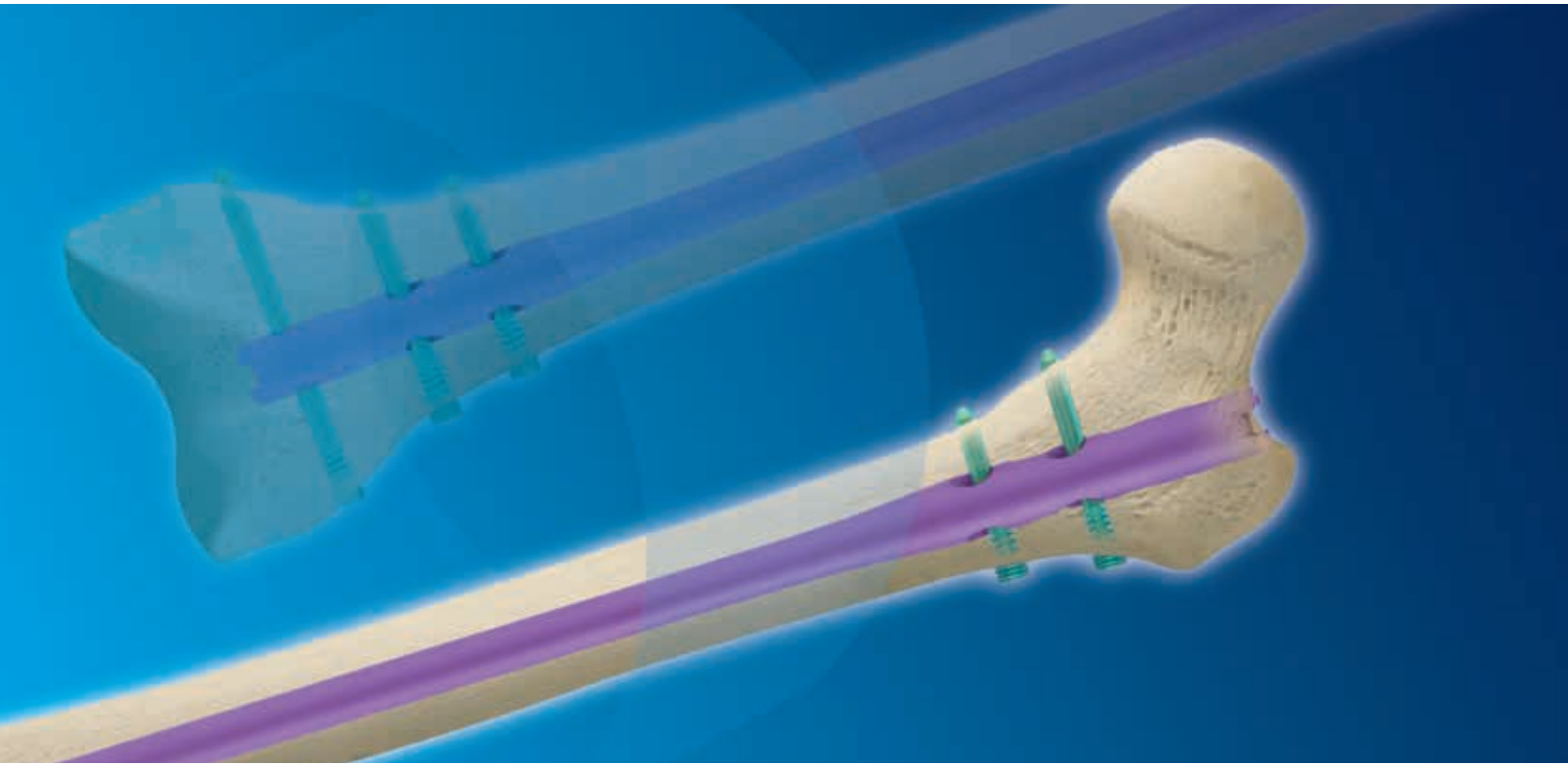
OPERATIVE TECHNIQUE

CentroNail®

Titanium Femoral Nail



The Centronail Titanium Universal Femoral Nailing System

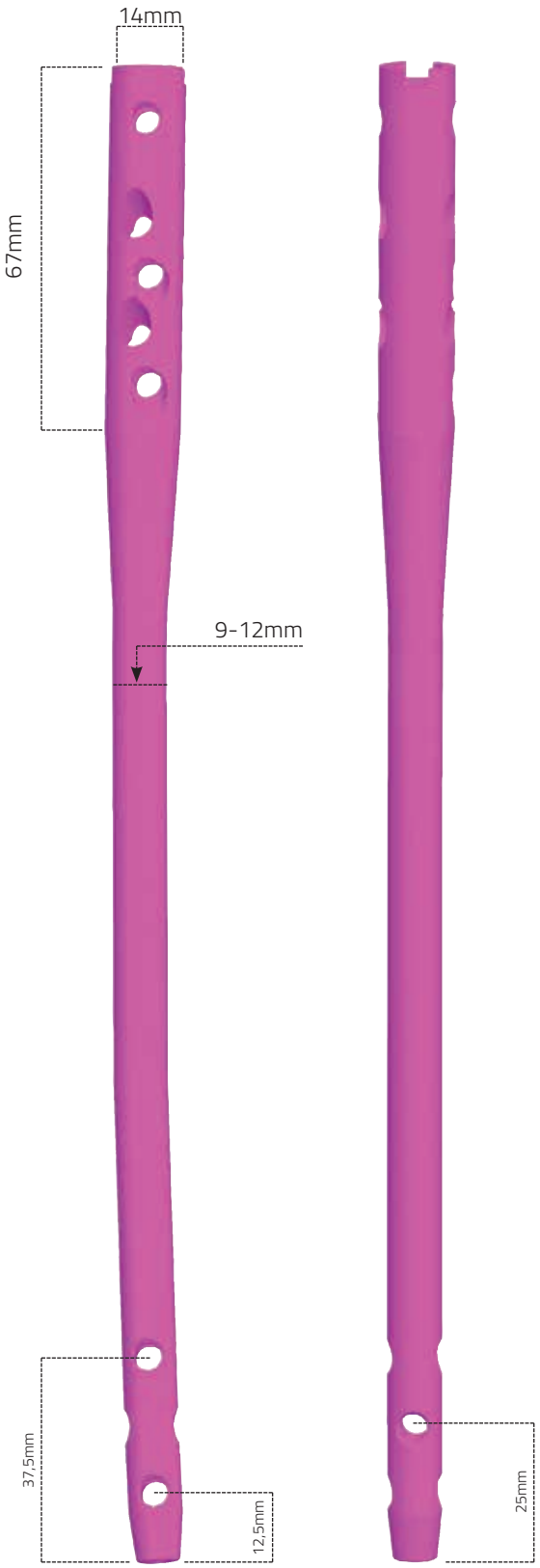
ORTHOFIX® ORTHOPEDICS

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

S. BERKI, MD
Department of General, Trauma and Hand Surgery,
University and County Hospital, Szentes, Hungary

W. KLEIN, MD
Department of Trauma Surgery, Wolfsburg Hospital,
Wolfsburg, Germany

FEATURES AND BENEFITS



Titanium nail and locking screws
Allows MRI investigation, if necessary

14mm proximal diameter

9-12mm distal diameter
9mm is solid

One design for Left and Right femur

Antegrade and retrograde insertion

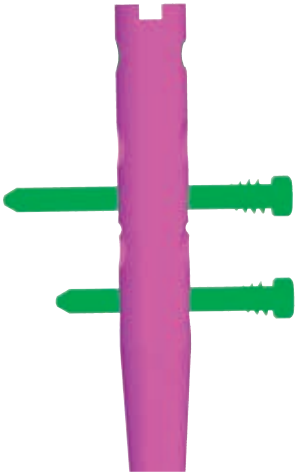
275-475mm (25mm increments)

Radius of curve 2500mm

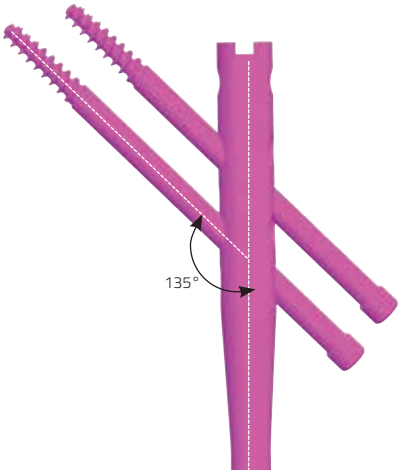
Proximal locking

Three possible configurations:

Transverse

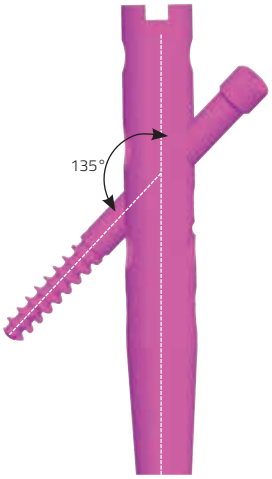


Recon



14 degree anteversion

Oblique



Locking screws

TITANIUM STANDARD LOCKING SCREWS

6.8mm thread diameter
4.8mm shaft diameter

TITANIUM REVISION LOCKING SCREWS

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

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

TITANIUM RECON/OBLIQUE SCREWS

6.5-5.7mm thread diameter
6.5mm shaft diameter

Solid: maximises fatigue strength.

Reverse thread on screw head: easy screw removal.

TITANIUM CONDYLAR COMPRESSION SCREWS

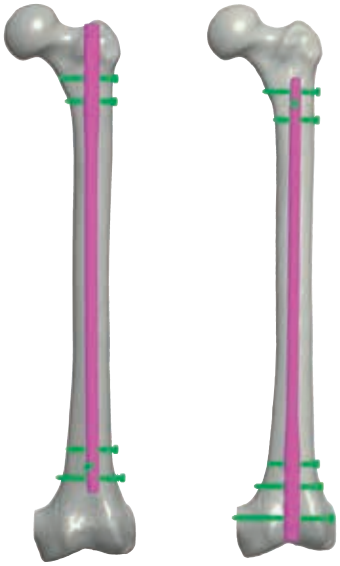
4.8mm diameter

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

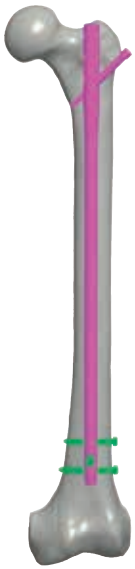
Transverse
Diaphyseal fractures



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
Pertrochanteric fractures
Subtrochanteric fractures

Oblique
Subtrochanteric fractures
Shaft fractures



EQUIPMENT REQUIRED

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

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

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.

4.8mm 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

4.8mm Titanium
Revision Locking Screws

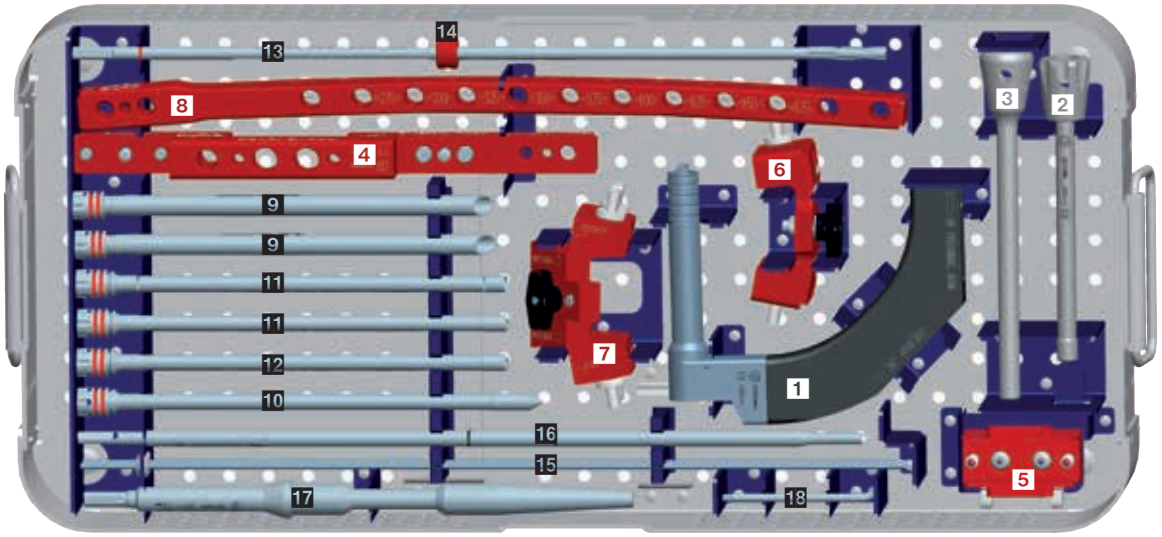
Code	Length (mm)
99-T74530	30
99-T74535	35
99-T74540	40
99-T74545	45
99-T74550	50
99-T74555	55
99-T74560	60
99-T74565	65
99-T74570	70
99-T74575	75
99-T74580	80
99-T74585	85
99-T74590	90
99-T74595	95
99-T74500	100
99-T74505	105
99-T74510	110

6.5mm 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

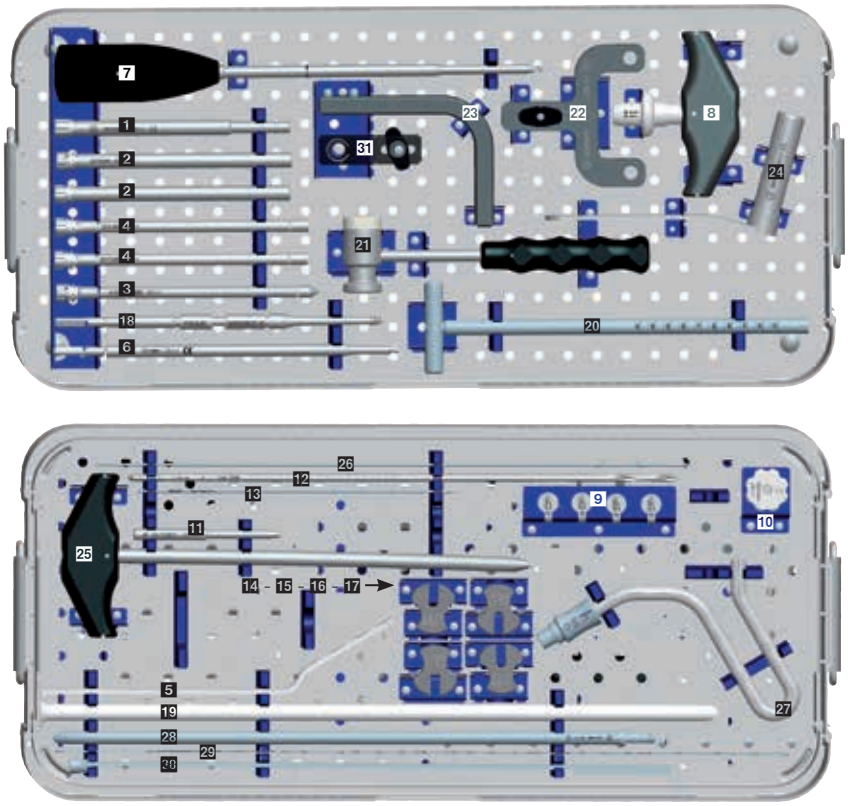
4.8mm Titanium
Condylar Screw Kit

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



FEMORAL SPECIFIC INSTRUMENTS BOX, EMPTY (173991) can accommodate:

Part #		Description	Qty
173100	1	HANDLE	1
173110	2	LOCKING ROD	1
173115	3	INSERTION KNOB	1
173120	4	UF PROXIMAL ARM	1
173130	5	TRANSVERSE JIG	1
173140	6	OBLIQUE JIG	1
173150	7	RECON JIG	1
173161	8	UF DISTAL ARM	1
173221	9	RECON SCREW GUIDE	2
173222	10	RECON TROCAR	1
173223	11	RECON WIRE GUIDE	2
173224	12	RECON DRILL GUIDE	1
173283	13	RECON DRILL BIT	1
173295	14	RECON DRILL BIT STOP	1
173288	15	THREADED WIRE 3X400MM	2
173304	16	LONG SCREW WRENCH	1
173270	17	CANNULATED RIGID REAMER	1
10012	18	ALLEN WRENCH, 3MM	1



GENERAL INSTRUMENTS BOX, EMPTY (173997) can accommodate:

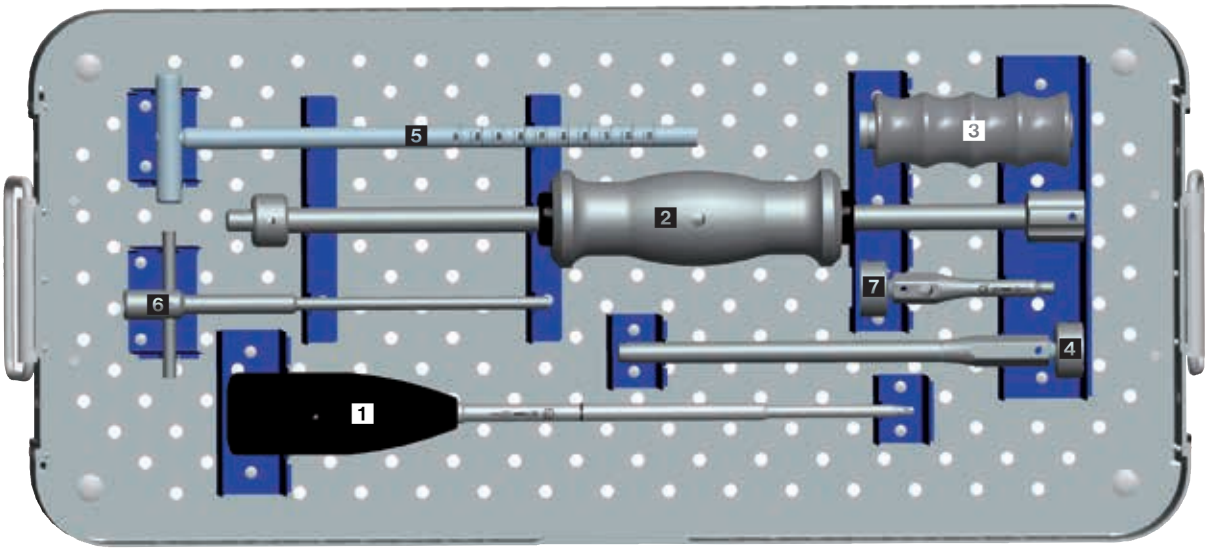
Part #		Description	Qty
173201	1	STABILIZING SLEEVE	1
173211	2	SCREW GUIDE	2
173212	3	TROCAR	1
173213	4	DRILL GUIDE	1
173301	5	SCREW SCALE	1
173302	6	CANNULATED SCREW WRENCH ADAPTER	1
173320	7	CANNULATED SCREW DRIVER	1
173350	8	T HANDLE	1
173026	9	LOCKING CAM	4
173032	10	LOCKING NUT	1
173071	11	IMPACTOR	1
173286	12	DRILL BIT D. 4,8 X 365MM	2
173287	13	K-WIRE 2MM	1
173052	14	SPACER NAIL 9MM	1
173053	15	SPACER NAIL 10MM	1
173054	16	SPACER NAIL 11MM	1

GENERAL INSTRUMENTS BOX, EMPTY (173997) can accommodate:

Part #		Description	Qty
173055	17	SPACER NAIL 12MM	1
173031	18	STABILIZING ROD	1
17353	19	GUIDE WIRE EXCHANGE TUBE	1
17652	20	LOCKING SCREW EXTRACTOR	1
173380	21	HAMMER	1
173170	22	AP ARM CONNECTOR	1
173180	23	AP ARM CONNECTOR	1
173230	24	FEMORAL REAMER SLEEVE	1
173260	25	AWL	1
80122	26	X-WIRE WITHOUT OLIVE DIAMETER 2MM LENGTH 400MM	1
173264	27	REDUCTION TOOL HANDLE	1
173265	28	REDUCTION TOOL	1
173275	29	RULER	1
173276	30	RULER SUPPORT	1
173185	31	AP CENTERING JIG	1

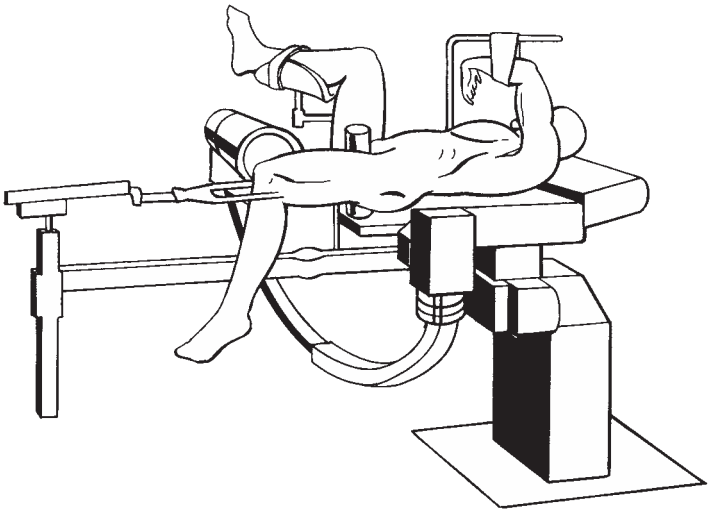
Sterile Packaged Instruments

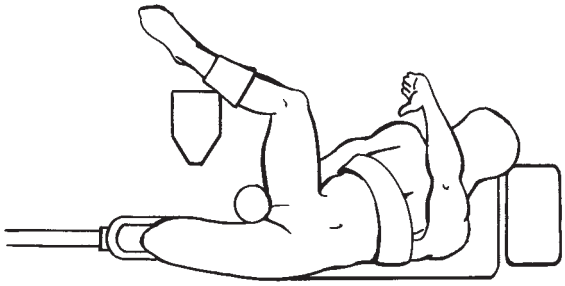
Part #	Description
99-173285	CANNULATED DRILL BIT 6MM STERILE
99-173281	GUIDE WIRE WITH OLIVE D.3X980MM STERILE
99-176281	GUIDE WIRE WITHOUT OLIVE D.2.5X980MM STERILE



EXTRACTION INSTRUMENTS BOX, EMPTY (173998) can accommodate:

Part #		Description	Qty
173320	1	CANNULATED SCREW DRIVER	1
173370	2	SLIDING HAMMER	1
170035	3	BLACK HANDLE WITH BAYONET FITTING	1
17391	4	FEMORAL NAIL EXTRACTOR	1
17652	5	LOCKING SCREW EXTRACTOR	1
174220	6	TIBIAL EXTRACTOR	1
178390	7	HUMERAL NAIL EXTRACTOR	1

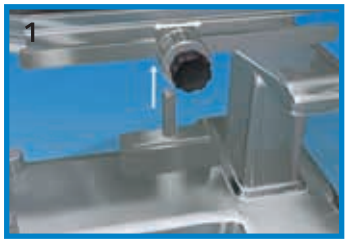




Whenever possible, femoral fractures should be stabilized within the first 24 hours following injury, provided the patient's condition will allow it. Do not start surgery unless the fracture is well reduced.

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"
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.

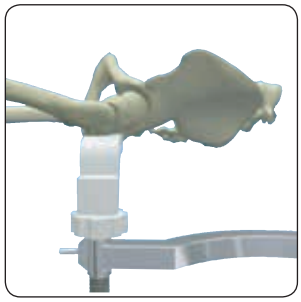
1 Slide the Clark Attachment on to the side rail of the fracture table. Insert the vertical post of the Box Bracket into the Clark Attachment from beneath and tighten the clamp on the post so that the bracket is held securely.

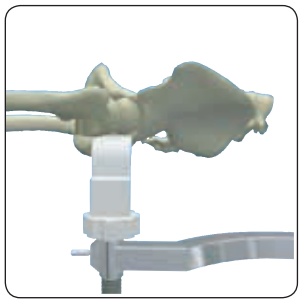
2 Assemble the PORD™ in the following way: Slide the Horizontal Bar through the Box Bracket with its curved portion facing the fracture table. This curved section is designed to allow for unobstructed multiple plane imaging using the C-arm of the Image Intensifier.

3 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

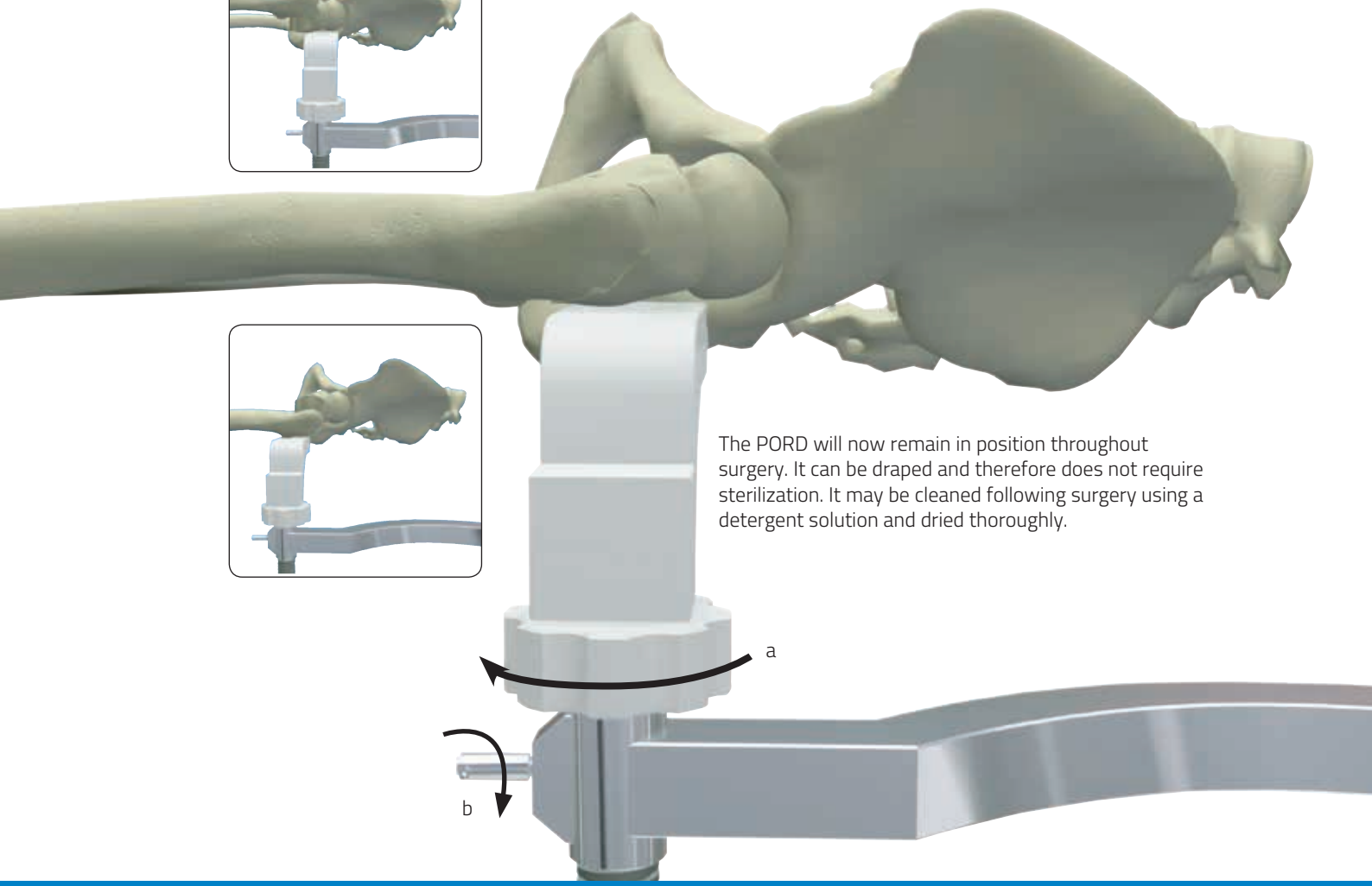
110000
PORD

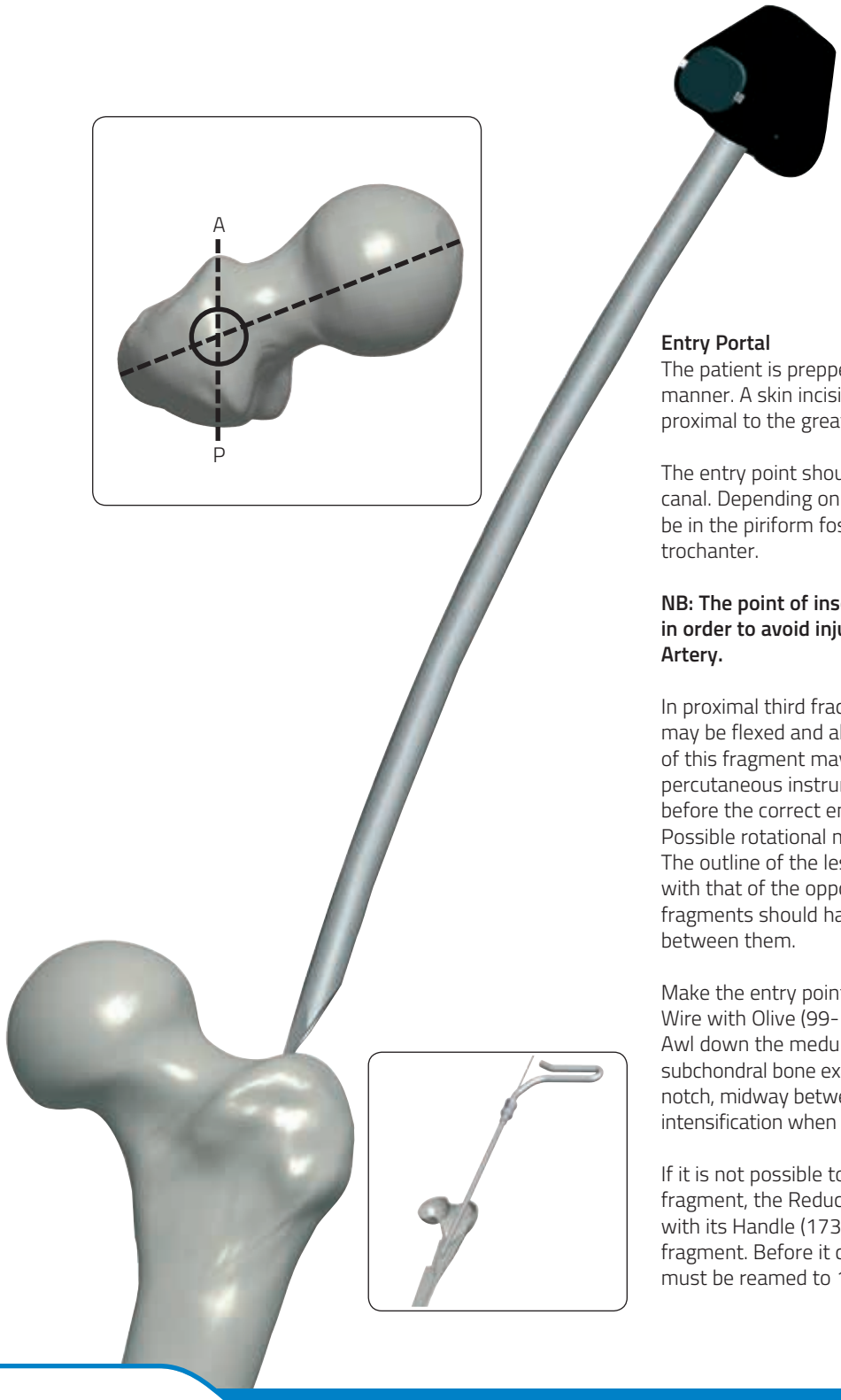




The Limb Support is positioned beneath that portion of the fracture that requires elevating. The correct position of the support is confirmed on the AP view (the shadow of the support can be seen). Using the lateral view, the limb support is raised by turning the nut (a) clockwise until exact posterior 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 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 10mm.

INSTRUMENTATION

173260
Awl

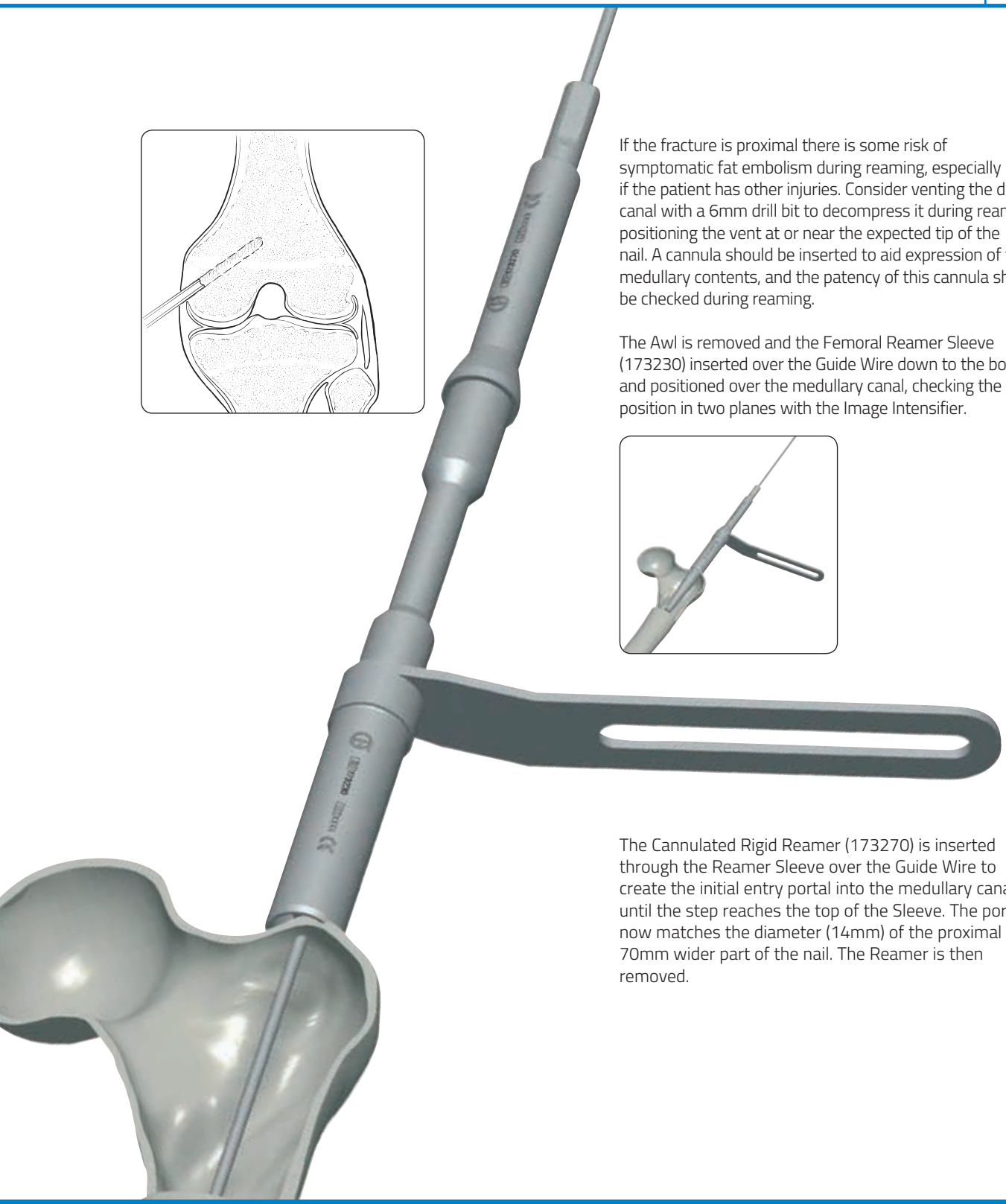
173264
Reduction Tool
Handle

173265
Reduction Tool

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 6mm 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.

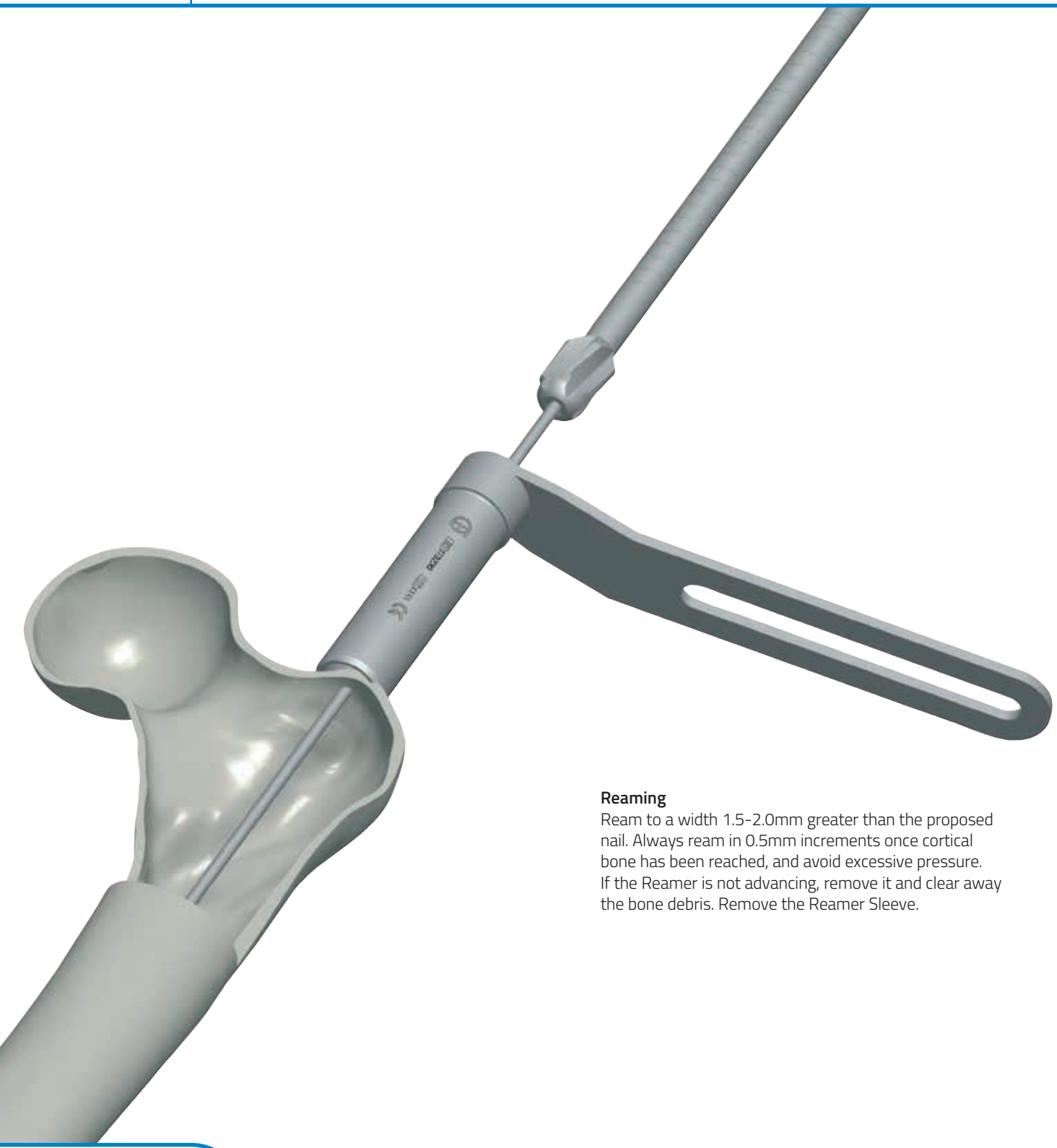
The Awl is removed and the Femoral Reamer Sleeve (173230) inserted over the Guide Wire down to the bone and positioned over the medullary canal, checking the position in two planes with the Image Intensifier.

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 (14mm) of the proximal 70mm wider part of the nail. The Reamer is then removed.

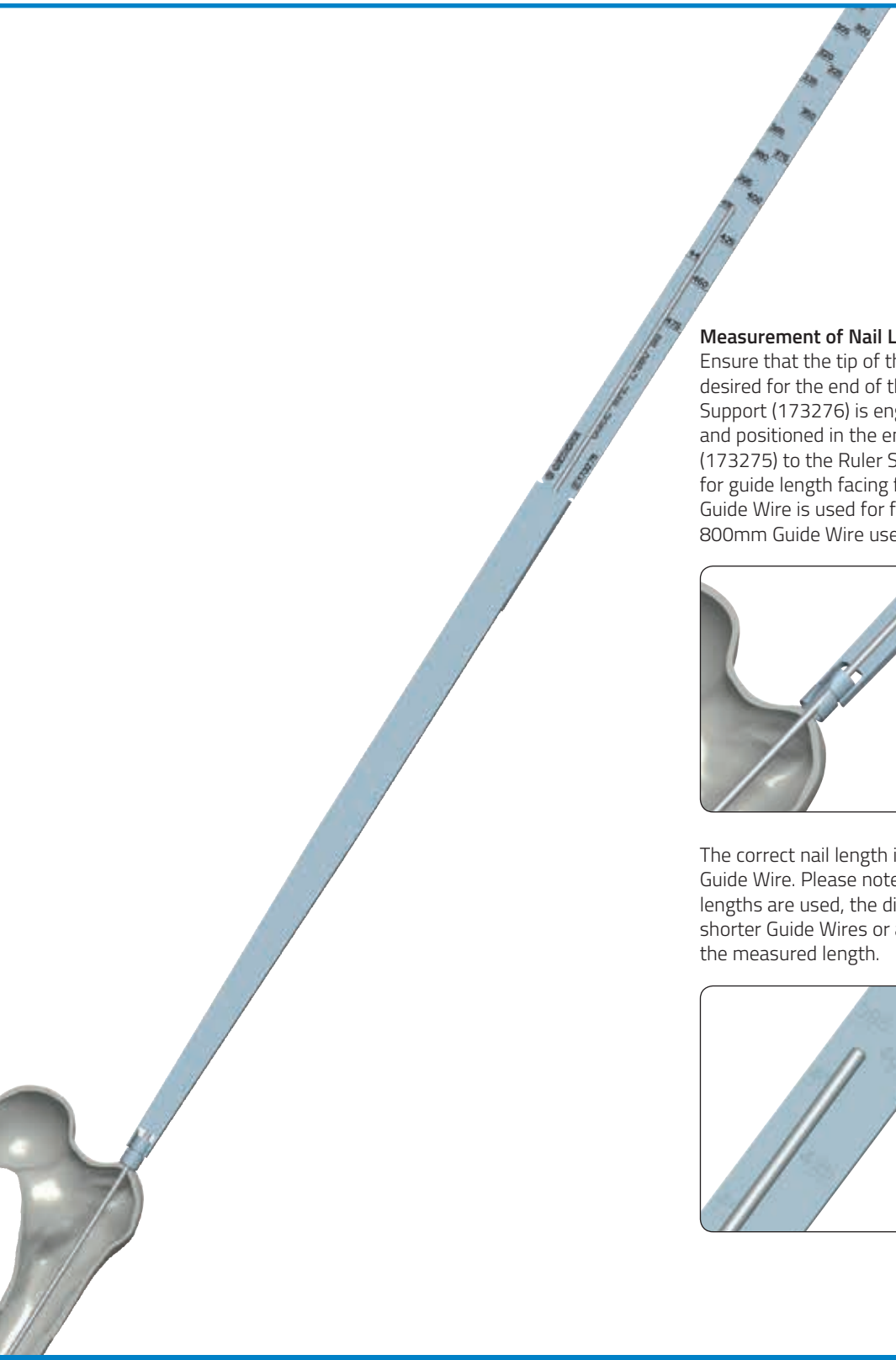


173230
Femoral
Reamer Sleeve

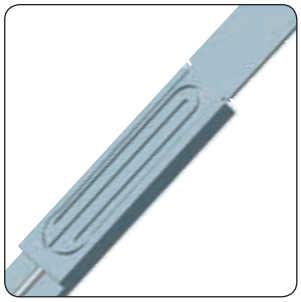
173270
Cannulated
Rigid Reamer



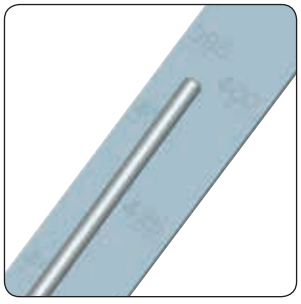
Reaming
Ream to a width 1.5-2.0mm greater than the proposed nail. Always ream in 0.5mm increments once cortical bone has been reached, and avoid excessive pressure. If the Reamer is not advancing, remove it and clear away the bone debris. Remove the Reamer Sleeve.



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 980mm Guide Wire is used for femoral and tibial nailing, and the 800mm Guide Wire used for the humerus).

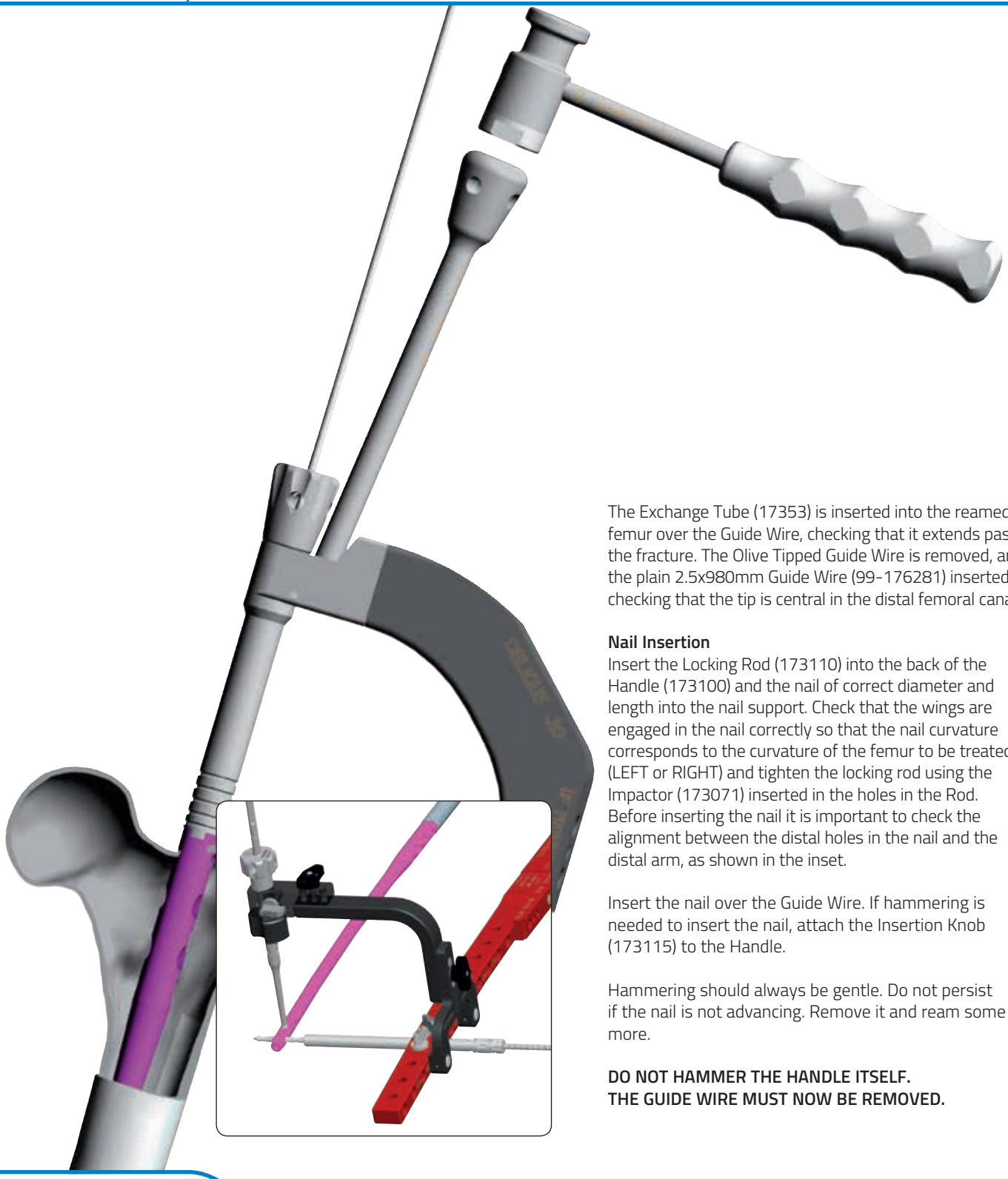


The correct nail length is read at the proximal tip of the Guide Wire. Please note, that if different Guide Wire lengths are used, the difference must be deducted for shorter Guide Wires or added for longer Guide wire to the measured length.



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 2.5x980mm 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

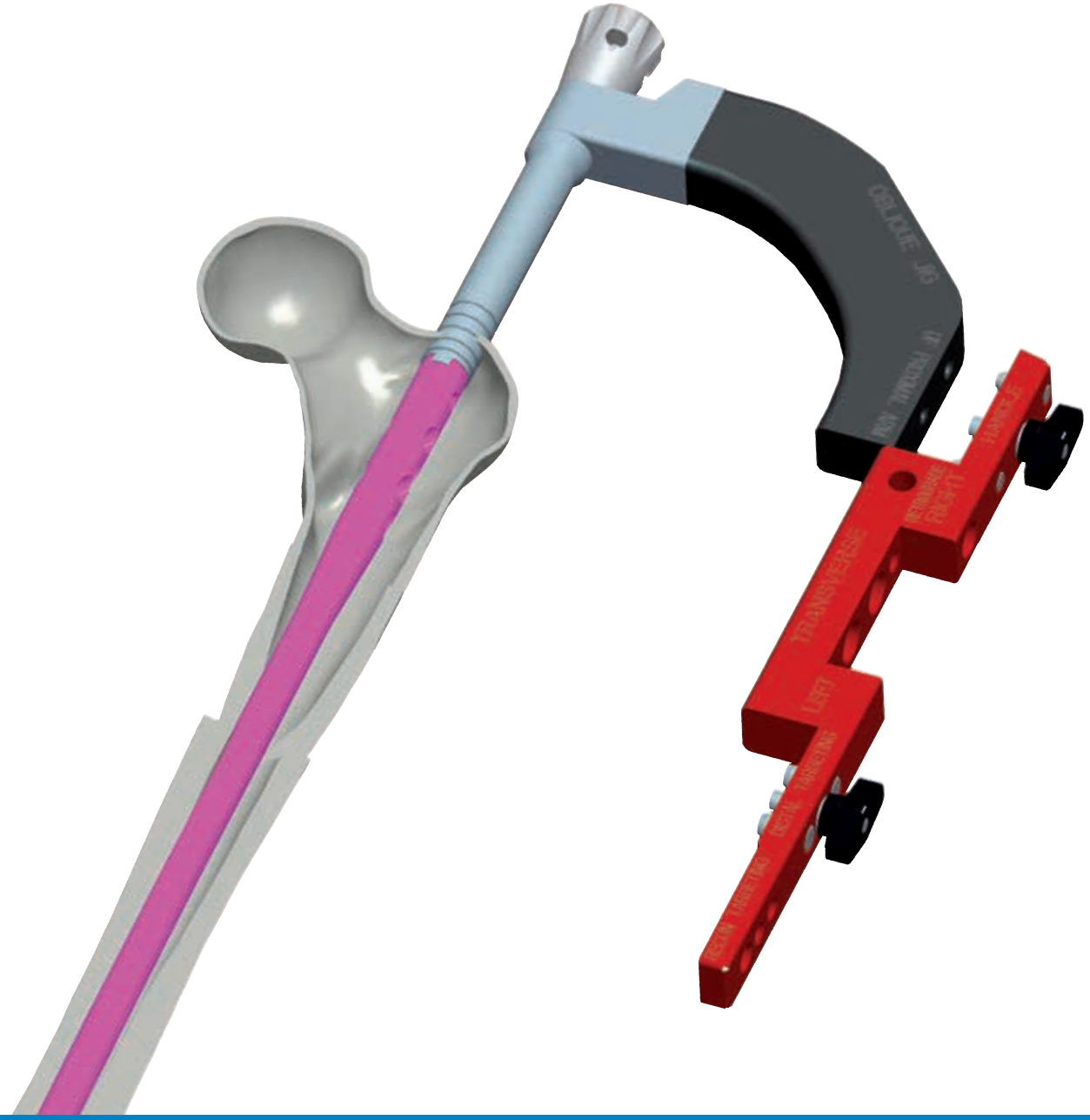
173115
Insertion Knob

173380
Hammer

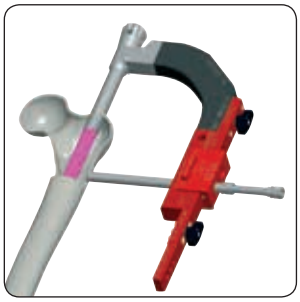
17353
Exchange Tube

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

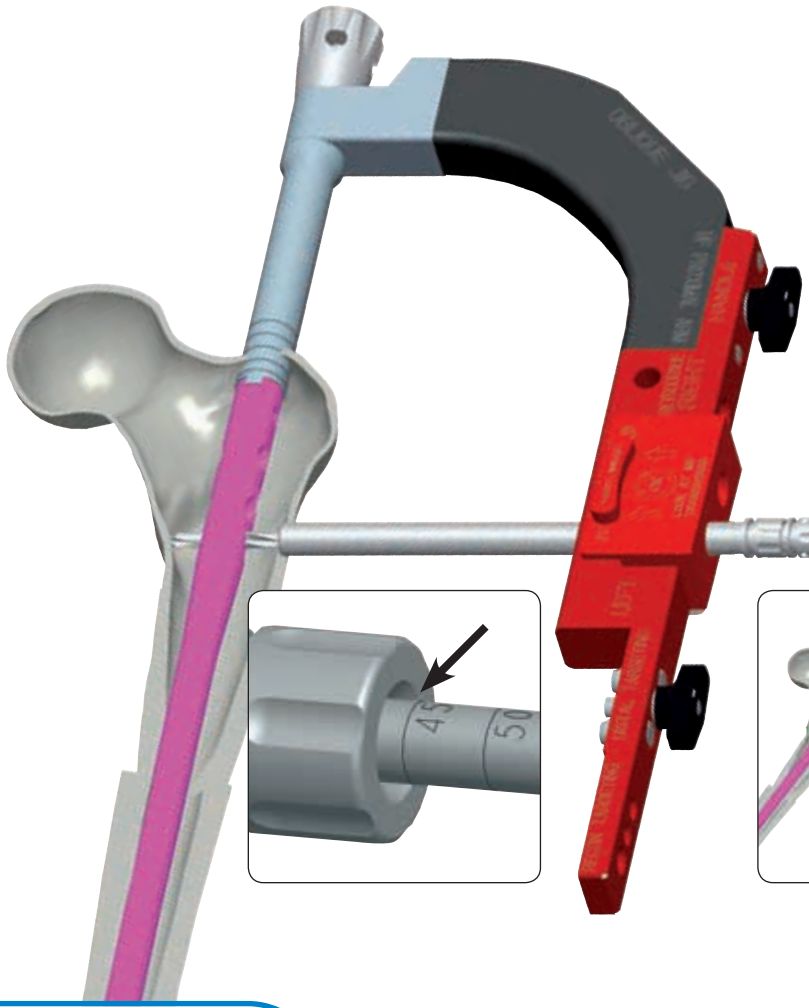


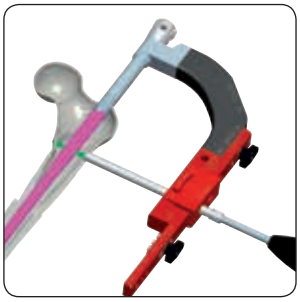
If standard proximal locking is to be used, it is possible to do the distal locking first (see next page). If Recon Locking is required proximally, this must be done first (see page 28).

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 4.8mm 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 3.5mm 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

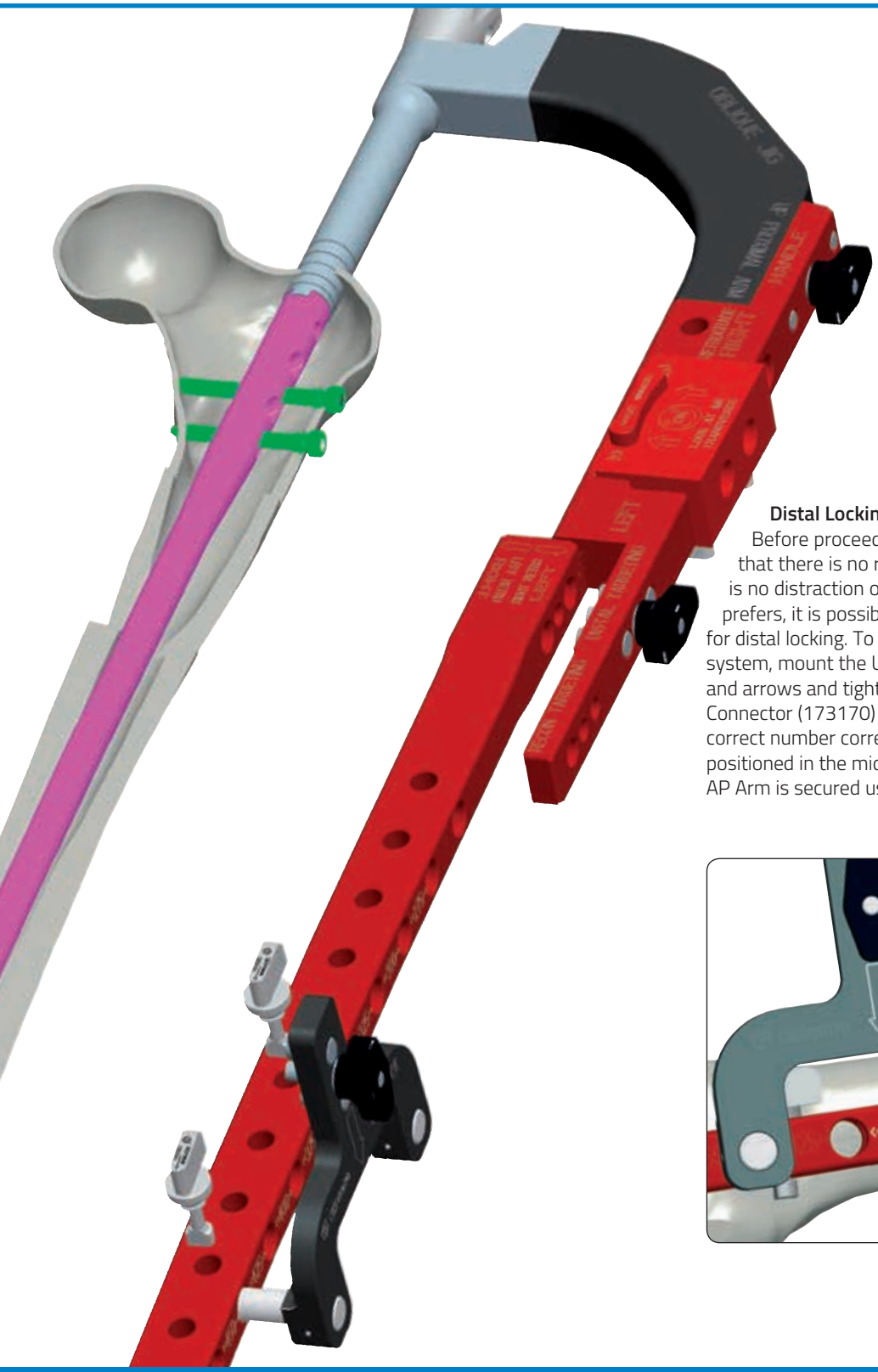
173212
Trocar

173211
Screw Guide

173286
4.8mm Drill Bit

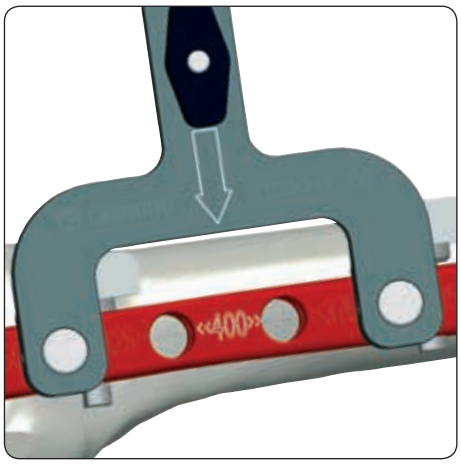
173213
Drill Guide

173320
3.5mm 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) (notetext 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.

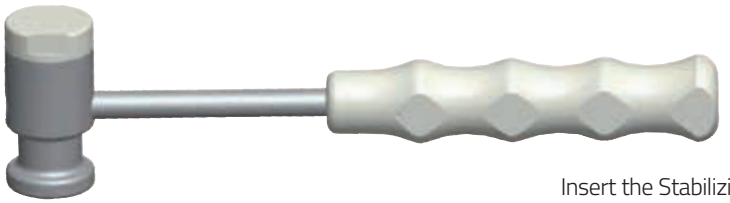
Not aligned

Aligned

INSTRUMENTATION

173180
AP Arm

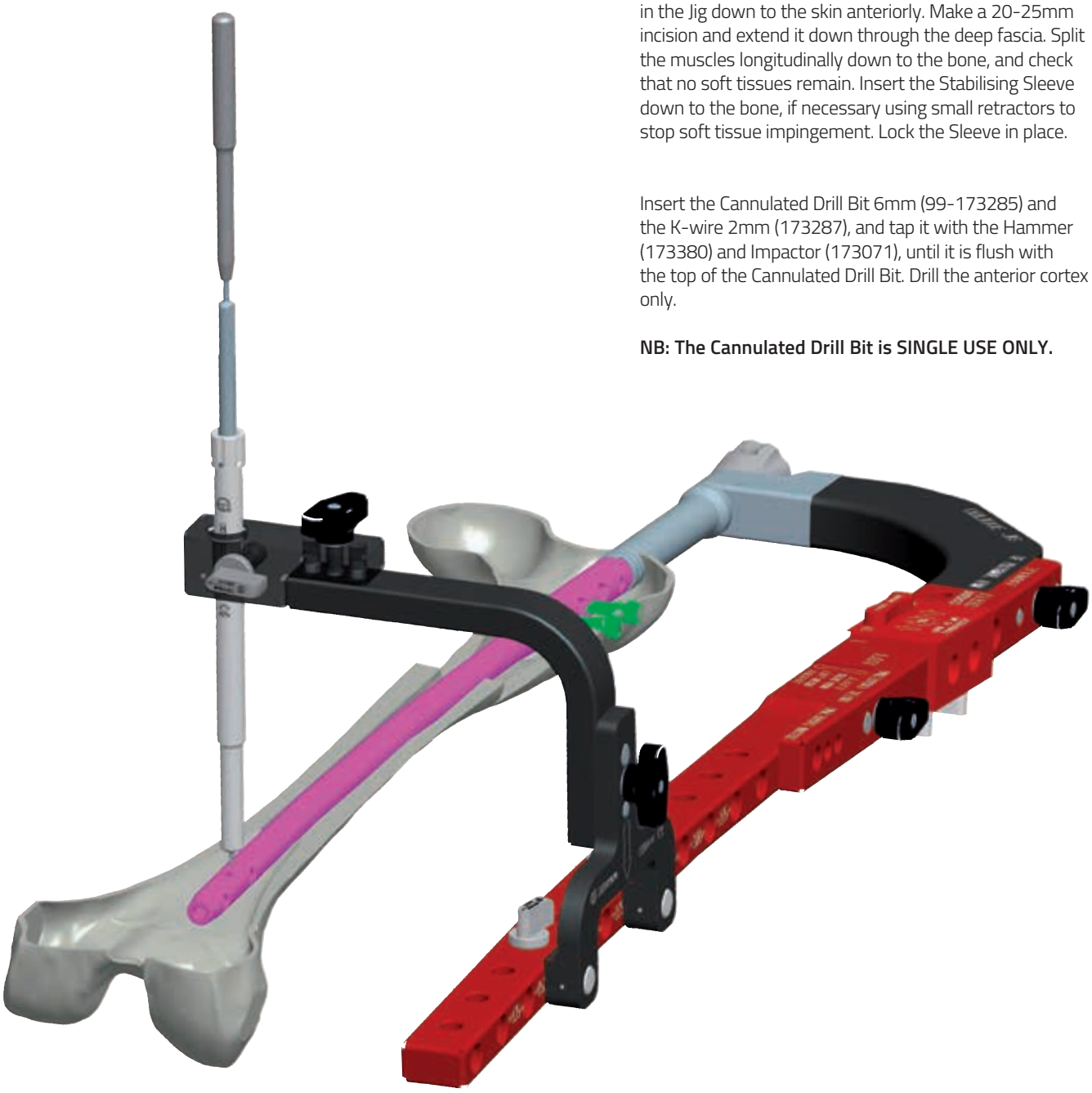
173185
AP Centering Jig



Insert the Stabilizing Sleeve (173201) through the hole in the Jig down to the skin anteriorly. Make a 20-25mm 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 6mm (99-173285) and the K-wire 2mm (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 6mm

173287
K-wire 2mm

173380
Hammer

173071
Impactor

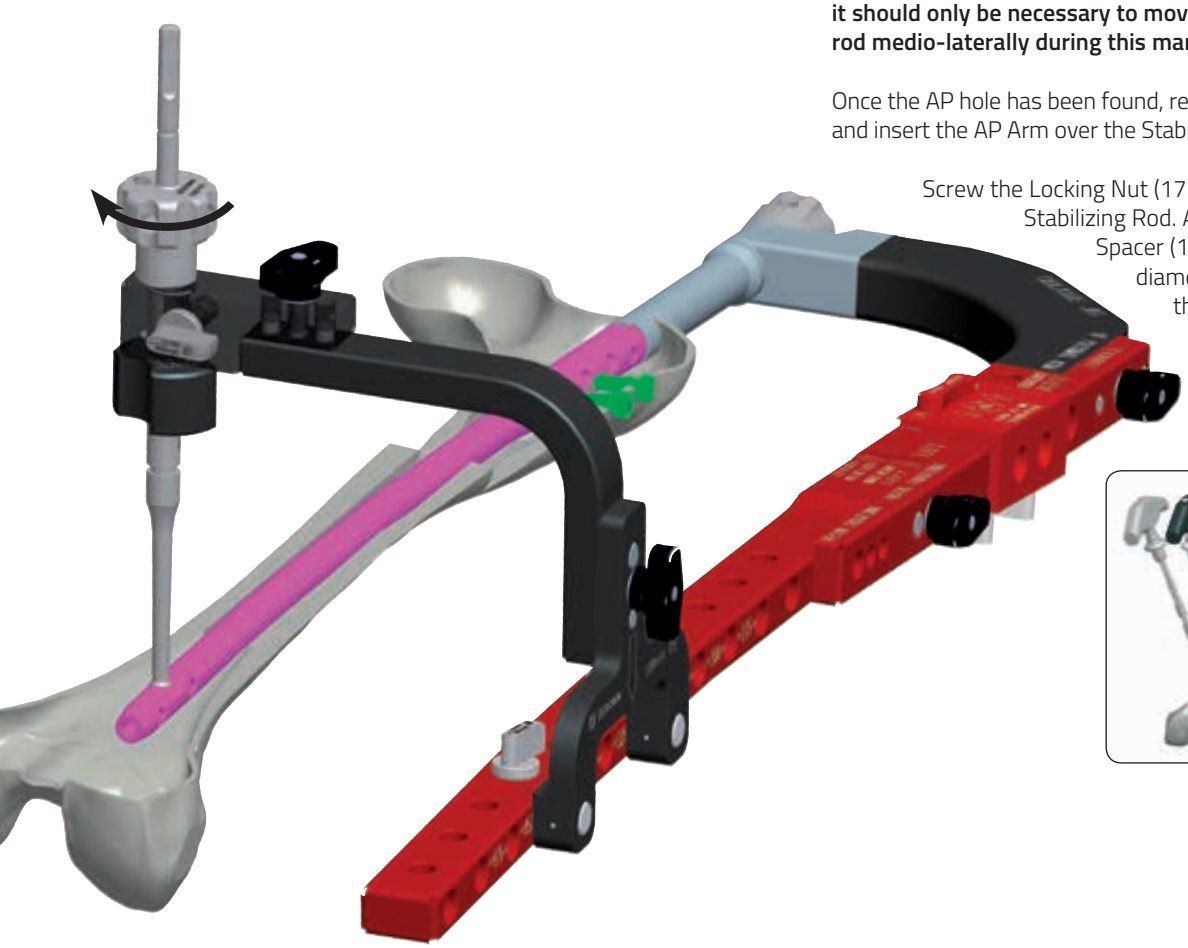
Remove the Cannulated Drill Bit, K-wire and Stabilizing Sleeve. Attach the T Handle (173350) to the Stabilizing Rod (173031) and insert it into the AP hole in the nail. Screw it in fully.

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 (9-12mm) of the nail with the nail diameter facing the surgeon and tighten the nut fully.



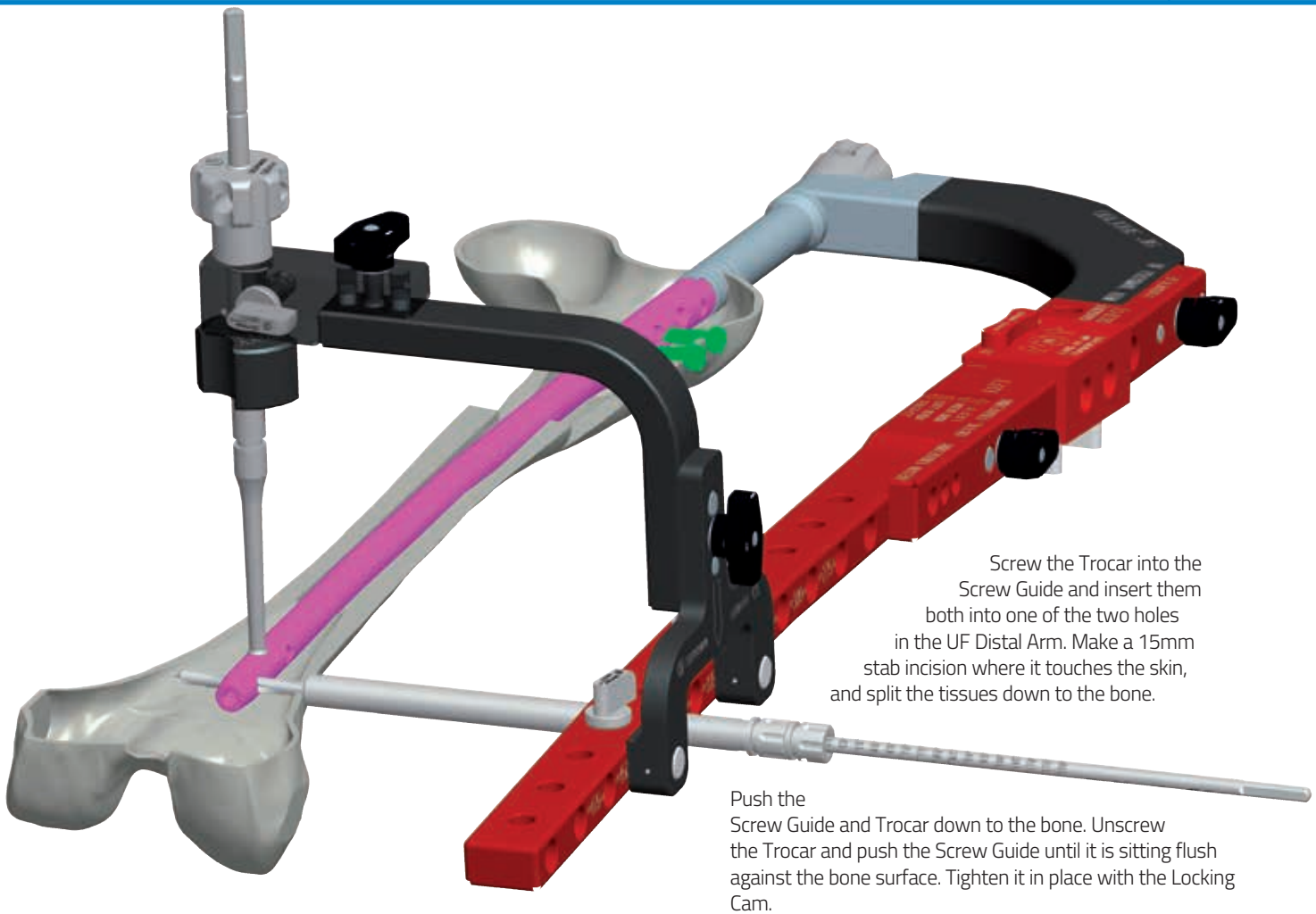
INSTRUMENTATION

173350
T Handle

173031
Stabilizing Rod

173032
Locking Nut

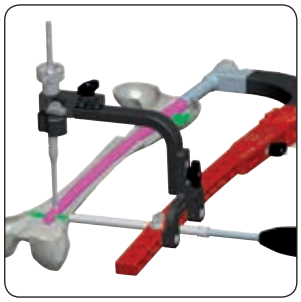
173052-5
Spacer



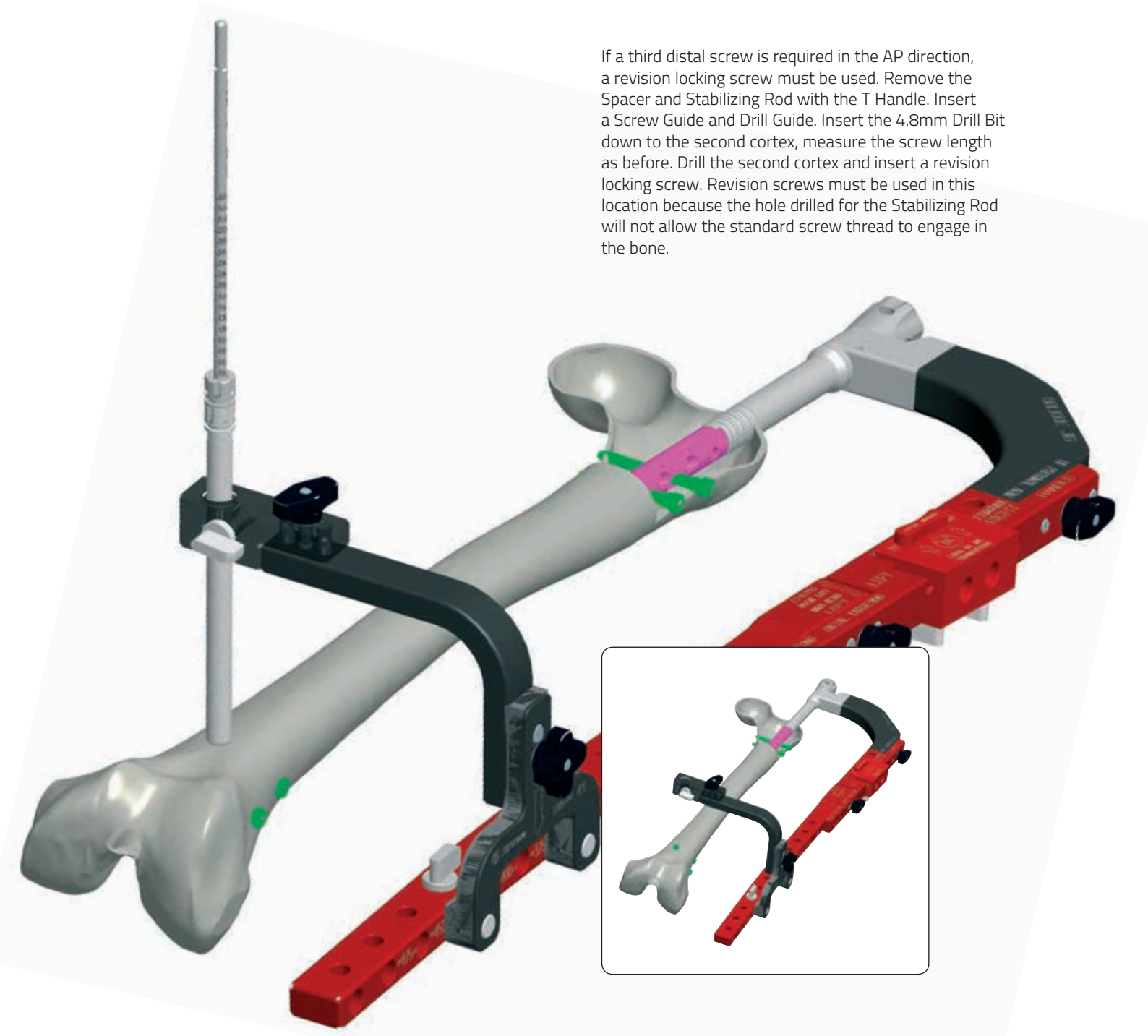
Screw the Trocar into the Screw Guide and insert them both into one of the two holes in the UF Distal Arm. Make a 15mm stab incision where it touches the skin, and split the tissues down to the bone.

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.

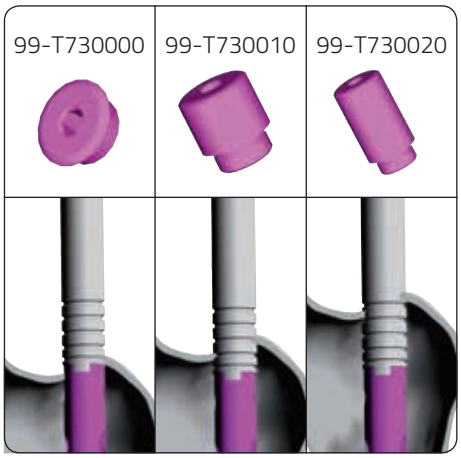
Remove the Trocar and screw the Drill Guide into the Screw Guide. Drill with the 4.8mm Drill Bit as before. Stop at the second cortex and measure the screw length using the scale on the Drill Bit. Complete drilling, and insert the screw using the 3.5mm Cannulated Screw Driver. Repeat the procedure for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



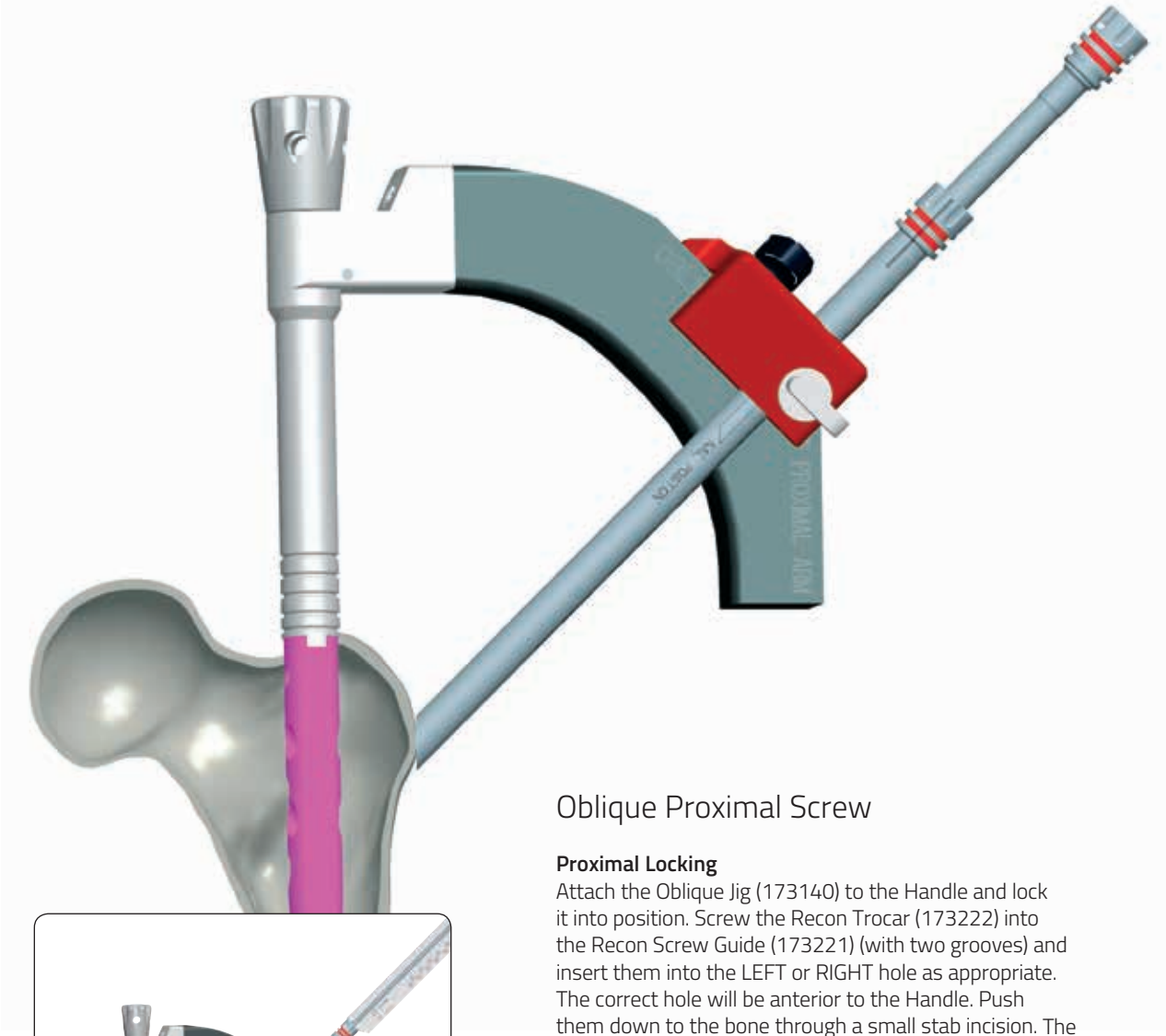
If a third distal screw is required in the AP direction, a revision locking screw must be used. Remove the Spacer and Stabilizing Rod with the T Handle. Insert a Screw Guide and Drill Guide. Insert the 4.8mm Drill Bit down to the second cortex, measure the screw length as before. Drill the second cortex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

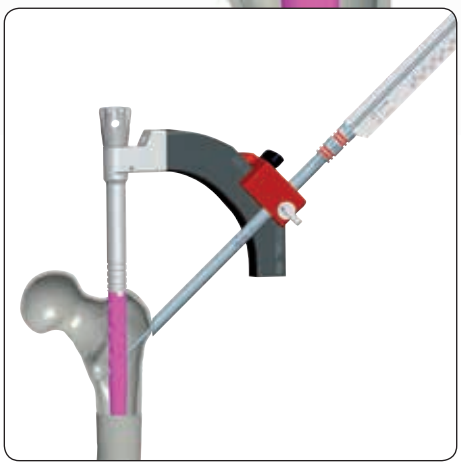


Removal of the Handle and Closure
Before removing the Handle from the nail, check correct insertion of locking screws both in the AP and lateral planes. Remove the Handle and the Locking Rod and, using the 3.5mm Cannulated Screw Driver, insert the nail end cap over a K-wire (99-T730000, 99-T730010, 99-T730020), 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
3.5mm 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 3x400mm (173288) just through the second cortex. Measure the correct screw length with the Screw Scale (173301).

INSTRUMENTATION

173140
Oblique Jig

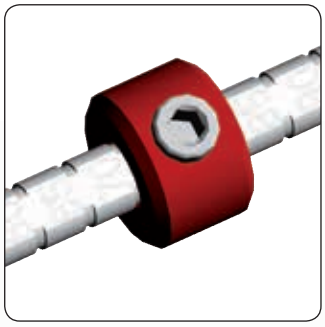
173222
Recon Trocar

173221
Recon
Screw Guide

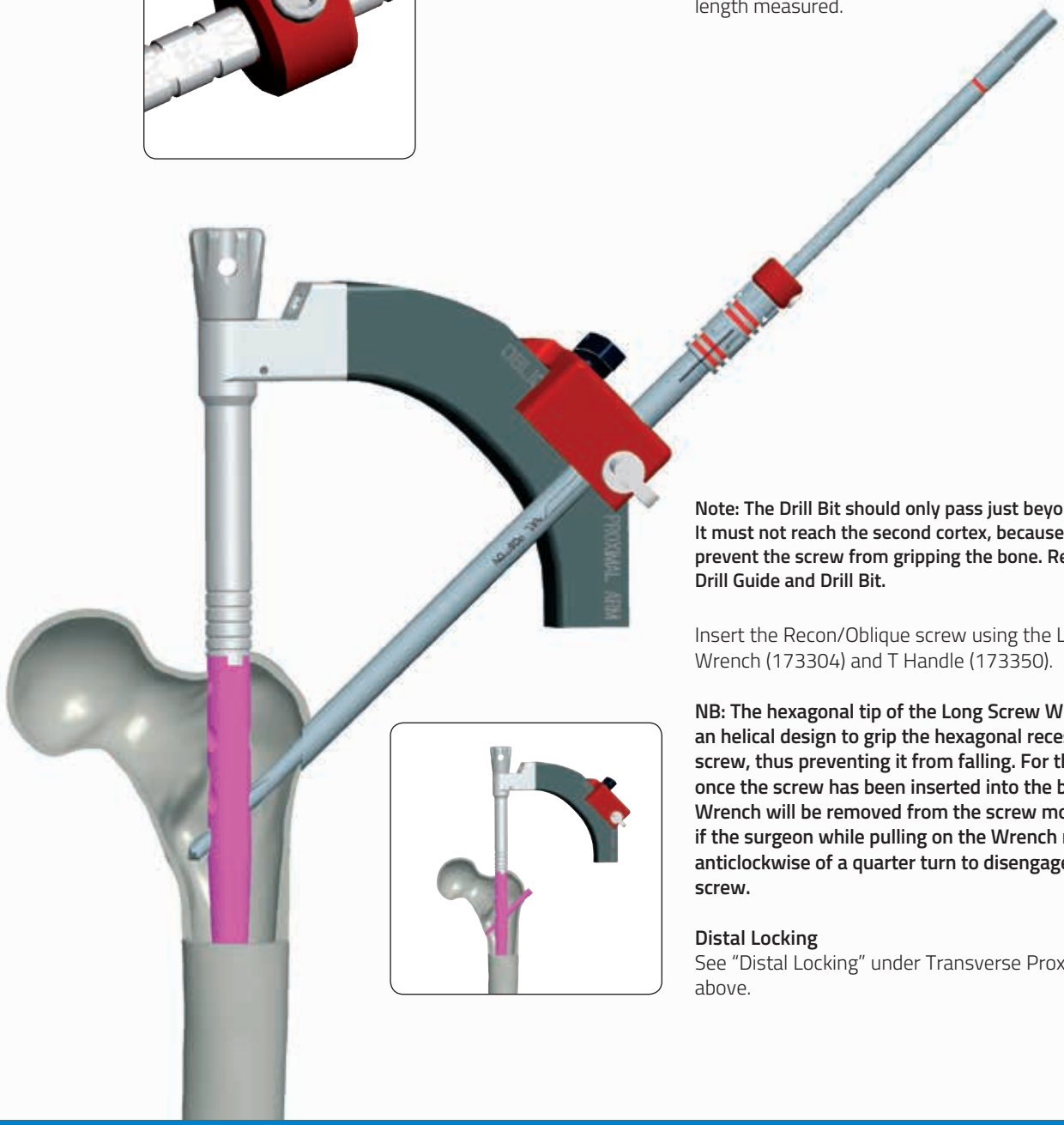
173223
Recon
Wire Guide

173288
Threaded Wire
3x400mm

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.

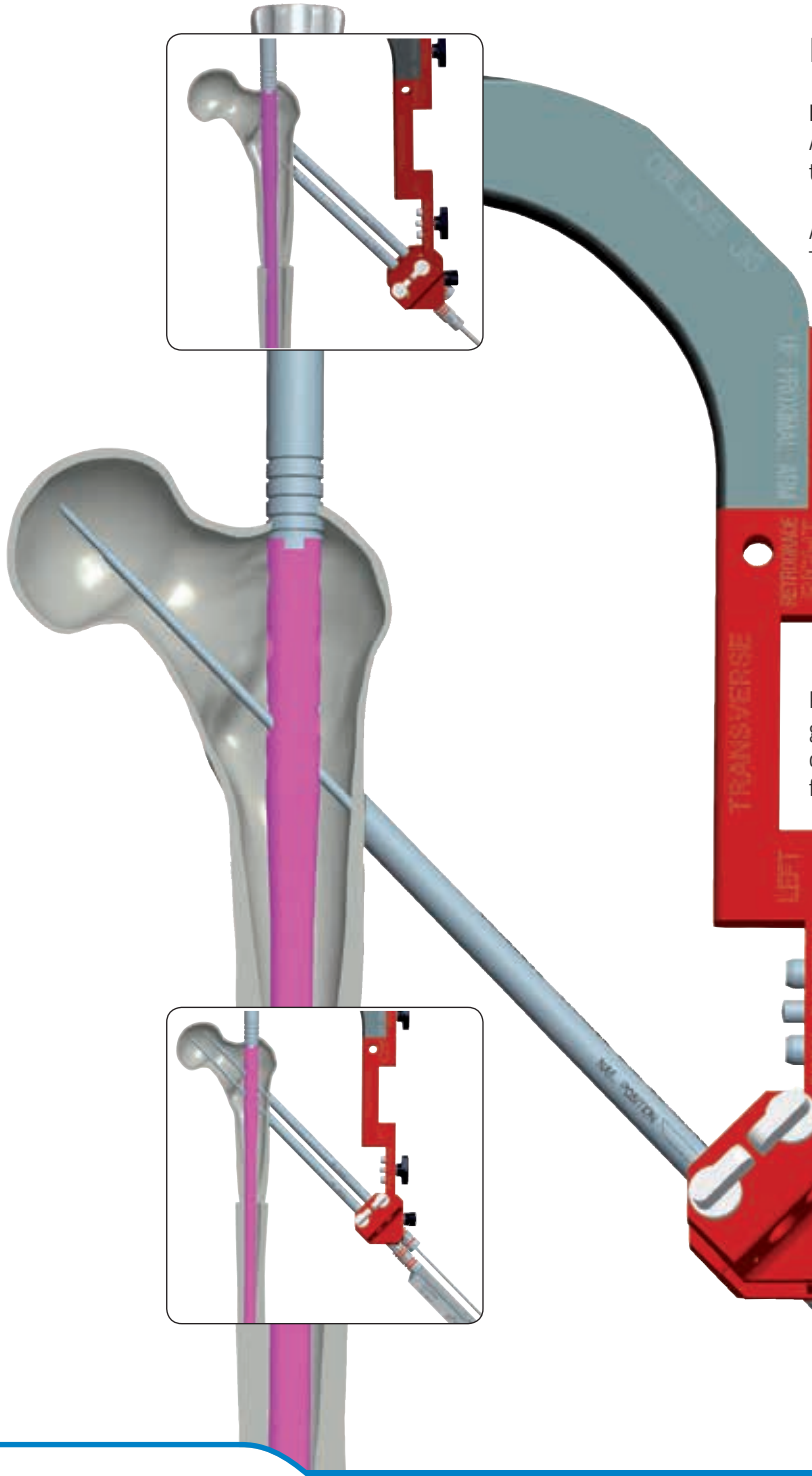
173224
Recon
Drill Guide

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.

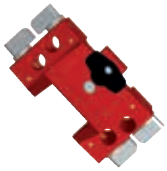
Attach the Recon Jig (173150), screw the Recon Trocar (173222) (with two grooves) into the Recon Screw Guide and insert them both in either the LEFT or RIGHT DISTAL locking hole as appropriate (note that the correct holes in the jig will be posterior to the UF Proximal Arm, to allow for the femoral neck 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 4.8mm drill guide (173213) into the Screw Guide. Use a 4.8mm 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 3x400mm (173288) into the femoral head up to 1 cm from the articular surface. The wire should be 2-3mm 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 3mm 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).

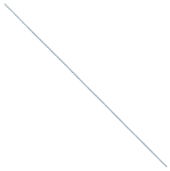
INSTRUMENTATION

173120
UF Proximal Arm



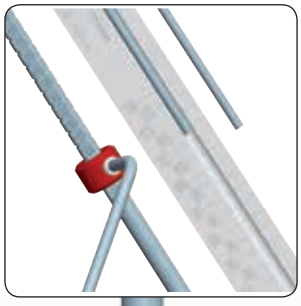
173150
Recon Jig

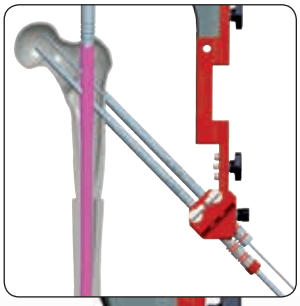
173222
Recon Trocar

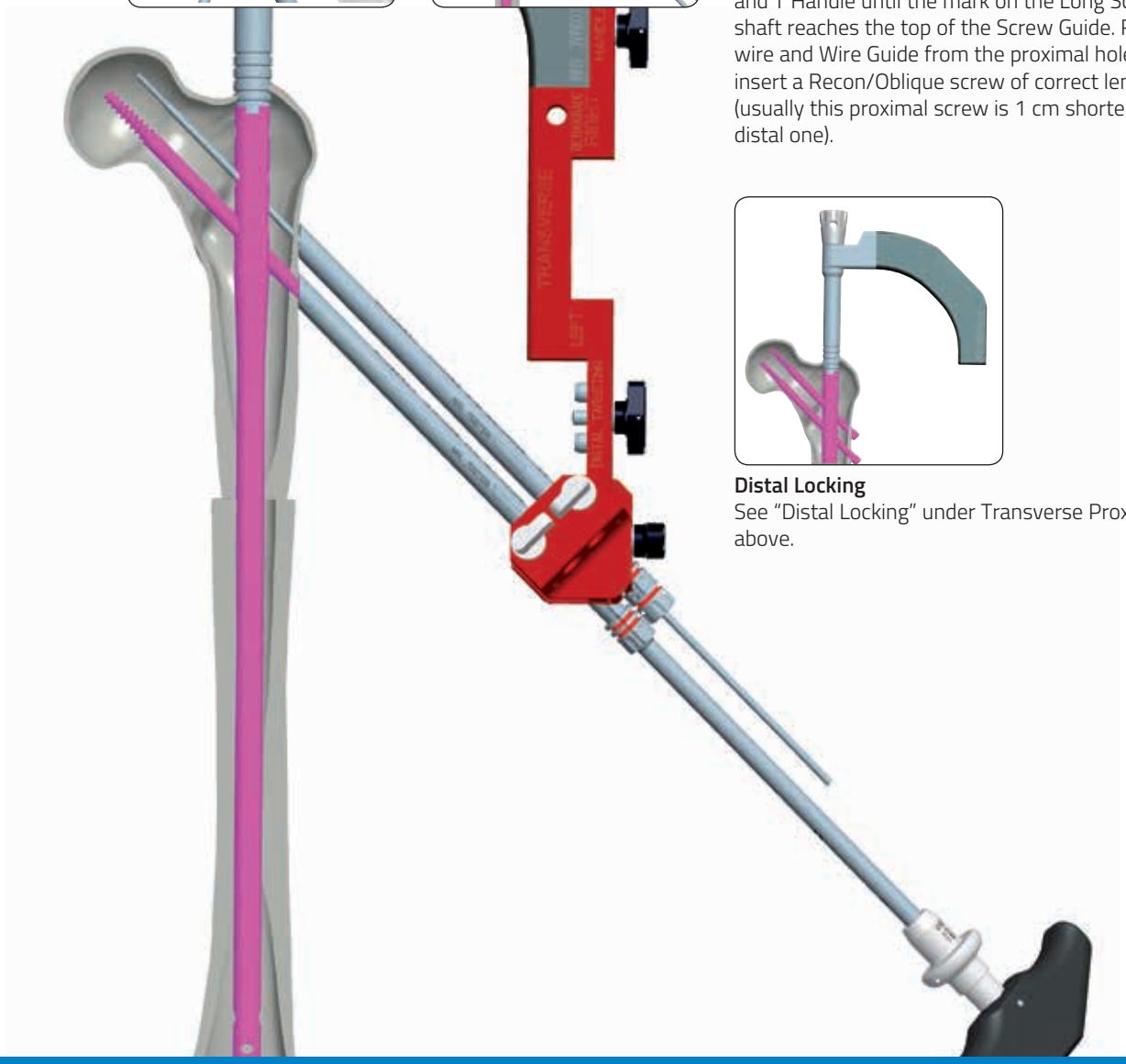


173288
Threaded Wire
3x400mm

173301
Screw Scale

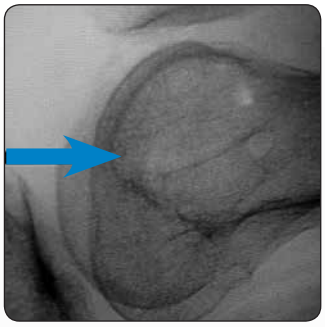






Remove the K-wire and Wire Guide from the distal hole. Screw in the Recon Drill Guide (173224) and drill with the Recon Drill Bit (173283), after positioning the Recon Drill Bit Stop (173295) on the drill scale at the level of the screw length measured. Note: The Drill Bit should only reach just beyond 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.

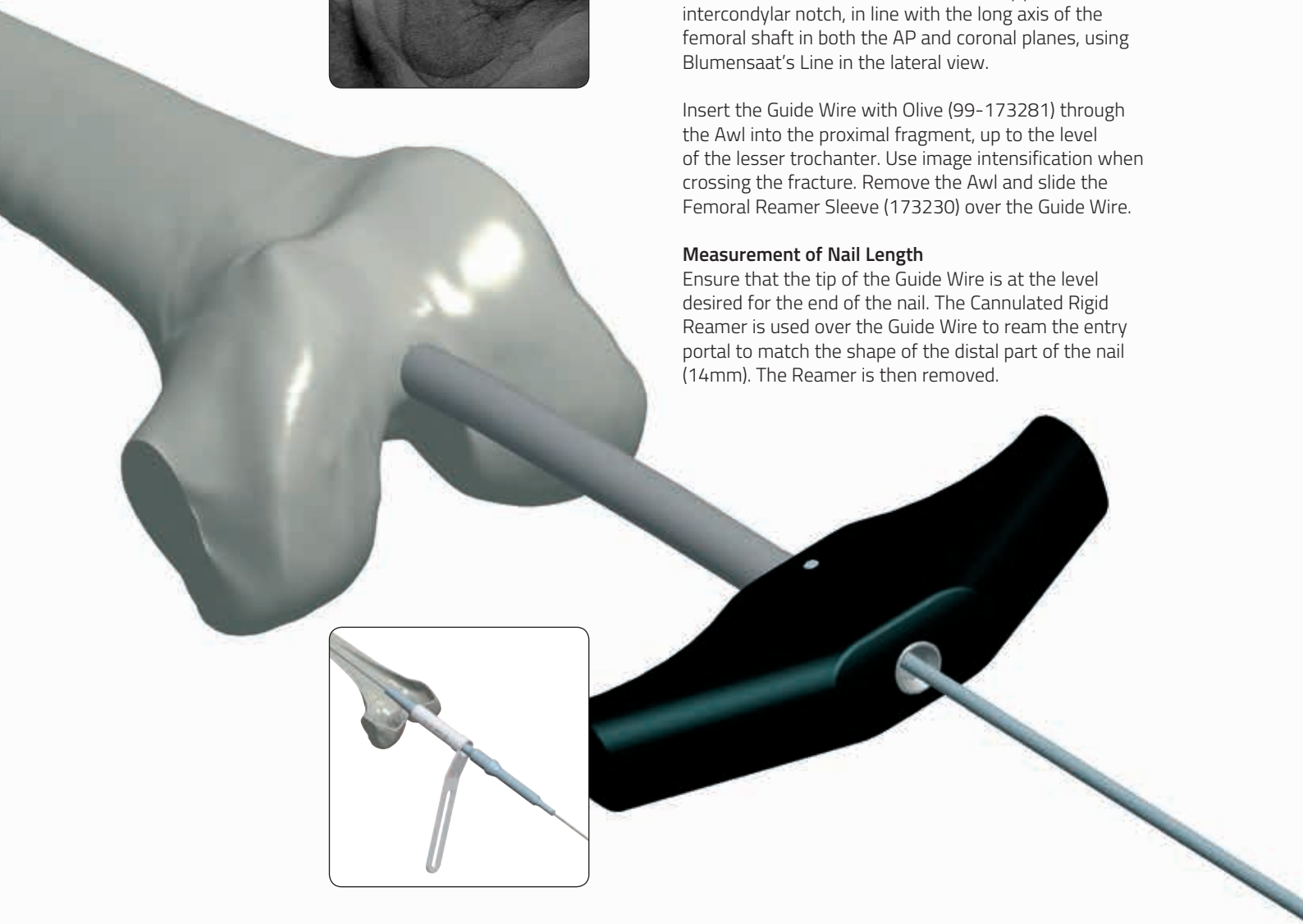


RETROGRADE INSERTION

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 (14mm). The Reamer is then removed.



INSTRUMENTATION

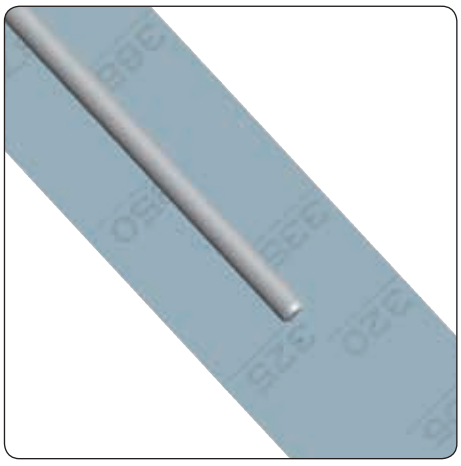
173260
Awl

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 980mm Guide Wire is used for femoral and tibial nailing, and the 800mm Guide Wire used for the humerus).

The correct nail length is read at the proximal tip of the Guide Wire. Please note, 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.

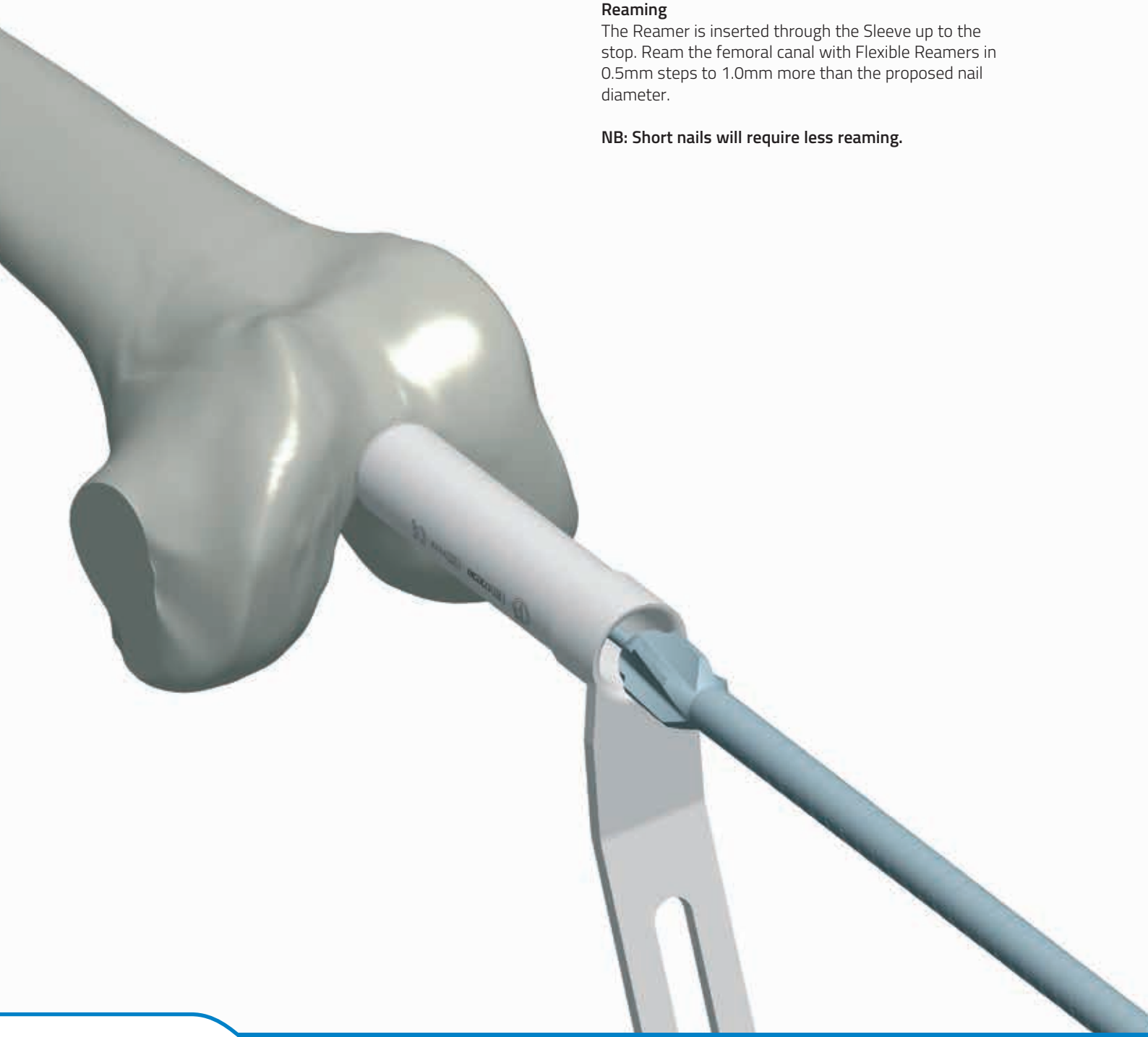


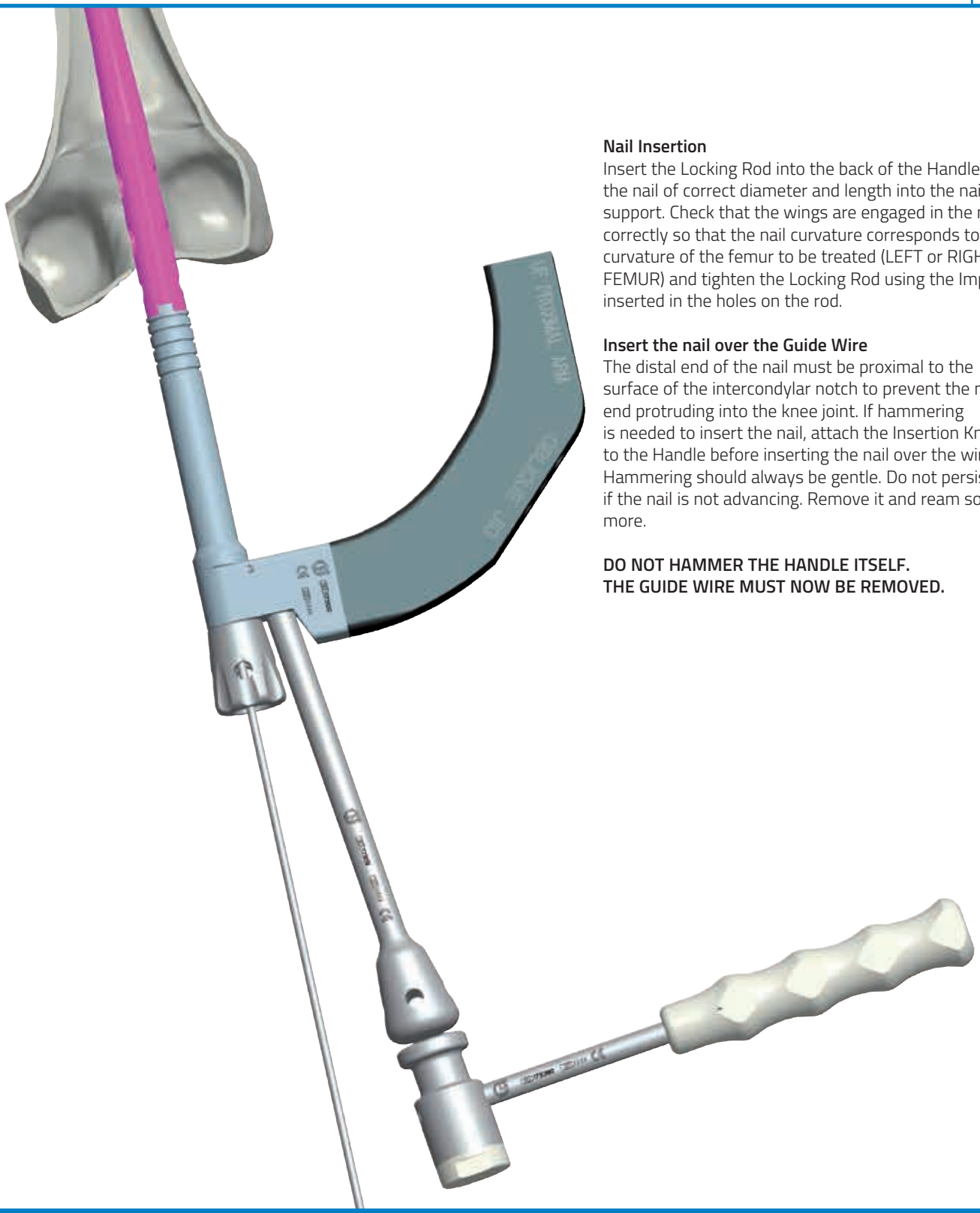
173276
Ruler Support

173275
Ruler

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

NB: Short nails will require less reaming.

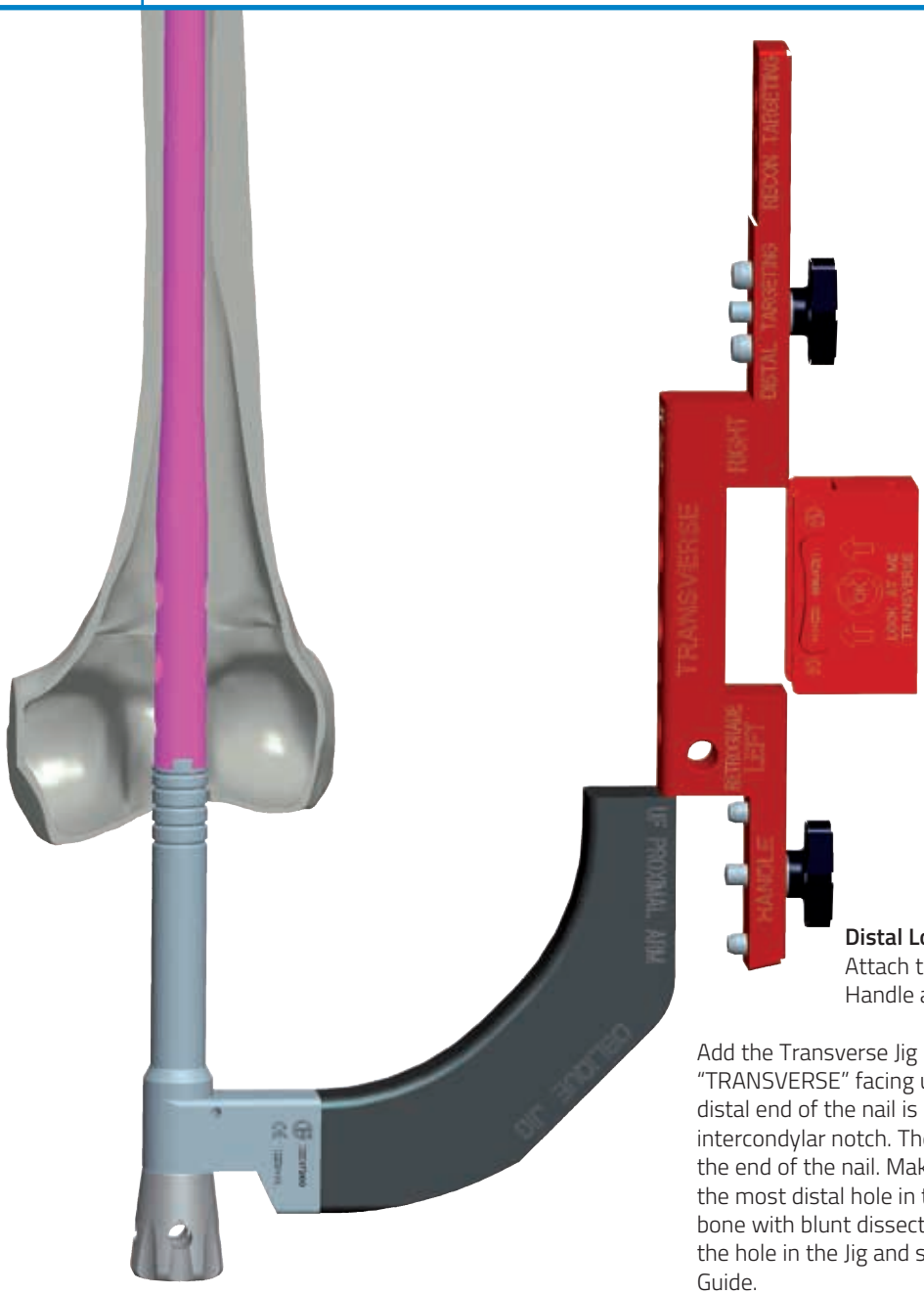




Nail Insertion
Insert the Locking Rod into the back of the Handle and the nail of correct diameter and length into the nail support. Check that the wings are engaged in the nail correctly so that the nail curvature corresponds to the curvature of the femur to be treated (LEFT or RIGHT FEMUR) and tighten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



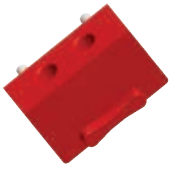
Distal Locking
Attach the UF Proximal Arm to the Handle and tighten the Knob firmly.

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.

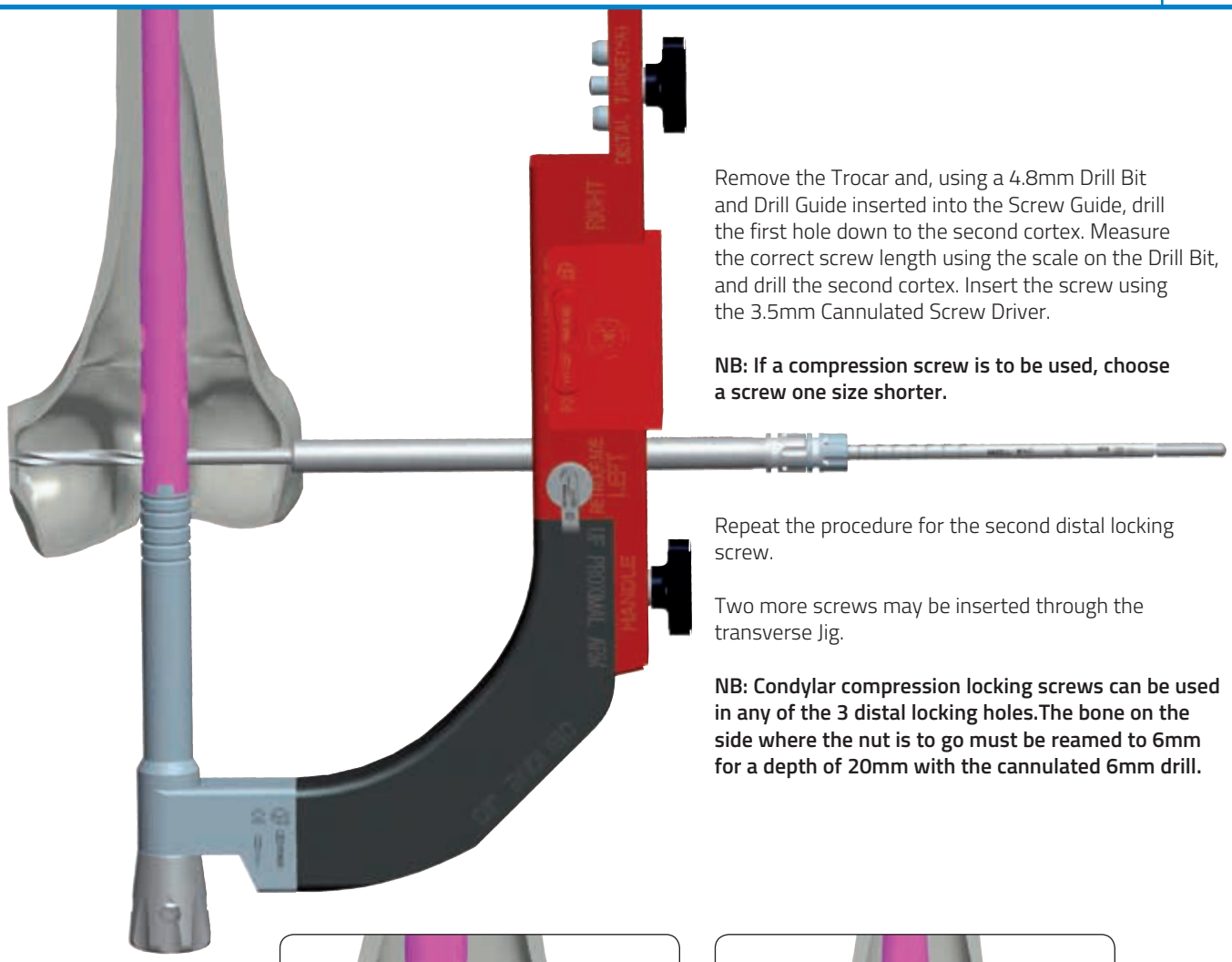
INSTRUMENTATION

173120
UF Proximal Arm



173130
Transverse Jig

173212
Trocar



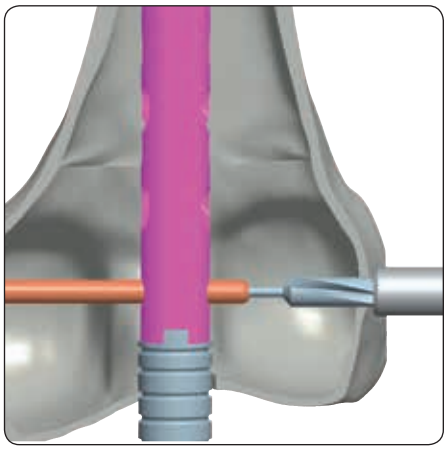
Remove the Trocar and, using a 4.8mm Drill Bit and Drill Guide inserted into the Screw Guide, drill the first hole down to the second cortex. Measure the correct screw length using the scale on the Drill Bit, and drill the second cortex. Insert the screw using the 3.5mm Cannulated Screw Driver.

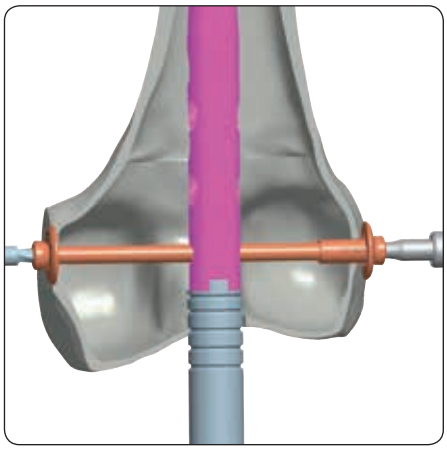
NB: If a compression screw is to be used, choose a screw one size shorter.

Repeat the procedure for the second distal locking screw.

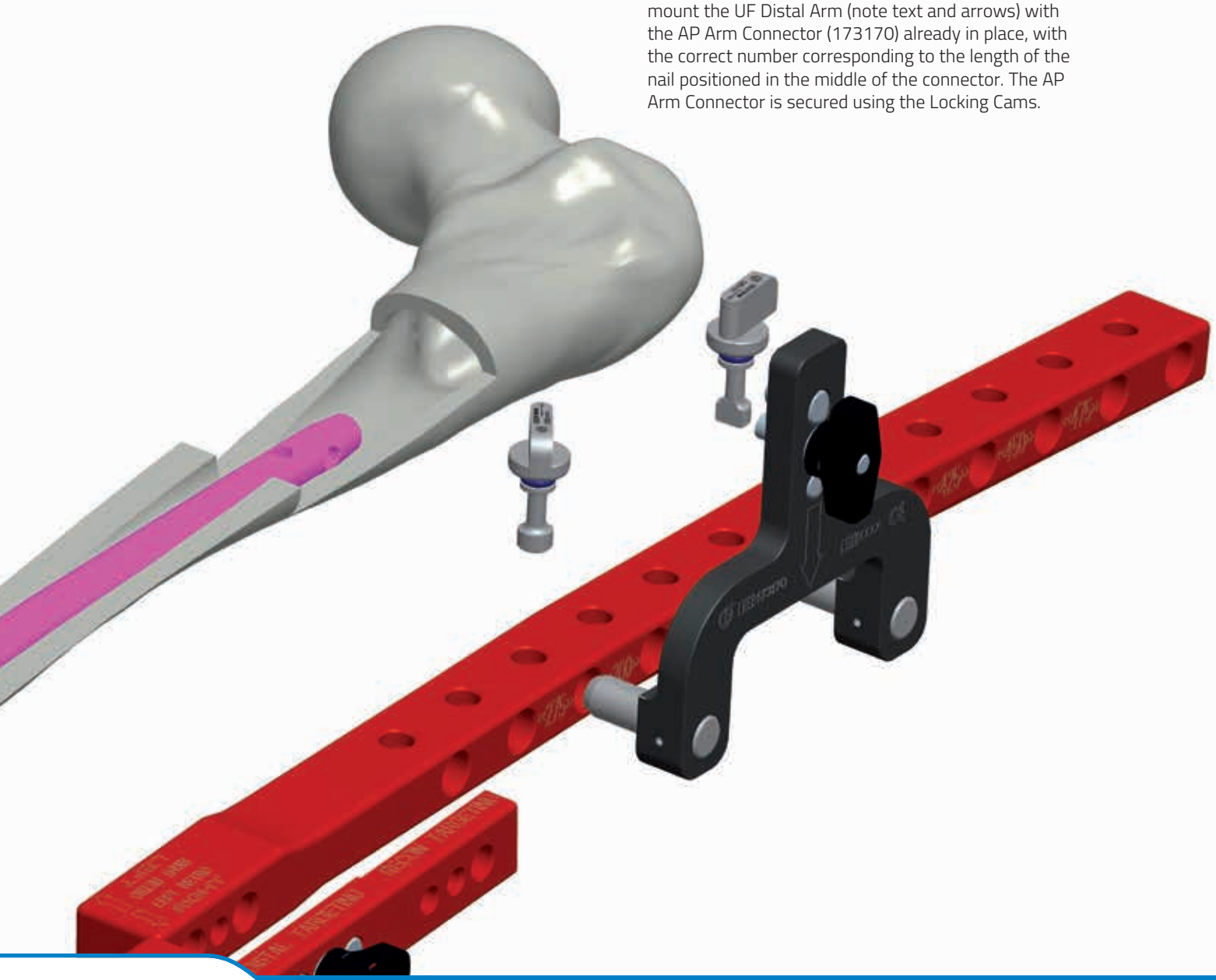
Two more screws may be inserted through the transverse Jig.

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 6mm for a depth of 20mm with the cannulated 6mm 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 Cams.



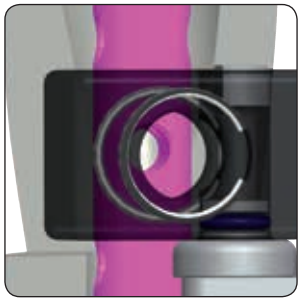
INSTRUMENTATION

173161
UF Distal Arm

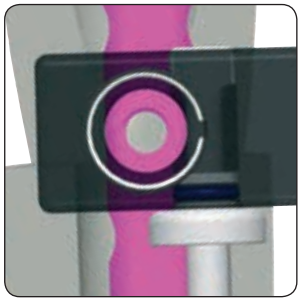
173170
AP Arm Connector

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 20-25mm 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 6mm and the 2mm 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 6mm

173287
K-wire 2mm

173380
Hammer

173071
Impactor

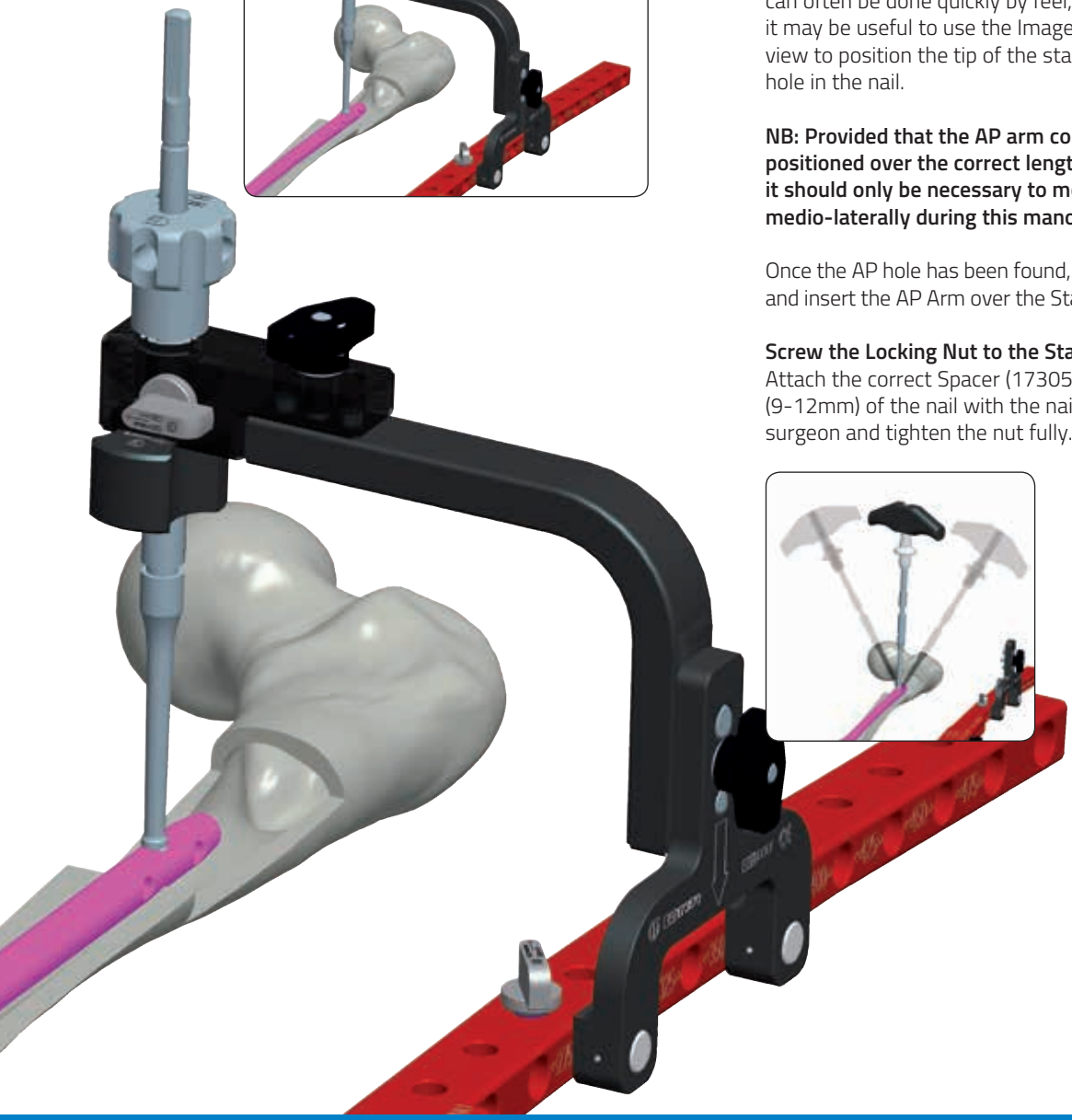
Remove the Cannulated Drill Bit, K-wire and Stabilizing Sleeve. Attach the T Handle to the Stabilizing Rod and insert it into the AP hole in the nail. Screw it in fully.

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 (9-12mm) of the nail with the nail diameter facing the surgeon and tighten the nut fully.



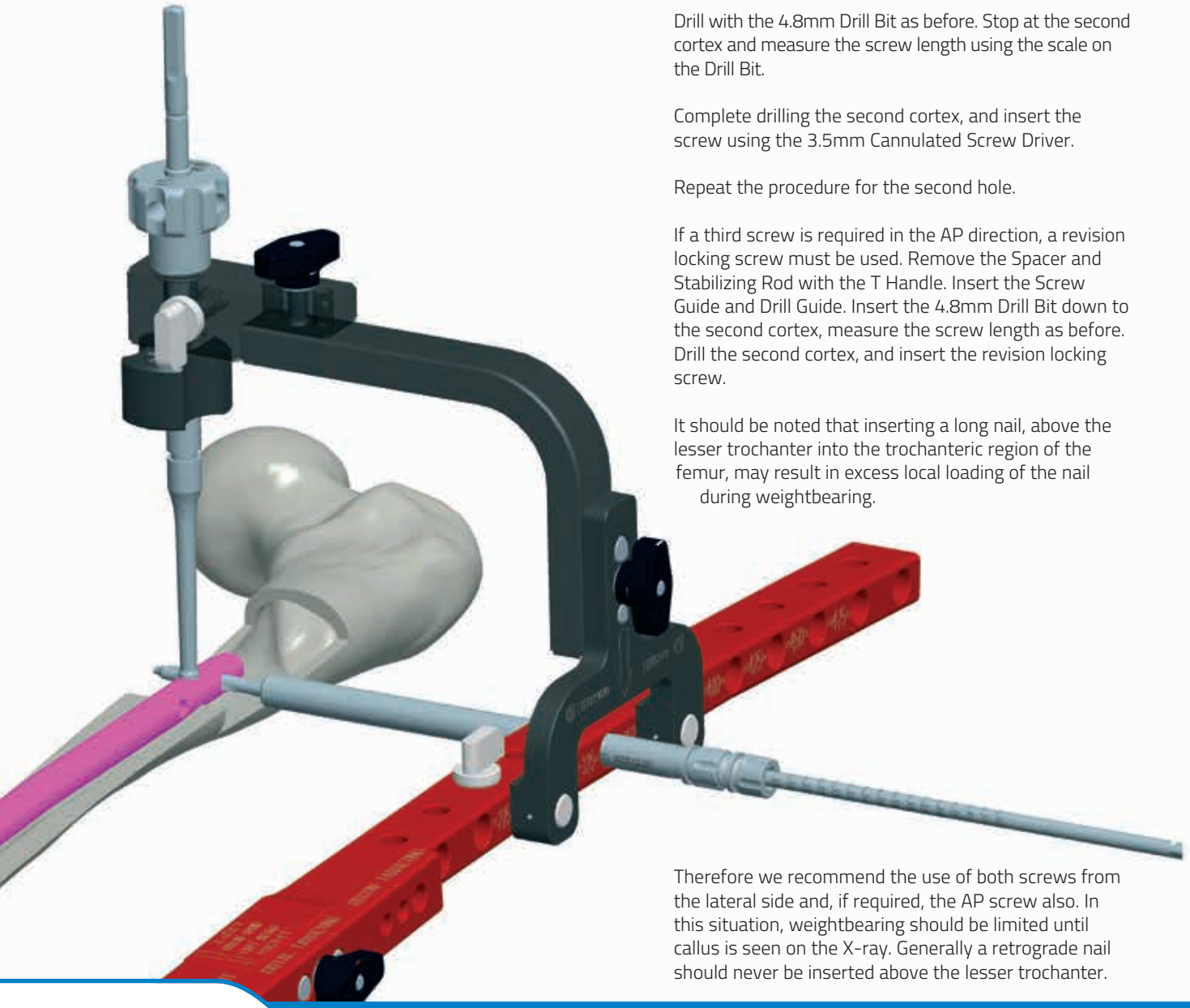
173350
T Handle

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

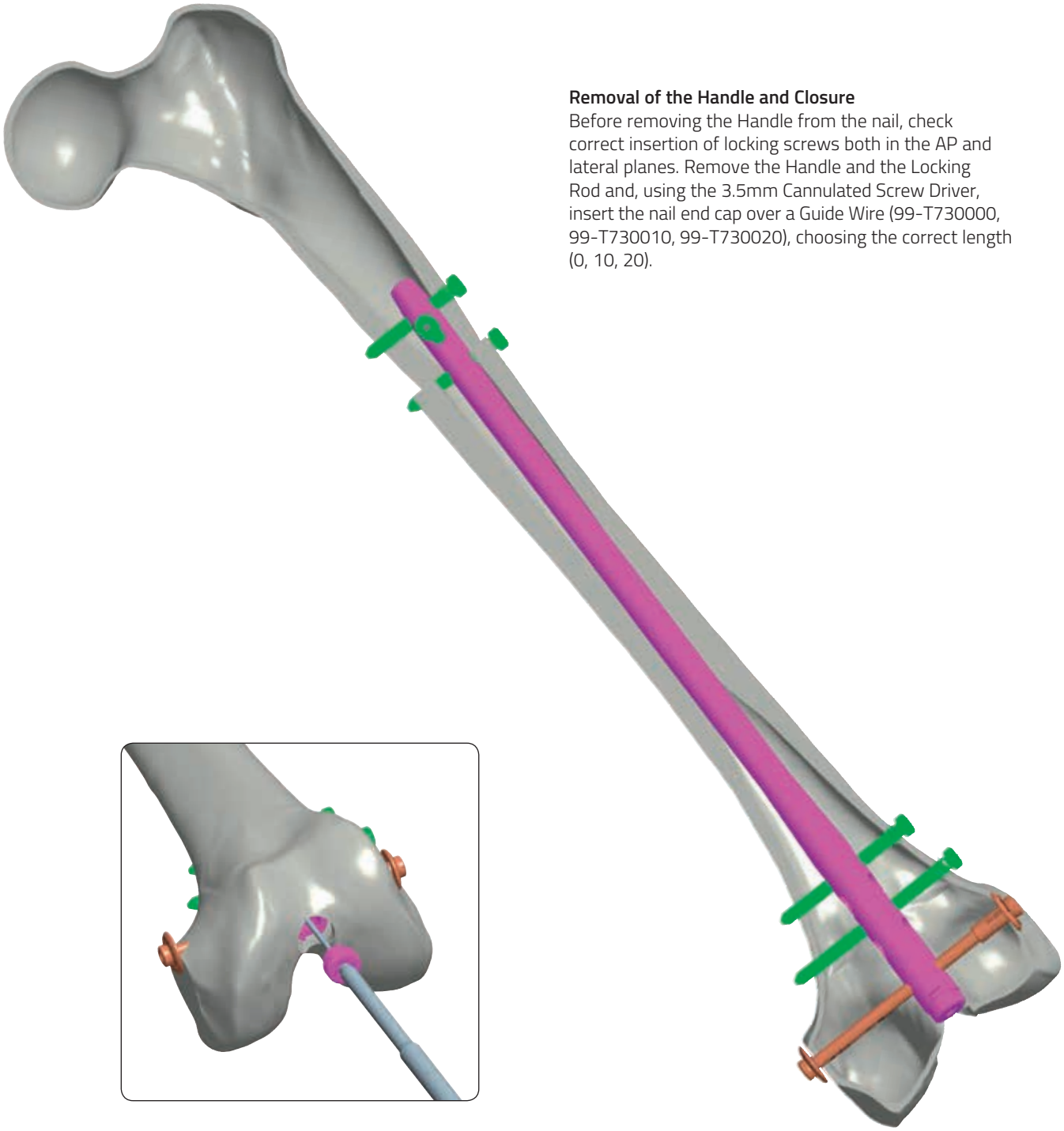
Complete drilling the second cortex, and insert the screw using the 3.5mm Cannulated Screw Driver.

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 4.8mm Drill Bit down to the second cortex, measure the screw length as before. Drill the second cortex, and insert the revision locking screw.

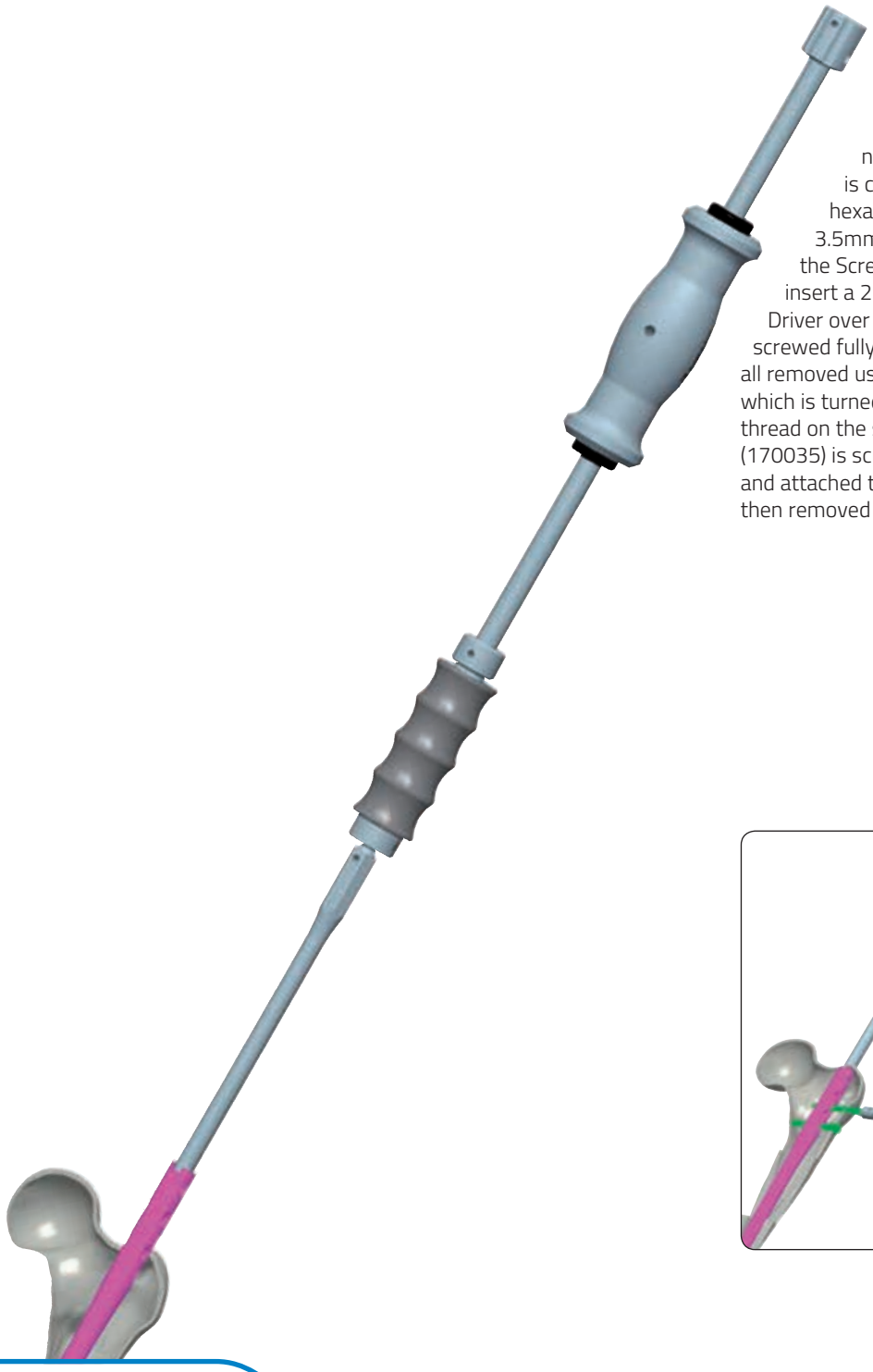
It should be noted that inserting a long nail, above the lesser trochanter into the trochanteric region of the femur, may result in excess local loading of the nail during weightbearing.

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.



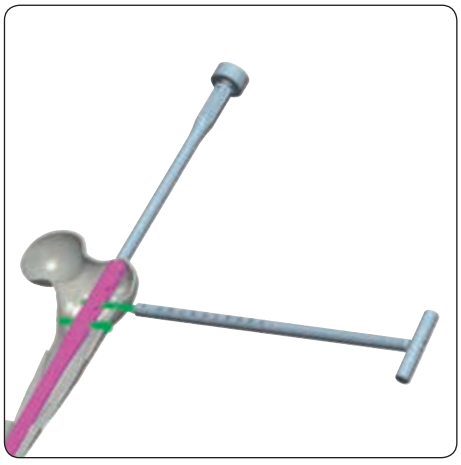
Removal of the Handle and Closure
Before removing the Handle from the nail, check correct insertion of locking screws both in the AP and lateral planes. Remove the Handle and the Locking Rod and, using the 3.5mm Cannulated Screw Driver, insert the nail end cap over a Guide Wire (99-T730000, 99-T730010, 99-T730020), choosing the correct length (0, 10, 20).

173320
3.5mm 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 3.5mm Cannulated Screw Driver. If seating the Screw Driver is difficult, it may be useful to insert a 2mm 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

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

Please refer to the "Instructions for Use" supplied with the product for specific information on indications for use, contraindications, warnings, precautions, adverse reactions and sterilization.

Instructions for Use: See actual package insert for Instructions for Use

Caution: Federal law (USA) restricts this device to sale by or on the order of a physician. Proper surgical procedure is the responsibility of the medical professional. Operative techniques are furnished as an informative guideline. Each surgeon must evaluate the appropriateness of a technique based on his or her personal medical credentials and experience.

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