "Distal Locking" under Transverse Proximal Screws above.





RETROGRADE INSERTION

Entry Portal

The patient is placed supine with the knee flexed at 50°. Make a 4-6 cm medial para-patellar incision and retract the patellar tendon and fat pad to the lateral side. With the Awl make the entry point in the intercondylar notch, in line with the long axis of the femoral shaft in both the AP and coronal planes, using Blumensaat's line in the lateral view.

Insert the Guide Wire with Olive (99-173281) through the Awl into the proximal fragment, up to the level of the lesser trochanter. **Use image intensification when crossing the fracture.** Remove the Awl and slide the Femoral Reamer Sleeve (173230) over the Guide Wire.

Measurement of Nail Length

Ensure that the tip of the Guide Wire is at the level desired for the end of the nail. The Cannulated Rigid Reamer is used over the Guide Wire to ream the entry portal to match the shape of the distal part of the nail (14 mm). The Reamer is then removed.



INSTRUMENTATION



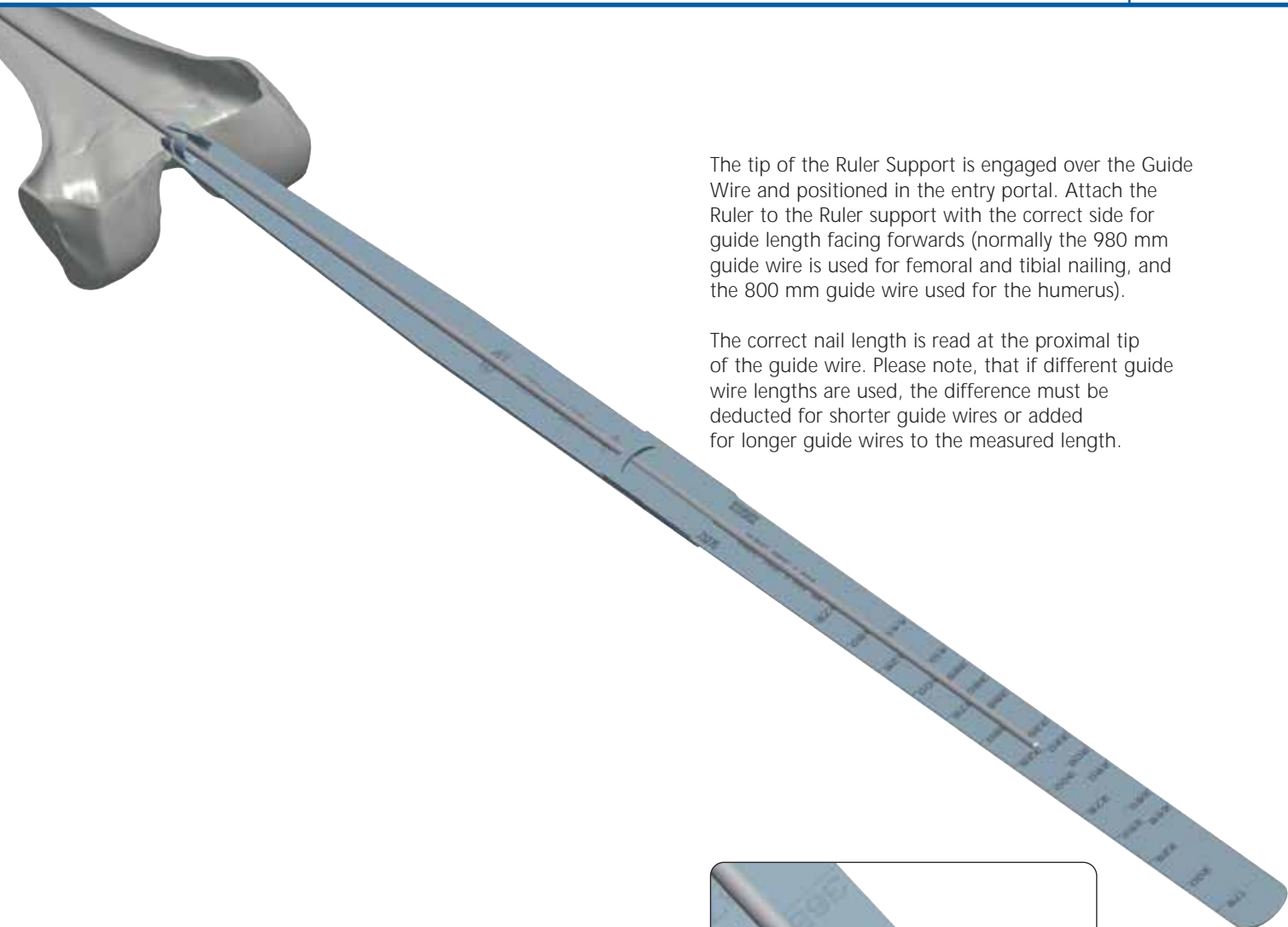
173260
Awl



173230
Femoral Reamer
Sleeve

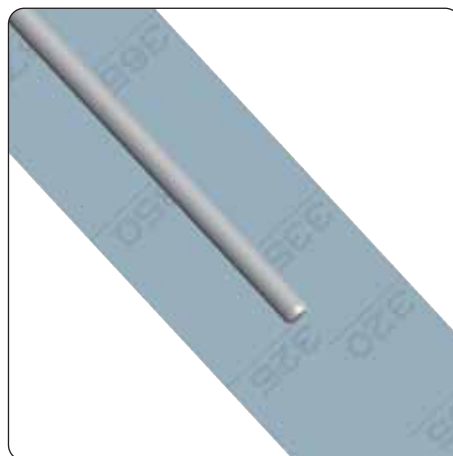


173270
Cannulated
Rigid Reamer



The tip of the Ruler Support is engaged over the Guide Wire and positioned in the entry portal. Attach the Ruler to the Ruler support with the correct side for guide length facing forwards (normally the 980 mm guide wire is used for femoral and tibial nailing, and the 800 mm guide wire used for the humerus).

The correct nail length is read at the proximal tip of the guide wire. Please note, that if different guide wire lengths are used, the difference must be deducted for shorter guide wires or added for longer guide wires to the measured length.



173276
Ruler Support

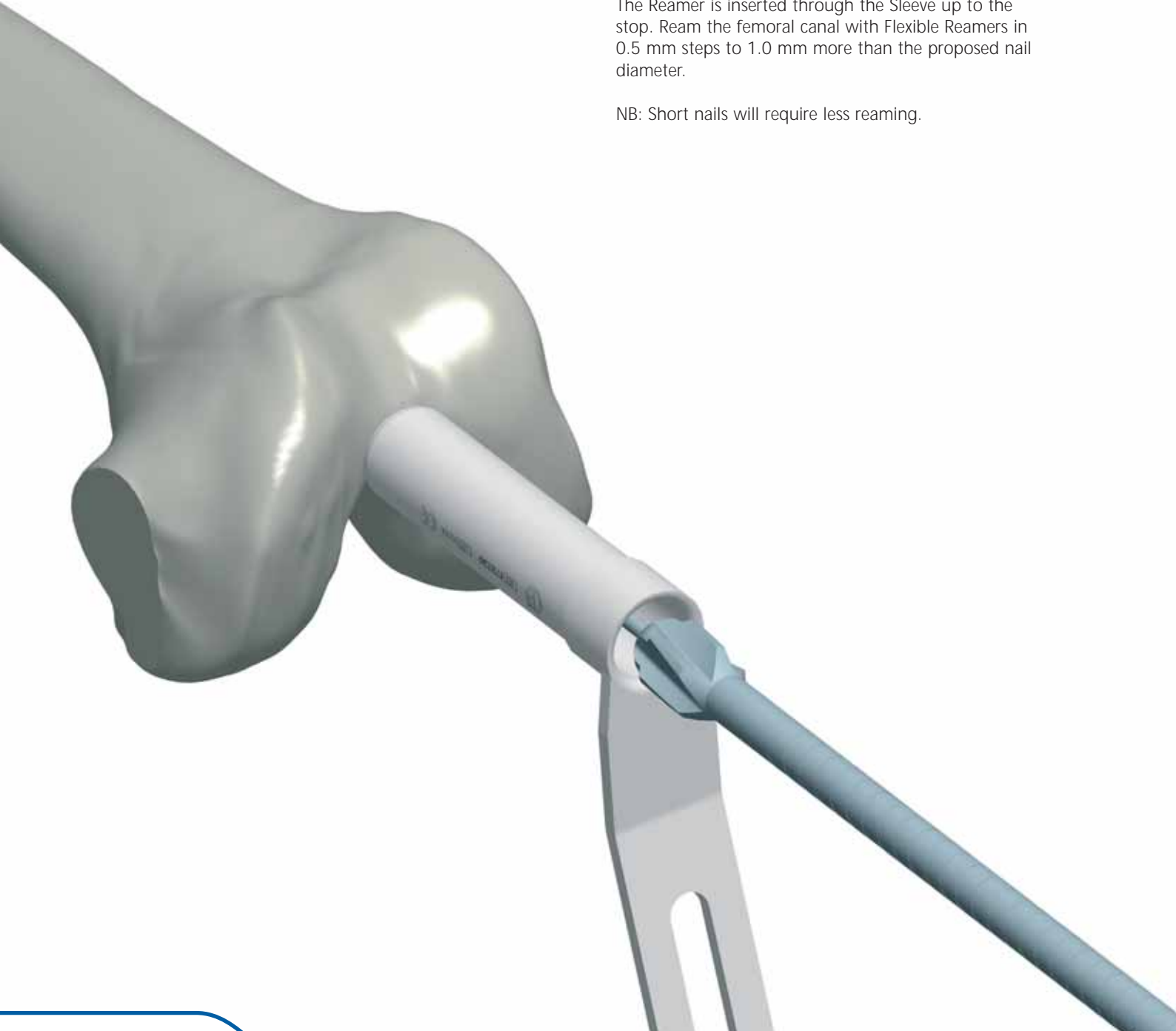


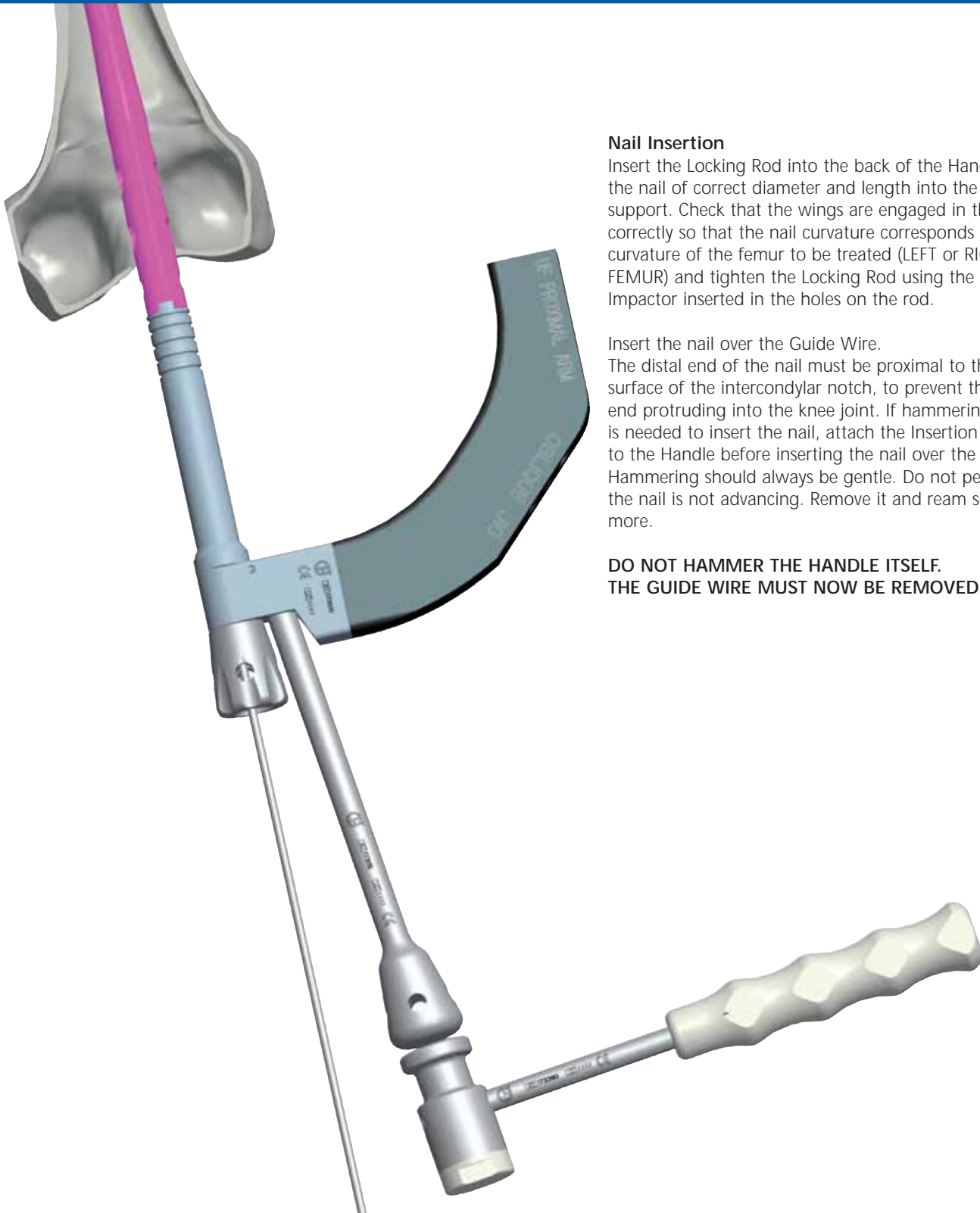
173275
Ruler

Reaming

The Reamer is inserted through the Sleeve up to the stop. Ream the femoral canal with Flexible Reamers in 0.5 mm steps to 1.0 mm more than the proposed nail diameter.

NB: Short nails will require less reaming.





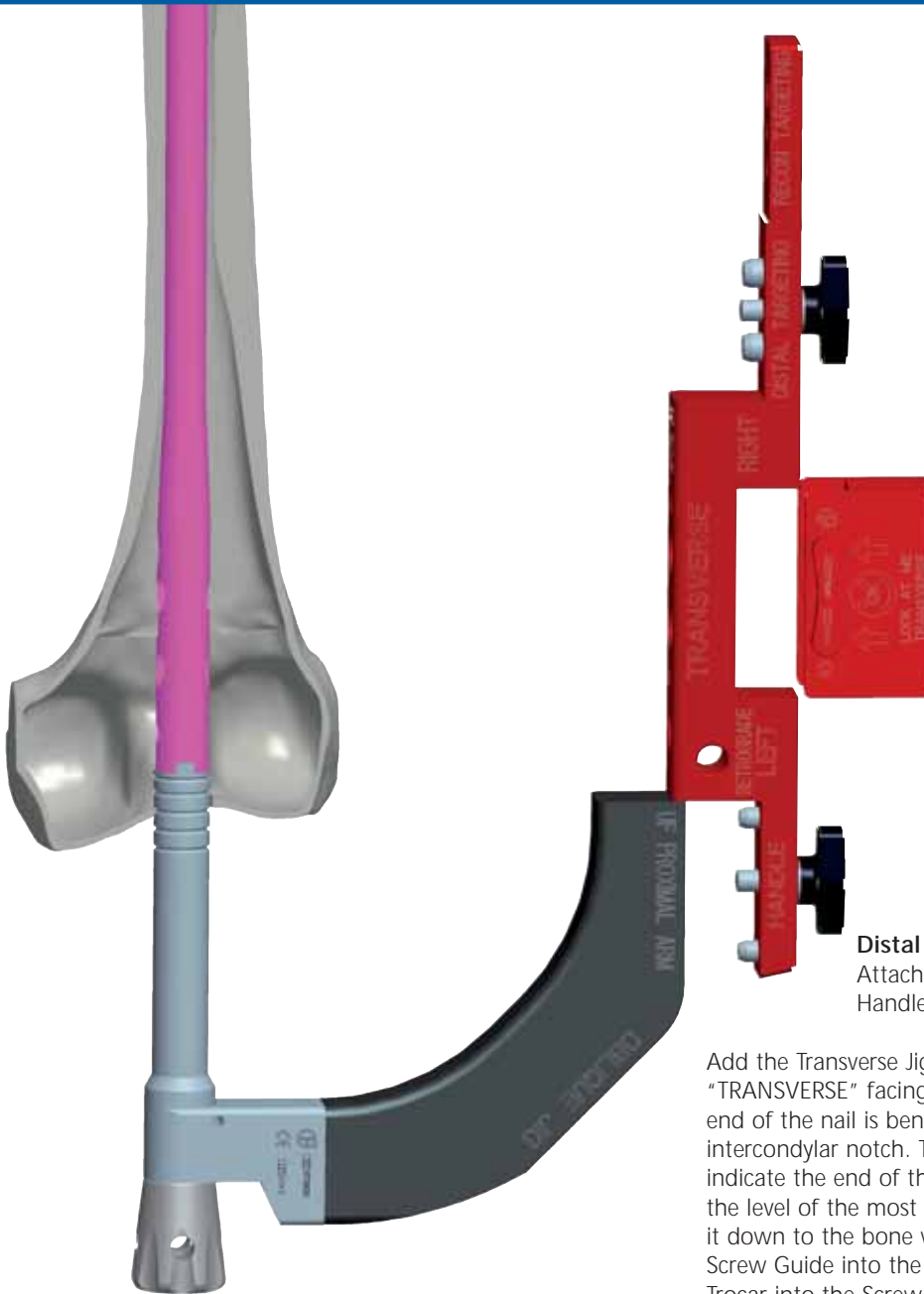
Nail Insertion

Insert the Locking Rod into the back of the Handle and the nail of correct diameter and length into the nail support. Check that the wings are engaged in the nail correctly so that the nail curvature corresponds to the curvature of the femur to be treated (LEFT or RIGHT FEMUR) and tighten the Locking Rod using the Impactor inserted in the holes on the rod.

Insert the nail over the Guide Wire.

The distal end of the nail must be proximal to the surface of the intercondylar notch, to prevent the nail end protruding into the knee joint. If hammering is needed to insert the nail, attach the Insertion Knob to the Handle before inserting the nail over the wire. Hammering should always be gentle. Do not persist if the nail is not advancing. Remove it and ream some more.

**DO NOT HAMMER THE HANDLE ITSELF.
THE GUIDE WIRE MUST NOW BE REMOVED.**



Distal Locking

Attach the UF Proximal Arm to the Handle and tighten the Knob firmly.

Add the Transverse Jig (173130) with the writing "TRANSVERSE" facing upwards. Check that the distal end of the nail is beneath the surface of the intercondylar notch. The grooves on the Handle indicate the end of the nail. Make a stab incision at the level of the most distal hole in the Jig and extend it down to the bone with blunt dissection. Insert a Screw Guide into the hole in the Jig and screw the Trocar into the Screw Guide.

Push them both down to the bone. Unscrew the Trocar and push the Screw Guide until it is sitting flush against the bone surface. **Lock the Screw Guide into position.**

INSTRUMENTATION



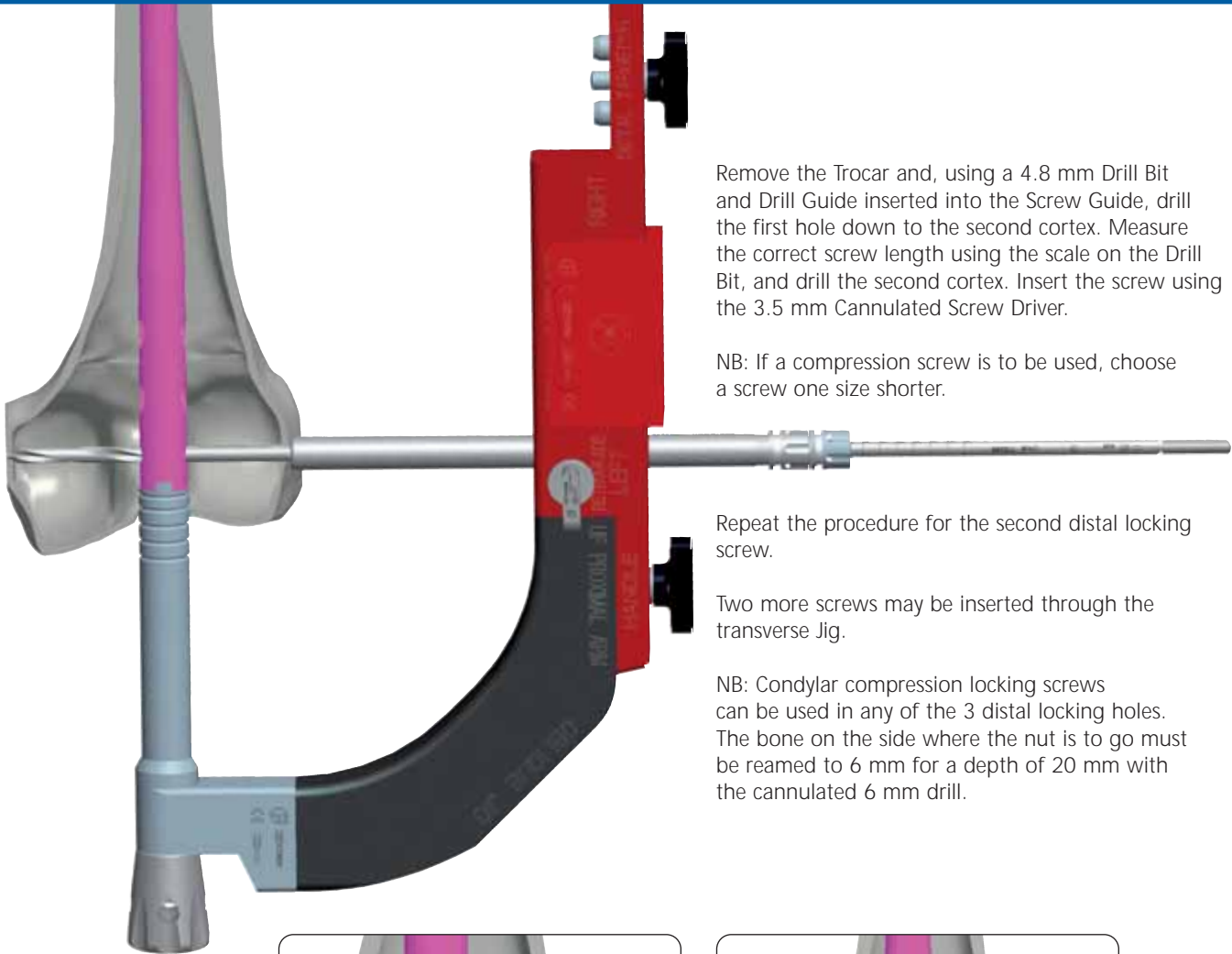
173120
UF Proximal Arm



173130
Transverse Jig



173212
Trocar



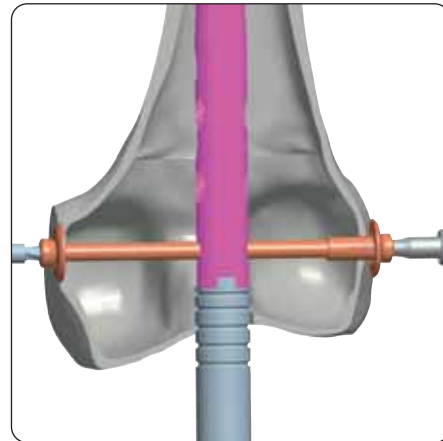
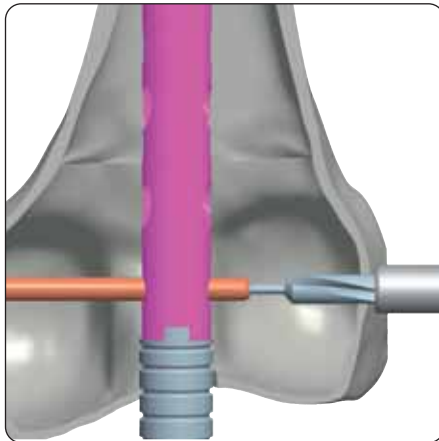
Remove the Trocar and, using a 4.8 mm Drill Bit and Drill Guide inserted into the Screw Guide, drill the first hole down to the second cortex. Measure the correct screw length using the scale on the Drill Bit, and drill the second cortex. Insert the screw using the 3.5 mm Cannulated Screw Driver.

NB: If a compression screw is to be used, choose a screw one size shorter.

Repeat the procedure for the second distal locking screw.

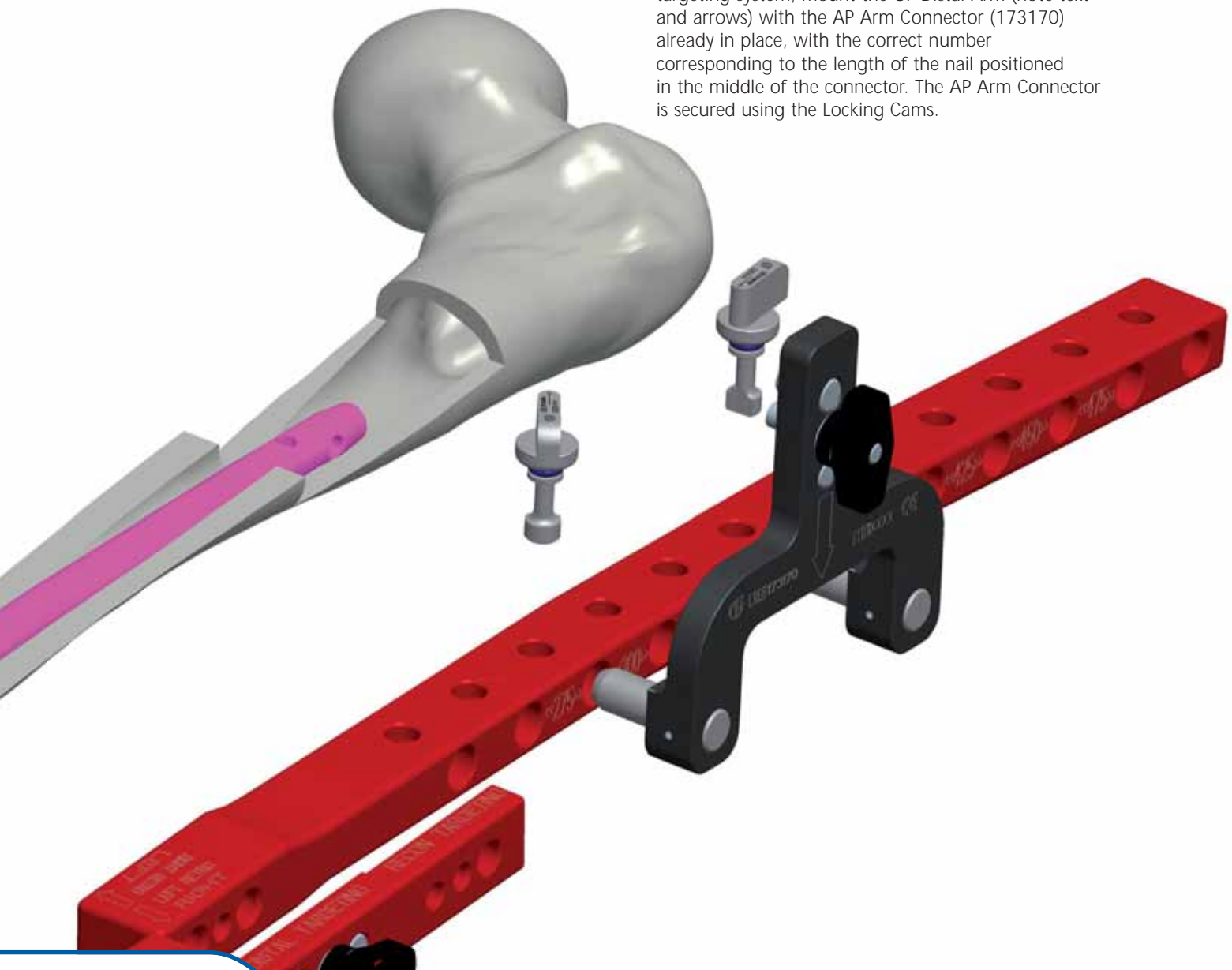
Two more screws may be inserted through the transverse Jig.

NB: Condylar compression locking screws can be used in any of the 3 distal locking holes. The bone on the side where the nut is to go must be reamed to 6 mm for a depth of 20 mm with the cannulated 6 mm drill.



Proximal Locking

Before proceeding with proximal locking, check that there is no rotational deformity, and that there is no distraction of the fracture site. If the surgeon prefers, it is possible to use the freehand technique for proximal locking. To use the mechanical distal targeting system, mount the UF Distal Arm (note text and arrows) with the AP Arm Connector (173170) already in place, with the correct number corresponding to the length of the nail positioned in the middle of the connector. The AP Arm Connector is secured using the Locking Cam.



INSTRUMENTATION



173161
UF Distal Arm



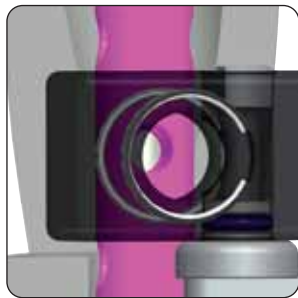
173170
AP Arm Connector



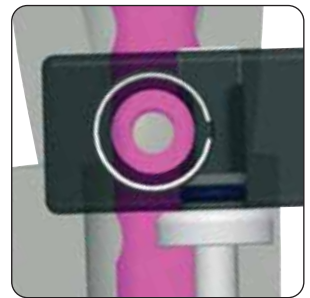
173026
Locking Cam



Mount the AP Arm with the AP Centering Jig. The hole in the Centering Jig has two targeting rings to enable it to be centred over the nail. The Image Intensifier is positioned over the Jig so that the two rings appear as one ring. If the rings are not central over the nail hole the Jig is moved medially or laterally until they are centered.



Not aligned



Aligned



173180
AP Arm



173185
AP Centering Jig



Insert the Stabilizing Sleeve through the hole in the Jig down to the skin anteriorly. Make a 20-25 mm incision at this point and extend it down to the deep fascia. Split the muscles longitudinally down to the bone, and check that no soft tissues remain.

Insert the Stabilising Sleeve down to the bone, if necessary using small retractors to stop soft tissue impingement. Lock the sleeve in place. Insert the Cannulated Drill Bit 6 mm and the 2 mm K-wire, and tap it with the Hammer and the Impactor, until it is flush with the end of the Cannulated Drill Bit. Drill the anterior cortex.

NB: The Cannulated Drill Bit is SINGLE USE ONLY.

INSTRUMENTATION



173201
Stabilizing
Sleeve



99-173285
Cannulated
Drill Bit 6 mm



173287
K-wire 2 mm



173380
Hammer



173071
Impactor

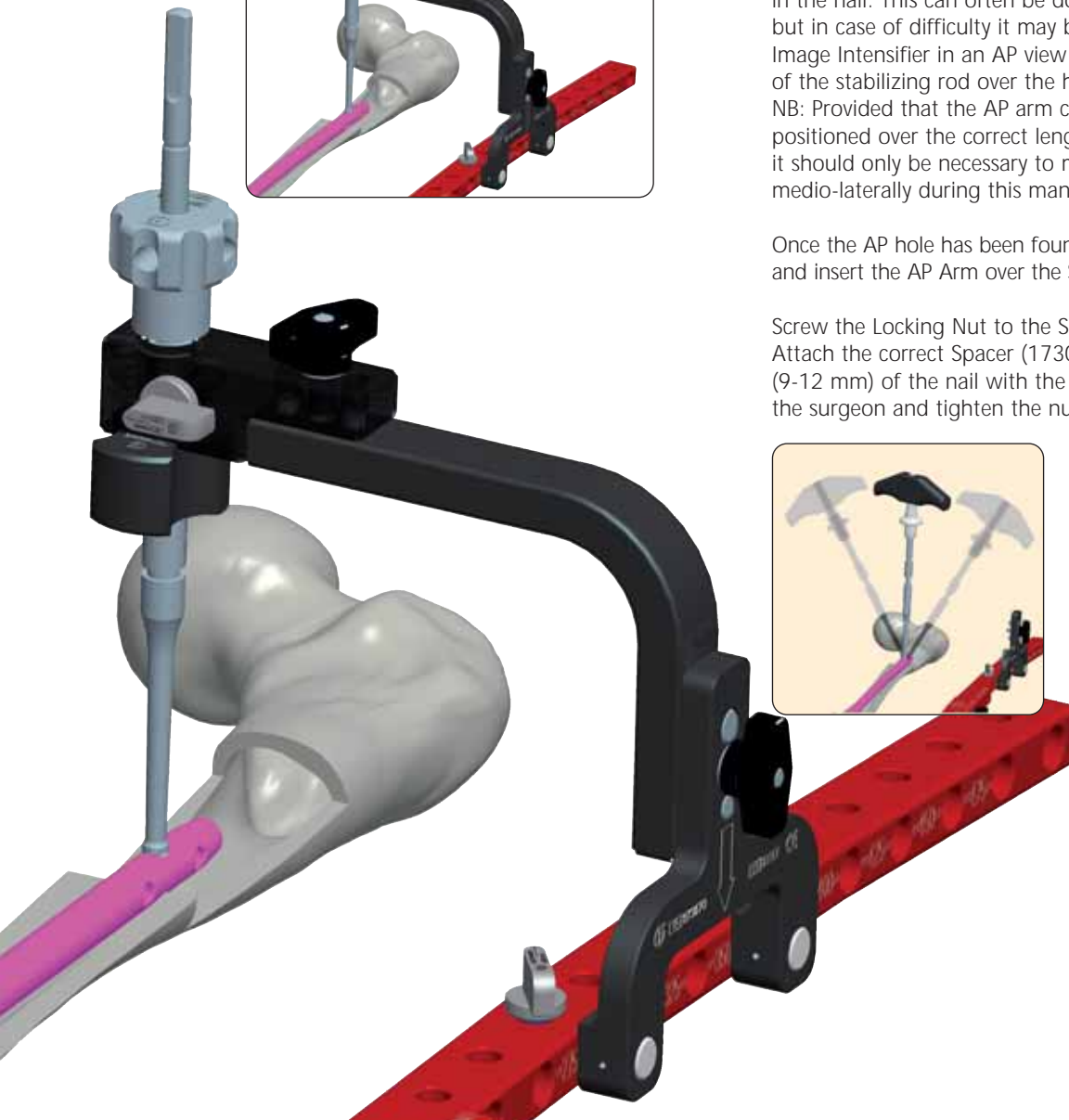


Remove the Cannulated Drill Bit, K-wire and Stabilizing Sleeve. Attach the T Handle to the Stabilizing Rod and insert it into the AP hole in the nail. Screw it in fully.

If there is difficulty in finding the hole in the nail with the AP Arm in place, it can be removed, so that a probing technique can be used to find the hole in the nail. This can often be done quickly by feel, but in case of difficulty it may be useful to use the Image Intensifier in an AP view to position the tip of the stabilizing rod over the hole in the nail. NB: Provided that the AP arm connector has been positioned over the correct length on the guide bar, it should only be necessary to move the stabilizing rod medio-laterally during this manoeuvre.

Once the AP hole has been found, remove the T Handle and insert the AP Arm over the Stabilizing Rod.

Screw the Locking Nut to the Stabilizing Rod. Attach the correct Spacer (173052-5) for the diameter (9-12 mm) of the nail with the nail diameter facing the surgeon and tighten the nut fully.



173350
T Handle



173031
Stabilizing Rod



173032
Locking Nut



173052-5
Spacer

Screw the Trocar into the Screw Guide and insert them both into one of the two holes in the UF Distal Arm. Unscrew the Trocar and push the Screw Guide until it is flush against the bone. Tighten the Screw Guide with the Locking Cam. Remove the Trocar and screw in the Drill Guide.

Drill with the 4.8 mm Drill Bit as before. Stop at the second cortex and measure the screw length using the scale on the Drill Bit.

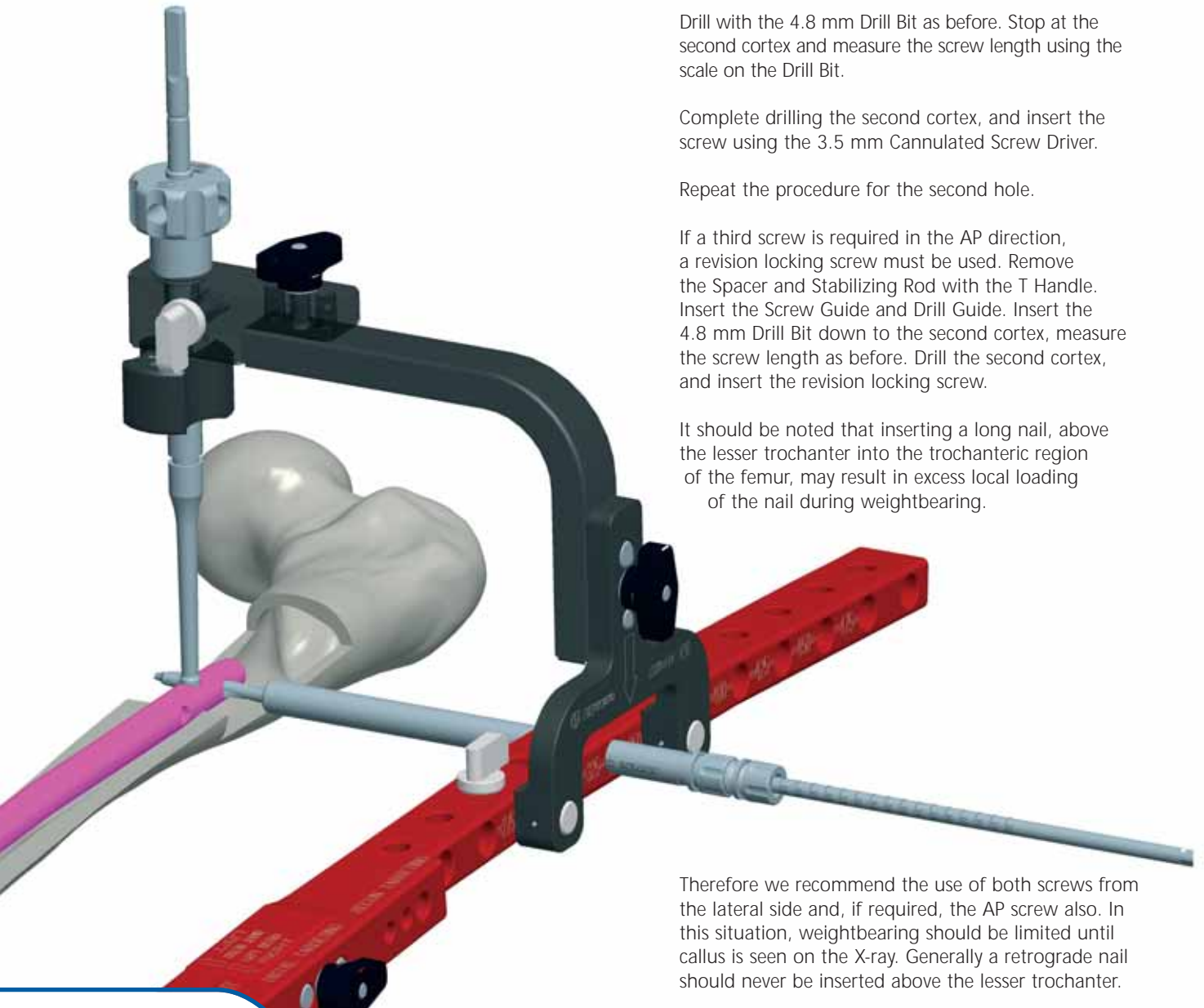
Complete drilling the second cortex, and insert the screw using the 3.5 mm Cannulated Screw Driver.

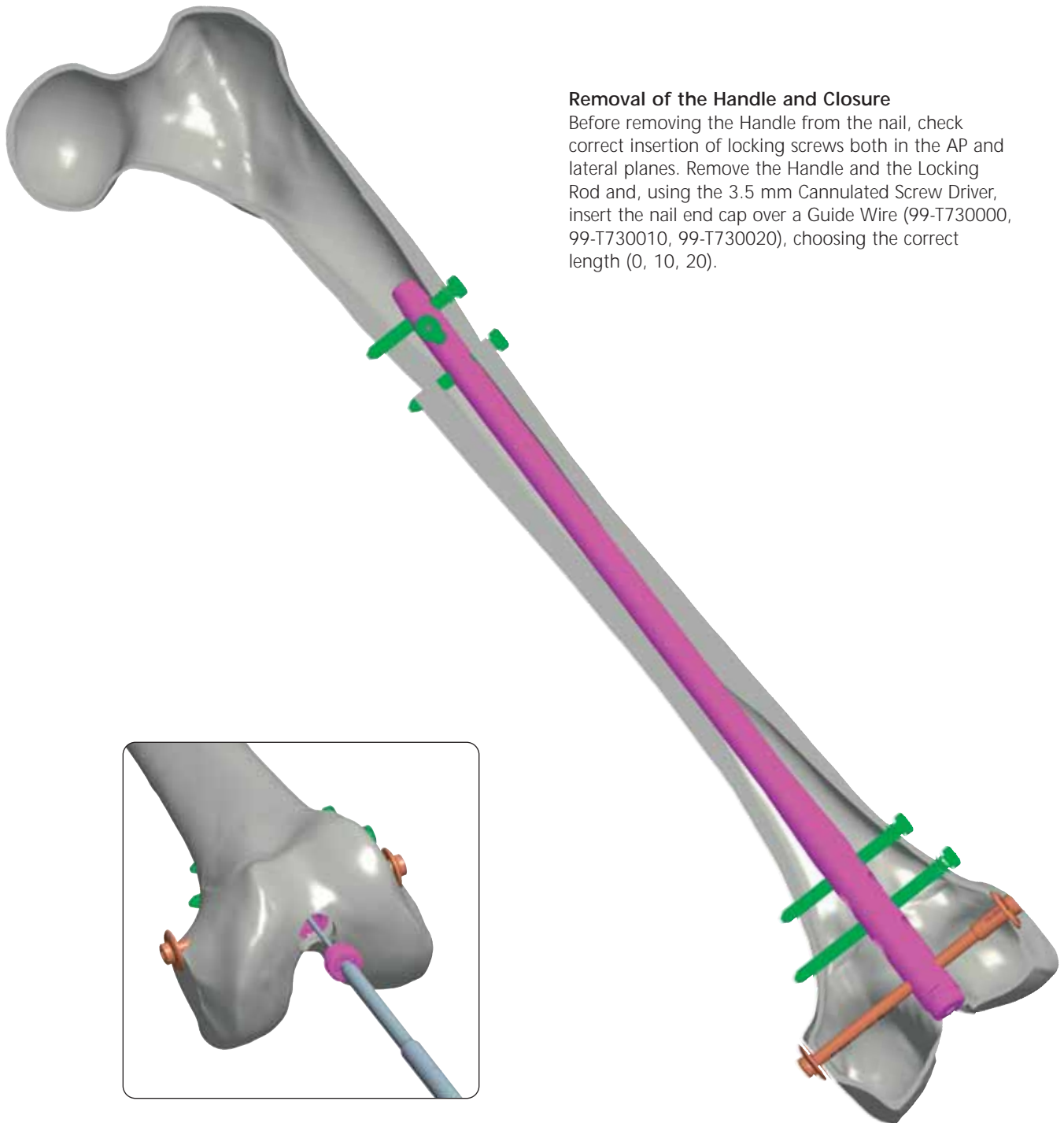
Repeat the procedure for the second hole.

If a third screw is required in the AP direction, a revision locking screw must be used. Remove the Spacer and Stabilizing Rod with the T Handle. Insert the Screw Guide and Drill Guide. Insert the 4.8 mm Drill Bit down to the second cortex, measure the screw length as before. Drill the second cortex, and insert the revision locking screw.

It should be noted that inserting a long nail, above the lesser trochanter into the trochanteric region of the femur, may result in excess local loading of the nail during weightbearing.

Therefore we recommend the use of both screws from the lateral side and, if required, the AP screw also. In this situation, weightbearing should be limited until callus is seen on the X-ray. Generally a retrograde nail should never be inserted above the lesser trochanter.

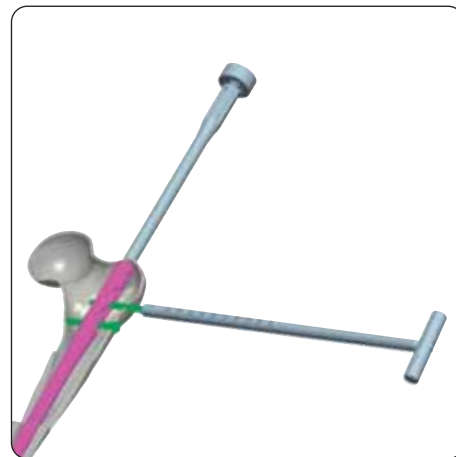




173320
3.5 mm Cannulated
Screw Driver

NAIL REMOVAL

The Extraction Instruments Box is needed for nail removal. The nail end cap is cleaned of bony ingrowth including the hexagonal recess, and removed with the 3.5 mm Cannulated Screw Driver. If seating the Screw Driver is difficult, it may be useful to insert a 2 mm K-wire first, and pass the Screw Driver over it. The Femoral Nail Extractor (17391) is screwed fully into the nail. The locking screws are now all removed using the Locking Screw Extractor (17652) which is turned anti-clockwise to engage the reverse thread on the screw heads. The Extractor Handle (170035) is screwed onto the Sliding Hammer (173370) and attached to the Femoral Nail Extractor. The nail is then removed by reverse hammering.



INSTRUMENTATION



17391
Femoral
Nail Extractor



17652
Locking Screw
Extractor



170035
Extractor Handle



173370
Sliding Hammer

CENTRONAIL OPERATIVE TECHNIQUES

CN-0701-OPT The Centronail Titanium Universal Femoral Nailing System

CN-0702-OPT The Centronail Titanium Tibial Nailing System

CN-0703-OPT The Centronail Titanium Supracondylar and Retrograde Nailing System

CN-0704-OPT The Centronail Titanium Humeral Nailing System

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