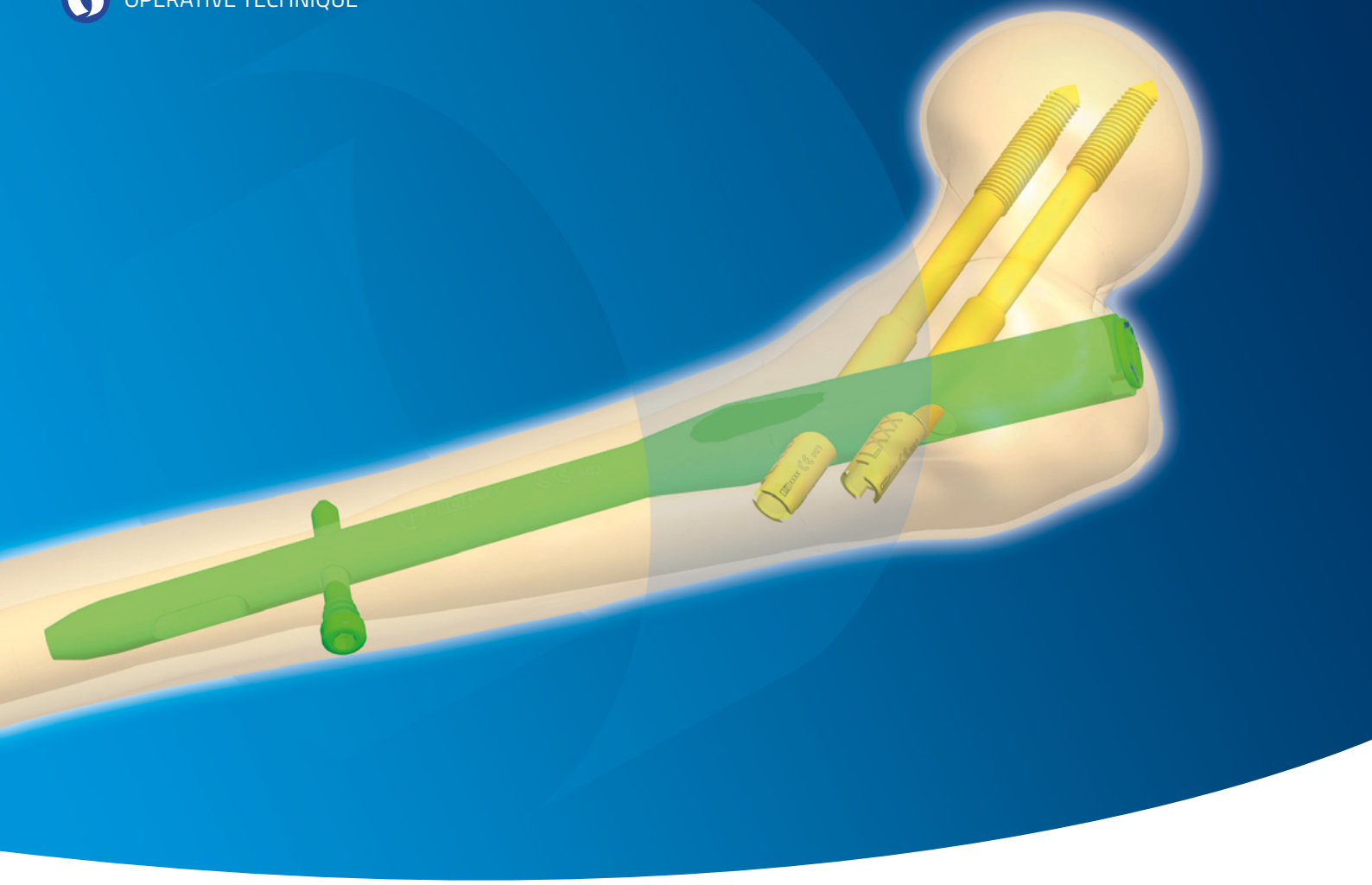
OPERATIVE TECHNIQUE



ORTHOFIX VERONAIL TROCHANTERIC NAIL

ORTHOFIX®
ORTHOPEDICS

The surgical technique shown is for illustrative purposes only.
The technique(s) actually employed in each case will always depend upon the medical judgment of the surgeon exercised before and during surgery as to the best mode of treatment for each patient. Please see the Instructions for Use for the complete list of indications, warnings, precautions, and other important medical information.

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INTRODUCTION

Pertrochanteric fractures are becoming more frequent as the average age of the population increases. Around 80% of these fractures occur in patients over 70 years of age, with the incidence in women twice that of men.[1] In 1990 there were about 1.7 million proximal femoral fractures worldwide, and the projected estimate in 2050 is for around 4.5 million.[2]
The effect of these fractures is frequently devastating.[3]
As a result, the social impact is high and the relative costs of treatment are increasing. For this reason, surgeons are looking for methods of osteosynthesis that will permit early mobilisation of the patient and a rapid return to pre-injury levels of independence. Treatment of these fractures requires internal fixation with a sliding hip screw or intramedullary nail. Most established nail systems have a single cephalic screw, but implants with a double cephalic screw have been developed to improve rotational stability, reduce the torque on the head during insertion of a single large diameter screw, and provide improved stability in osteoporotic bone, reducing the incidence of cut-out (3.8%) present in nailing with a single cephalic screw.[4]

The results of a study[5] have been published comparing single screw and double axis nails, showing that there are no significant differences between the two types of nail in terms of functional recovery or healing time (12 weeks on average). With regard to the most significant complications, diaphyseal fractures and cut-out phenomena were greater with the single cephalic screw, while secondary varus was seen more with the double cephalic screw.

The Orthofix Trochanteric Nail aims to combine the advantages of intramedullary nailing with high cephalic stability. Its proximal and distal diameter permits percutaneous insertion without reaming in the majority of elderly patients.[6] The unique feature that distinguishes it from other double axis systems is the alternative configuration of the cephalic screws, with either two parallel sliding screws or two convergent screws locked to the nail. The surgeon therefore has a versatile instrument to treat all types of trochanteric fractures. The inventory is thus contained and the appropriate stability provided for early rehabilitation.

References

1. Gallagher Jc, Melton L J, Riggs Bl, et al.. Epidemiology of fractures of the proximal femur in Rochester, Minnesota. Clin. Orthop. 1980; 150:163-171.
2. Lauritzen J.B. Hip fractures: incidence, risk factors, energy absorption, and prevention. Bone Vol.18, 1: 65S-75S; 1996.
3. Koval K.J., Zuckerman J.D.. Intertrochanteric fractures. In :Rockwood and Green's - Fractures in Adults- 2001 Vol.2- 1635-1663. an femoral nail. Orthop Trauma. 2002 Jul;16(6):386-93.
4. Hesse B, Gachter A. Complications following the treatment of trochanteric fractures with the gamma nail. Arch Orthop Trauma Surg. 2004 Oct 23.
5. Schipper IB, Steyberg EW, Lastelein RM, van der Heijden FHWM, den Hoed PT, Kerver JH, van Vugt AB. Randomised comparison of the Gamma Nail and the PFN. JBJS (Br). 2004; 86: 86-94.
6. Lavini F, Renzi Brivio L, Aulisa R, Cherubino F, Di Seglio PL, Galante N, Leonardi W, Manca M. The Treatment of Stable and Unstable Proximal Femoral Fractures with a New Trochanteric Nail. Results of a Multicentre Study with The Veronail. Strategies in Trauma and Limb Reconstruction. 2008; 3 (1): 15-22.

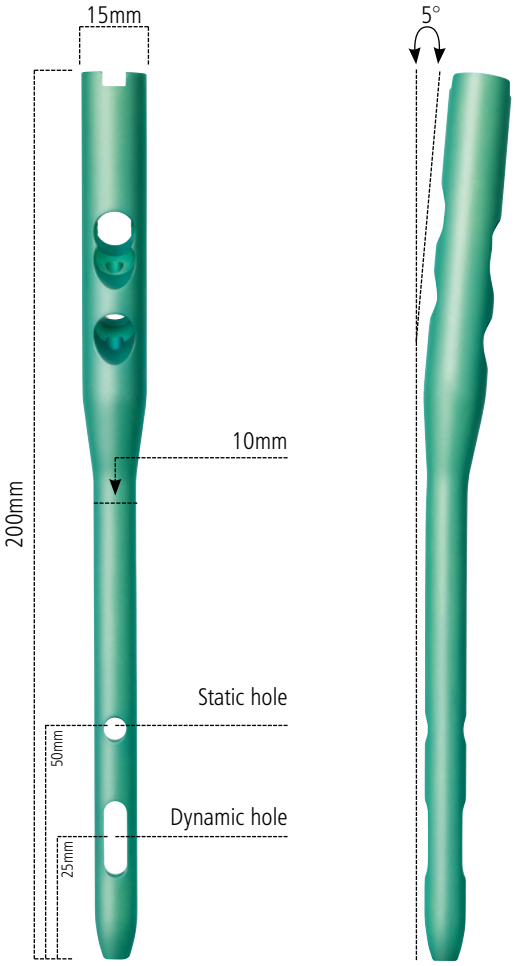
Bibliography

1. Parker MJ, Handoll HH. Gamma and other cephalocondylic intramedullary nails versus extramedullary implants for extracapsular hip fractures. Cochrane Database Syst Rev. 2004;(1):CD000093.
2. Lorich DG, Geller DS, Nielson JH. Osteoporotic pertrochanteric hip fractures: management and current controversies. Instr Course Lect. 2004;53:441-54.
3. Baumgaertner MR, Curtin SL, Lindskog DM. Intramedullary versus extramedullary fixation for the treatment of intertrochanteric hip fractures. Clin Orthop. 1998 Mar;(348):87-94.
4. Schipper IB, Marti RK, van der Werken C. Unstable trochanteric femoral fractures: extramedullary or intramedullary fixation. Review of the literature. Injury. 2004;35(2): 142-51.
5. Audige L, Hanson B, Swiontkowski MF. Implant related complications in the treatment of unstable intertrochanteric fractures: meta-analysis of dynamic screw plate versus dynamic screw-intramedullary nail devices. Int Orthop.2003;27(4):197-203.
6. Utrilla Al,Reig JS,Munoz FM,Tufanisco CB. Trochanteric gamma nail and compression hip screw for trochanteric fractures: a randomized, prospective, comparative study in 210 elderly patients with a new design of the gamma nail. J. Ortop Trauma 2005;19(4): 229-33.
7. Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomized study comparing post operative rehabilitation. JBJS. (Br). 2005; 87(1):76-81.

VeroNail™
System

FEATURES AND BENEFITS

Short nail (T79020)



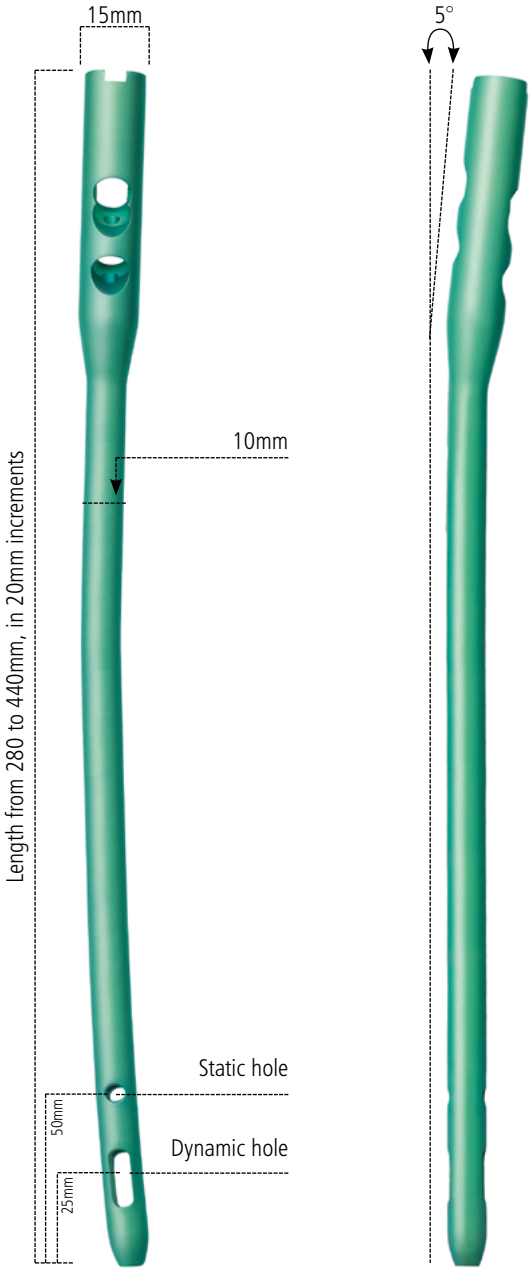
15mm proximal diameter
Avoids trochanteric damage

10mm distal diameter
Reduces anterior cortex impingement
Reduces need for reaming

5 degree M/L bend
Facilitates trochanteric insertion

200mm length
Addresses most fracture indications

Long nail



Same features and benefits of Short Nail, plus:

Left and Right available
Allow for anatomic reduction

280-440mm (20mm increments)
Address anatomy and fracture needs

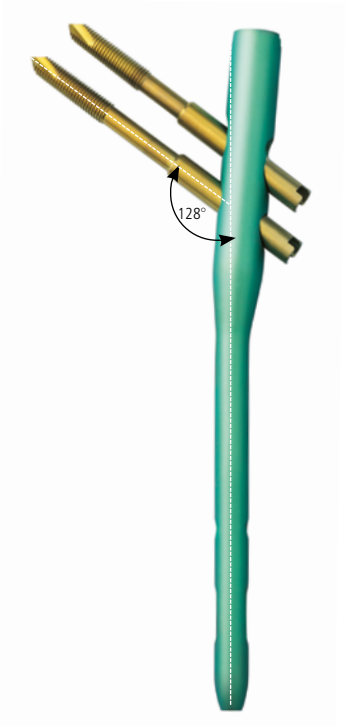
2000mm radius
Matches the average procurvatum of the femur

10 degree anteversion

Proximal locking

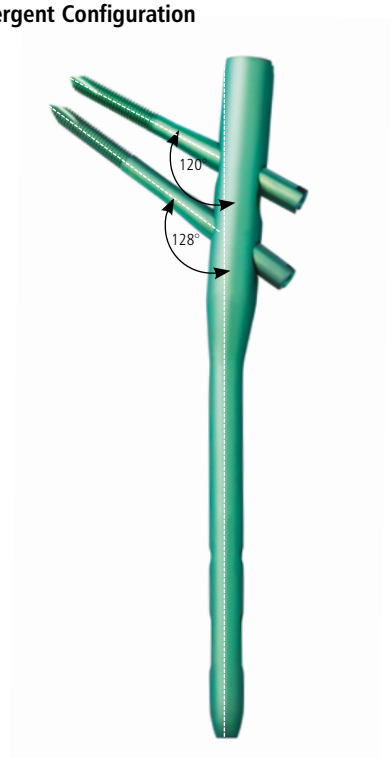
Proximal locking is with two possible configurations: parallel by means of two sliding screws that permit controlled impaction of the fracture site, or convergent with two screws converging in the femoral head and locked firmly to the nail.

Parallel Configuration



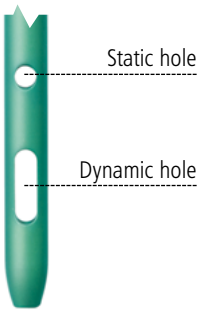
The sliding screws (parallel configuration) are telescopic with a sleeve that is screwed into the nail and a screw with a self drilling and tapping thread. In the parallel configuration the screw-nail angle is 128°. This combination of an angle favorable for sliding and the double axis fixation provides excellent rotational stability and conditions for controlled fracture impaction.

Convergent Configuration



In the convergent configuration the distal cephalic screw has a 128° neck angle and the proximal cephalic screw a 120° angle. The convergent configuration allows cephalic screws to be fitted in very narrow necks, and provides very stable fixation with locked screws for subtrochanteric fractures.

Distal locking



Distal locking is usually with a single screw that, depending on the type of fracture, may be static or dynamic, according to whether the screw is positioned in the round or oval hole. The non threaded, pegged design allows for increased fatigue resistance of locking screw.

Distal Standard Locking Screws

Distal Revision Locking Screws

The Revision Locking Screws are useful for distal locking when the bone is very osteoporotic or when freehand manoeuvres with long nails result in a slightly bigger hole in the distal lateral cortex.

INDICATIONS

Fractures **31.A1** and **31.A2** according to the AO classification.

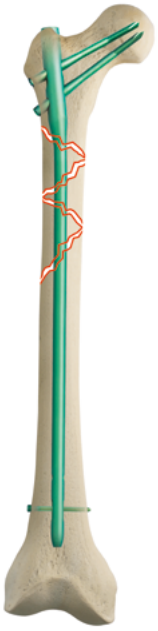
31.A1
Static Distal Locking Screw Optional

31.A2
Static Distal Locking Screw Recommended

Sliding Cephalic Screws
when crossing the trochanteric fracture line

Fractures **31.A3** according to the AO classification.

Dynamic Distal Locking Screw Recommended



Converging Fixed Cephalic Screws
when not crossing the fracture line

When using the long nail, distal locking will be static or dynamic depending upon the stability of the diaphyseal fracture pattern.

THE SLIDING SCREWS SHOULD NEVER BE INSERTED IN CONVERGENT MODE. THERE IS A RISK OF DIFFERENTIAL SCREW LOADING THAT MIGHT CAUSE SCREW FAILURE.

EQUIPMENT REQUIRED

Nails and Nail End Cap

Veronail Titanium Trochanteric Nail	
Ø 15/10mm L 200mm	99-T79020

Veronail Titanium Trochanteric Long Nail, Left	
Ø 15/10 L 280mm	99-T79028L
Ø 15/10 L 300mm	99-T79030L
Ø 15/10 L 320mm	99-T79032L
Ø 15/10 L 340mm	99-T79034L
Ø 15/10 L 360mm	99-T79036L
Ø 15/10 L 380mm	99-T79038L
Ø 15/10 L 400mm	99-T79040L
Ø 15/10 L 420mm	99-T79042L
Ø 15/10 L 440mm	99-T79044L
Veronail Titanium Trochanteric Long Nail, Right	
Ø 15/10 L 280mm	99-T79028R
Ø 15/10 L 300mm	99-T79030R
Ø 15/10 L 320mm	99-T79032R
Ø 15/10 L 340mm	99-T79034R
Ø 15/10 L 360mm	99-T79036R
Ø 15/10 L 380mm	99-T79038R
Ø 15/10 L 400mm	99-T79040R
Ø 15/10 L 420mm	99-T79042R
Ø 15/10 L 440mm	99-T79044R

Veronail Titanium Nail End Cap, sterile	99-T79401

Cephalic Screws*

Parallel (yellow) Length	
70	99-T79770
75	99-T79775
80	99-T79780
85	99-T79785
90	99-T79790
95	99-T79795
100	99-T79700
105	99-T79705
110	99-T79710
115	99-T79715

Convergent (green) Length	
70	99-T79670
75	99-T79675
80	99-T79680
85	99-T79685
90	99-T79690
95	99-T79695
100	99-T79600
105	99-T79605
110	99-T79610
115	99-T79615

Distal Standard Locking Screws

Length	
25	99-T79925
30	99-T79930
35	99-T79935
40	99-T79940
45	99-T79945
50	99-T79950
55	99-T79955

Length	
60	99-T79960
65	99-T79965
70	99-T79970
75	99-T79975
80	99-T79980
85	99-T79985
90	99-T79990

Distal Revision Locking Screws

Length	
30	99-T74530
35	99-T74535
40	99-T74540
45	99-T74545
50	99-T74550
55	99-T74555
60	99-T74560

Length	
65	99-T74565
70	99-T74570
75	99-T74575
80	99-T74580
85	99-T74585
90	99-T74590

** The Yellow Sliding Screws are supplied with an integral sleeve that is screwed into the nail.*

Cleaning, disinfection, sterilisation and maintenance of instrumentation

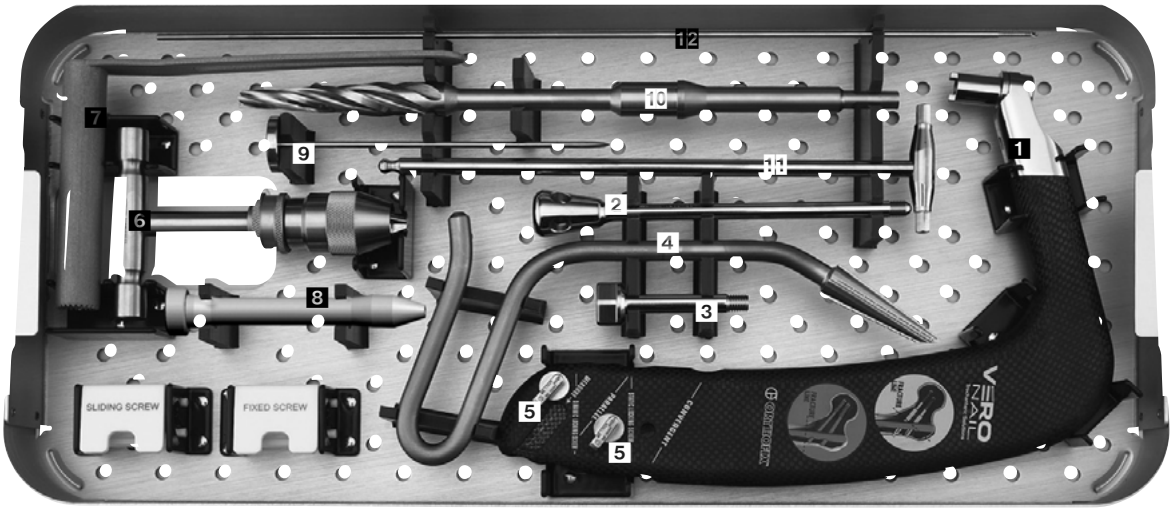
Orthofix supplies the titanium trochanteric nail, locking screws and end caps in a STERILE package. Contents of package are STERILE unless package is opened or damaged. Do not use if package is opened or damaged. Please check the sterility of each device on the product label.

The instruments are supplied 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 ISP.

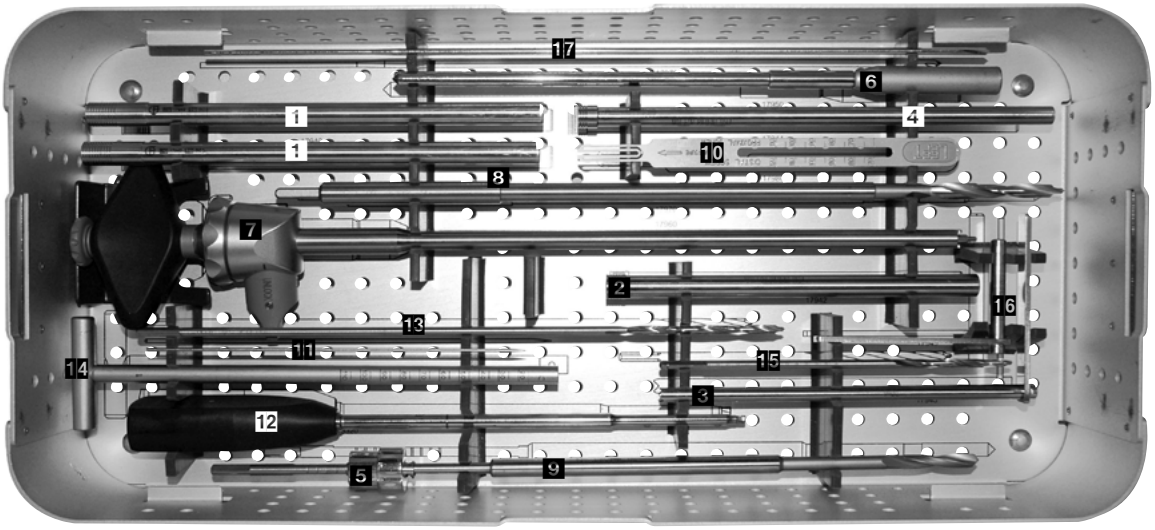
NB: Disassemble all instruments, including the Cephalic Screw Driver, for thorough cleaning and disinfection prior to sterilization.

Instrumentation
The instruments are available in a specific sterilisation box (17995~~C-2~~) that comprises:

Upper tray



Upper Tray			
Part #		**Description**	**Qty**
17915	1	RADIOLUCENT HANDLE	1
17935	2	INSERTION KNOB M8X1	1
17930	3	LOCKING ROD	1
17975	4	CANNULATED AWL	1
17926	5	SCREW GUIDE LOCKING CAM	2
17955	6	UNIVERSAL CHUCK WITH T-HANDLE	1
17947	7	PROTECTION SLEEVE 20MM/16MM	1
17948	8	WIRE GUIDE 16MM/3,5MM L125MM	1
17973	9	3MM TROCAR 145MM	1
17974	10	CANNULATED DRILL BIT D.16MM L300MM	1
17965	11	6MM POLYHEDRAL T-HANDLE WRENCH	1
173288	12	THREADED WIRE 3X400 MM	1
173276	13	RULER SUPPORT	1
17985	14	VERONAIL RULER	1
17986	15	VERONAIL XRAY RULER	1



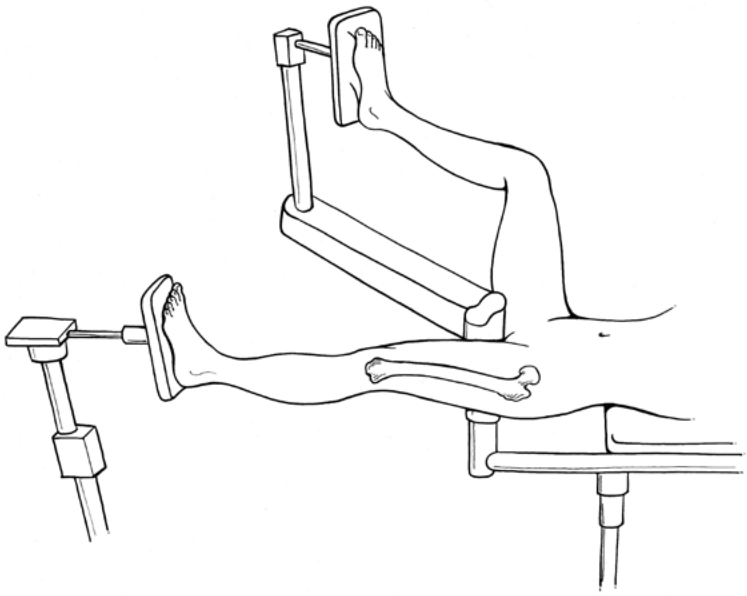
Lower Tray

Part #		Description	Qty
17940	1	CEPHALIC SCREW GUIDE	2
17942	2	SCREW GUIDE	1
17943	3	DRILL GUIDE	1
17944	4	CEPHALIC WIRE GUIDE	1
17946	5	CALCAR DRILL STOP	1
17950	6	TROCAR	1
17963	7	CEPHALIC SCREWDRIVER II	1
17970	8	CEPHALIC DRILL BIT D. 7,5 MM	1
17971	9	OPTIONAL CALCAR DRILL BIT D. 7,5 MM	1
17980	10	SCREW RULER	1
173287	11	K-WIRE 2 MM	1
173320	12	CANNULATED SCREW DRIVER	1
1102001	13	GRADUATED DRILL BIT D.4,8 L 330MM	1
17652	14	LOCKING SCREW EXTRACTOR	1
17976	15	SHORT GRADUATED DRILL BIT 4.8X180MM	1
17949	16	SHORT DRILL GUIDE	1
17972	17	CEPHALIC WIRE D. 4MM L 400MM	1

Material out of the tray

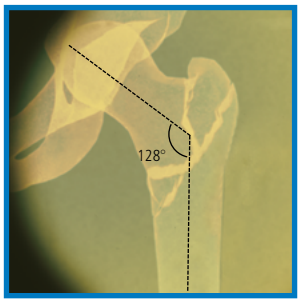
Part #	Description	Qty
99-173281	GUIDE WIRE WITH OLIVE D.3X980 MM STERILE	1
99-176281	GUIDE WIRE WITHOUT OLIVE D.2.5X980 MM STERILE	1

*** It's advisable to combine the Flexible Reamers with the Veronail Instruments. Please refer to the dedicated operative technique IF-0802-OPT.**



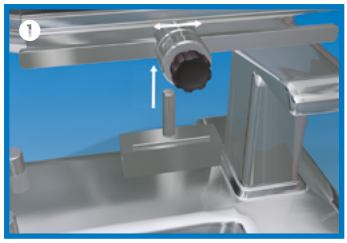
Fracture reduction in the frontal plane

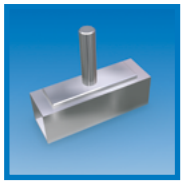
The patient is placed supine on a fracture table, and initial reduction obtained by traction under image intensification. Traction and abduction are then adjusted, if necessary, to arrive at a neck-shaft angle of 128°.



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.





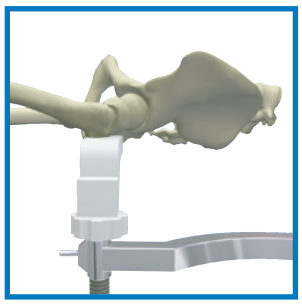
1. Slide the Clark Attachment onto the side rail of the fracture table. Insert the vertical post of the Box Bracket into the Clark Attachment from beneath and tighten the clamp on the post so that the bracket is held securely.

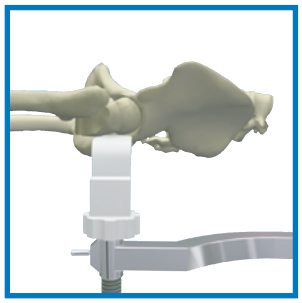
2. Assemble the PORD™ in the following way: Slide the Horizontal Bar through the Box Bracket with its curved portion facing the fracture table. This curved section is designed to allow for unobstructed multiple plane imaging using the C-arm of the Image Intensifier.

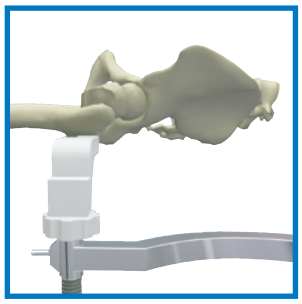
3. The Screw Jack of the Limb Support should be positioned in the housing at the end of the horizontal bar, with the nut under the radiolucent support. Turning the nut clockwise will then raise the support.

INSTRUMENTATION

110000
PORD

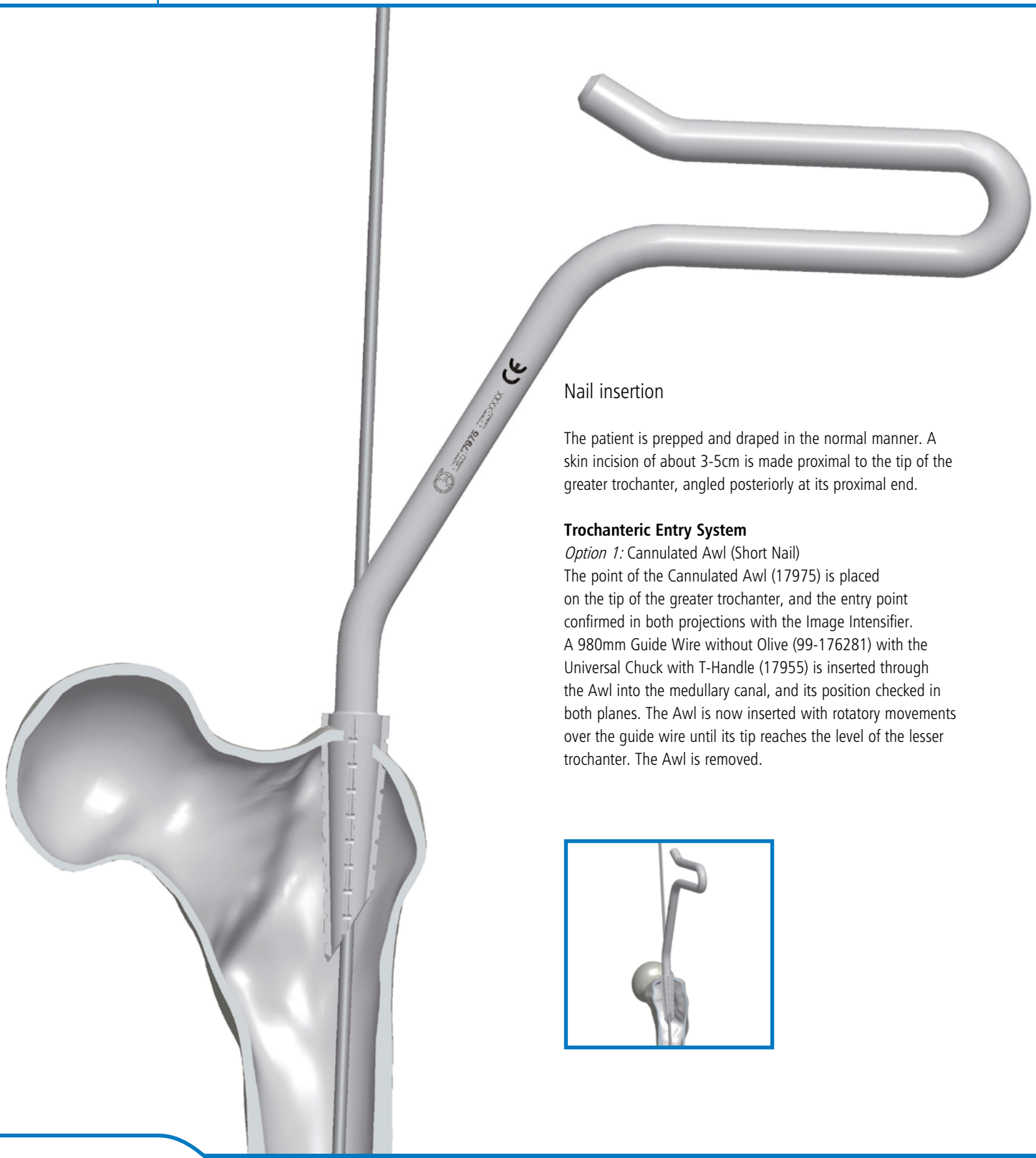






The Limb Support is positioned beneath that portion of the fracture that requires elevating. The correct position of the Limb Support is confirmed on the AP view (the shadow of the support can be seen). Using the lateral view, the Limb Support is raised by turning the nut (a) clockwise until exact posterior reduction has been achieved. The position of the Limb Support is now maintained by tightening the Lug Screw on the housing (b). 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.



Nail insertion

The patient is prepped and draped in the normal manner. A skin incision of about 3-5cm is made proximal to the tip of the greater trochanter, angled posteriorly at its proximal end.

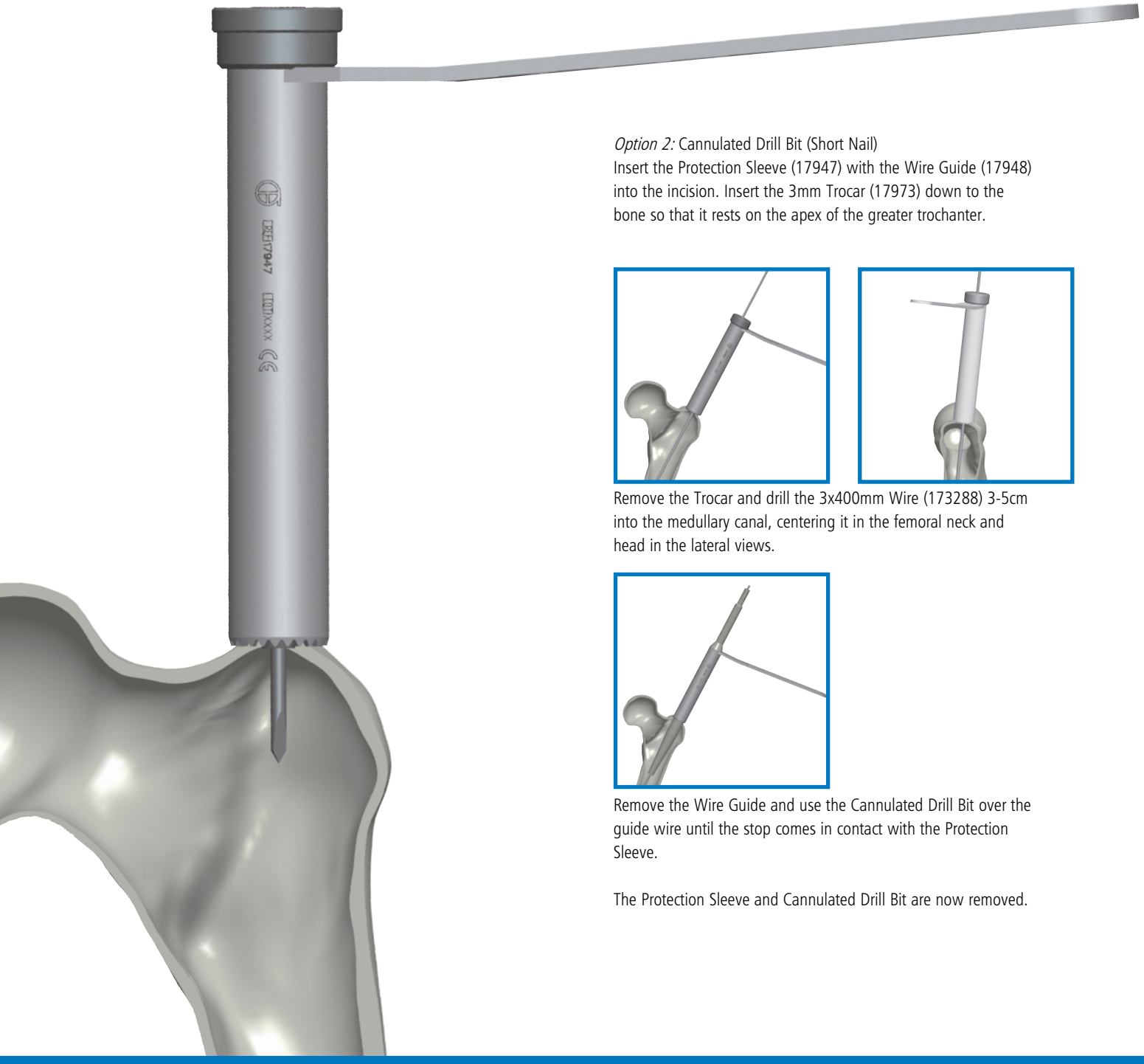
Trochanteric Entry System
Option 1: Cannulated Awl (Short Nail)
The point of the Cannulated Awl (17975) is placed on the tip of the greater trochanter, and the entry point confirmed in both projections with the Image Intensifier. A 980mm Guide Wire without Olive (99-176281) with the Universal Chuck with T-Handle (17955) is inserted through the Awl into the medullary canal, and its position checked in both planes. The Awl is now inserted with rotatory movements over the guide wire until its tip reaches the level of the lesser trochanter. The Awl is removed.

INSTRUMENTATION

17975
Cannulated
Awl

99-176281
980mm
Guide Wire
without Olive

17955
Universal Chuck
with T-Handle



Option 2: Cannulated Drill Bit (Short Nail)
Insert the Protection Sleeve (17947) with the Wire Guide (17948) into the incision. Insert the 3mm Trocar (17973) down to the bone so that it rests on the apex of the greater trochanter.

Remove the Trocar and drill the 3x400mm Wire (173288) 3-5cm into the medullary canal, centering it in the femoral neck and head in the lateral views.

Remove the Wire Guide and use the Cannulated Drill Bit over the guide wire until the stop comes in contact with the Protection Sleeve.

The Protection Sleeve and Cannulated Drill Bit are now removed.

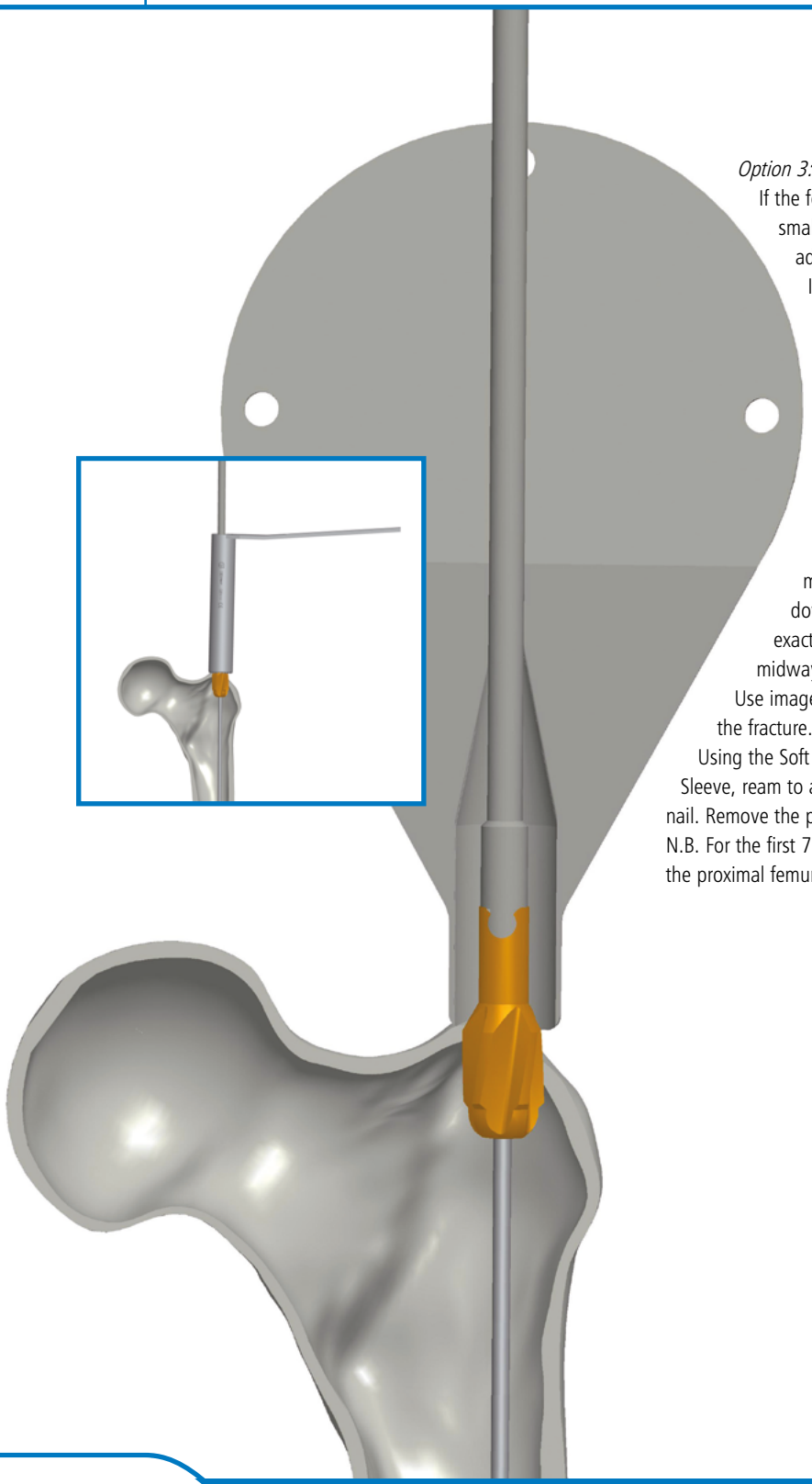
17947
Protection Sleeve

17948
Wire Guide, 16mm/3.5mm, L 125mm

17973
3mm Trocar

173288
Wire 3x400mm

17974
Cannulated Drill Bit



Option 3: Flexible Reamer (Long Nail)

If the femoral diaphysis has an internal diameter smaller than 10mm, reaming up to 11.5-12mm is advisable.

If reaming is performed, the Cannulated Awl is placed on the greater trochanter at 5 degrees lateral to the femur shaft axis, and the entry point confirmed in both projections with the Image Intensifier. The Awl is now inserted with rotatory movements until its tip reaches the level of the lesser trochanter. The Awl is removed and the 980mm Guide Wire with Olive (99-173281) inserted centrally in the medullary canal. This is ensured by driving it down 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.

Using the Soft Tissue Protector (172220) or the Protection Sleeve, ream to a width 1.5-2.0mm greater than the proposed nail. Remove the protection sleeve.

N.B. For the first 72mm all long nails are 15mm in diameter, and the proximal femur should therefore be reamed to this diameter.

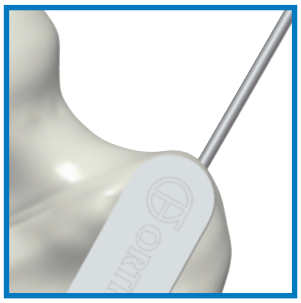
INSTRUMENTATION

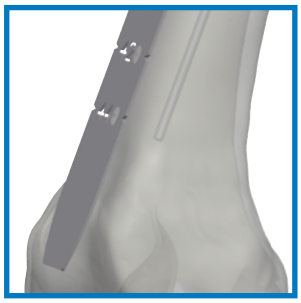
99-173281
980mm
Guide Wire
with Olive

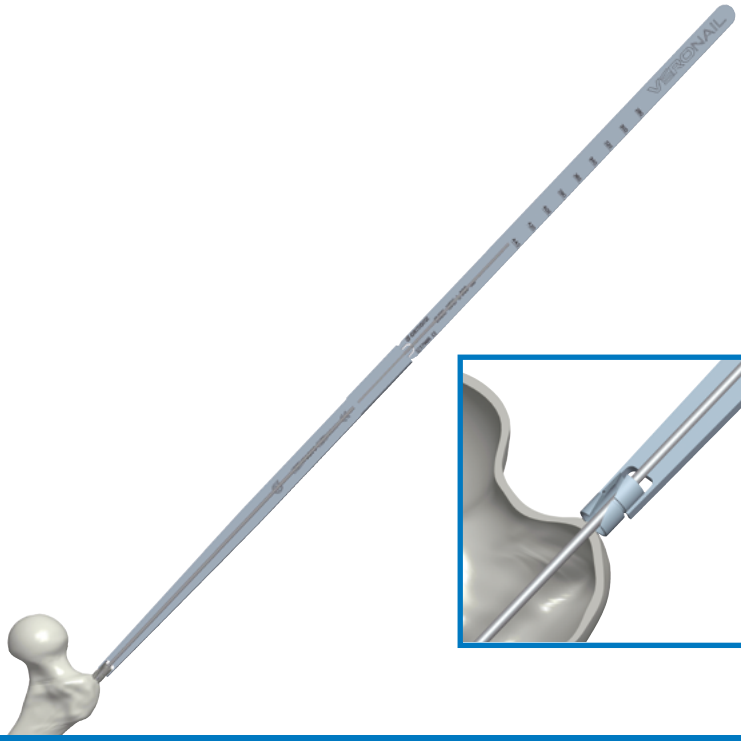
172220
Soft Tissue
Protector

Measurement of Nail Length

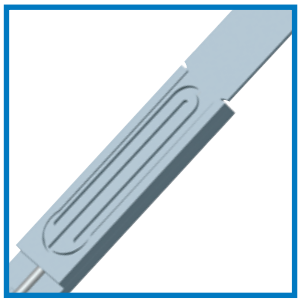
Option 1: Veronail Overlay Ruler
Use the Veronail Overlay Ruler (17986), by positioning its rounded end over the femur at the level of the entry point, using the Image Intensifier. Move the Image Intensifier to the distal femur and read the nail length directly from the image of the ruler.
NB: Make sure that the C arm gives a true AP view.

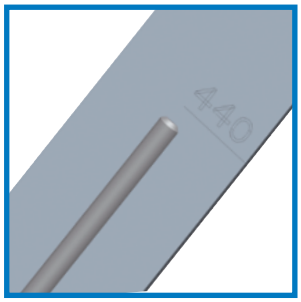






Option 2: Veronail Ruler
With the ball tip of the guide wire at the level desired for the distal end of the nail, position the Ruler Support (173276) over the guide wire in the entry portal. The Veronail Ruler (17985) is attached to the ruler support and the length of the nail read at the proximal tip of the guide wire. NB: This only works with the standard 980mm guide wire.





17986
Veronail
Overlay Ruler

173276
Ruler Support

17985
Veronail Ruler

The Locking Rod (17930) is inserted into the Radiolucent Handle (17915), and the nail into the nail support.
The Rod is tightened firmly with the 6mm Polyhedral T-Handle Wrench (17965), and the nail inserted over the guide wire without hammering.

If hammering is needed, insert the Insertion Knob (17935) (see inset 1).

The correct insertion depth is reached when the distal cephalic hole is at the level of the calcar. The guide wire is now removed.

1

Proximal locking

The Cephalic Screw Guide (17940) is inserted into the distal hole in the Handle to mark the skin incision. The incision is made to the deep fascia, and continued down to the bone with blunt dissection. The Cephalic Screw Guide, with the Trocar (17950), is advanced down to the bone, and locked in place with the appropriate Screw Guide Locking Cam (17926).

INSTRUMENTATION

17930
Locking Rod

17915
Radiolucent Handle

17965
6mm Polyhedral T-Handle Wrench

17935
Insertion Knob

17940
Cephalic Screw Guide

17950
Trocar

The Cephalic Wire Guide (17944) is now inserted. The 4mm Cephalic Wire (17972) has a reduced lateral diameter that allows for wire driver compatibility, and is inserted through the Cephalic Wire Guide (17944), so that it is 2-5mm proximal to the calcar in the AP plane and central in the axial plane. The tip of the wire should be 5-10mm from the articular surface.

The Screw Ruler (17980) is inserted into the recess on the handle so that the arrow on the scale is pointing towards the measurement face of the handle (choose correct side, LEFT or RIGHT, as appropriate). The length of the proximal and distal Cephalic Screws is read from the position of the end of the Kirschner Wire.

If the length measured is between two readings, the smaller reading should be selected. In the illustration the correct value is 100mm for the distal screw and 90mm for the proximal.

Note: The proximal Cephalic Screws is ALWAYS 10mm shorter than the distal one.

17926
Screw Guide Locking Cam

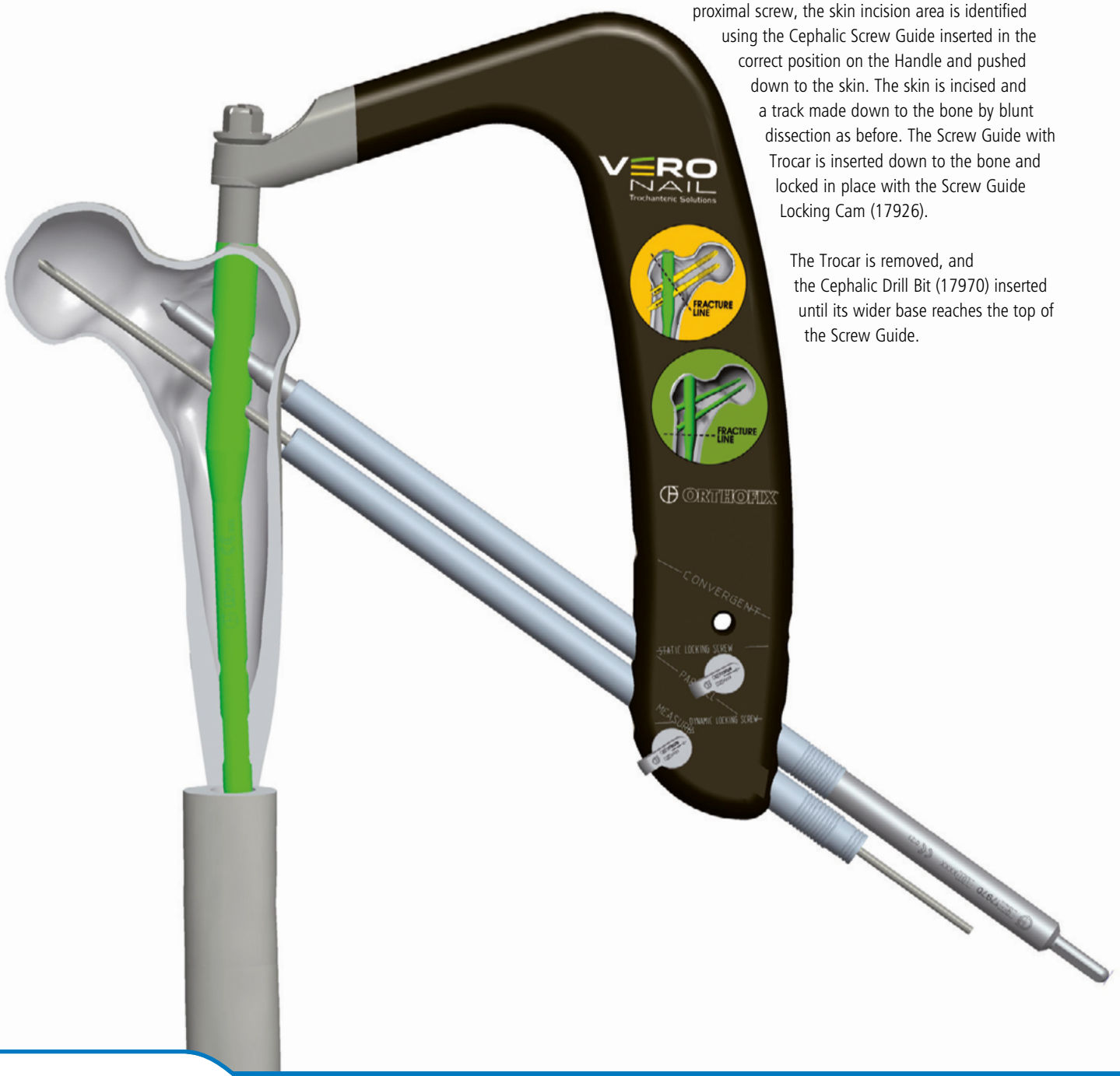
17944
Cephalic Wire Guide

17972
4mm Cephalic Wire

17980
Screw Ruler

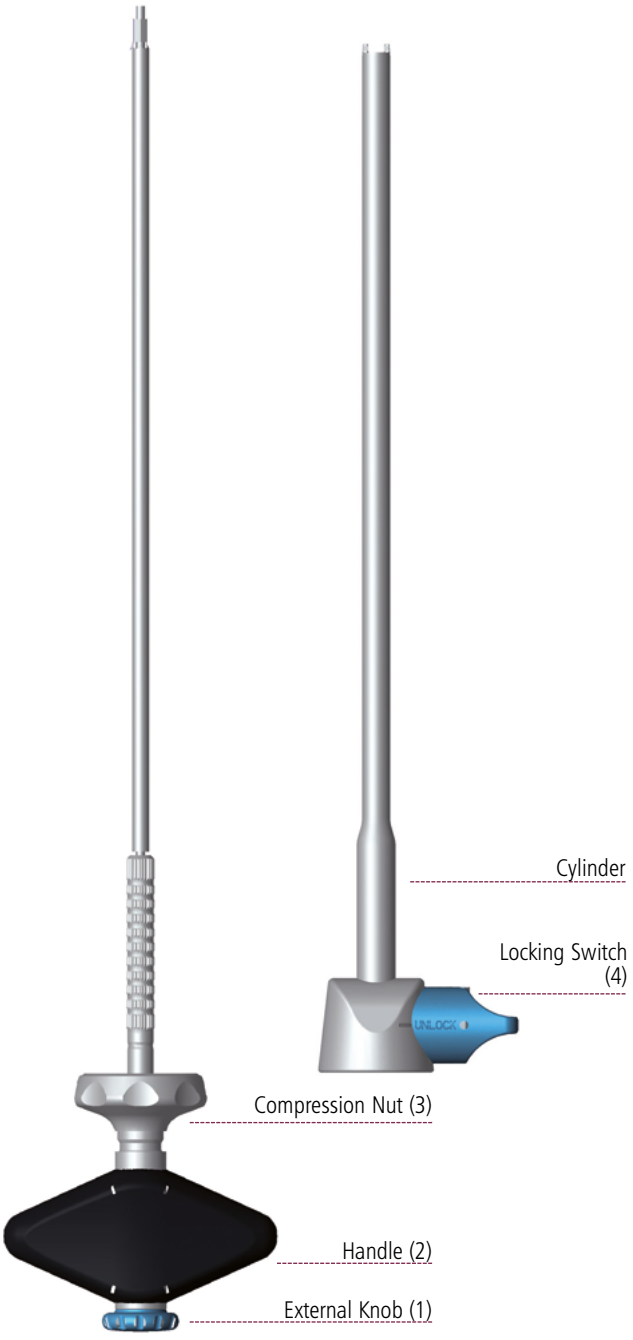
The Cephalic Wire Guide is kept in the distal position and, depending on parallel or convergent configuration of the proximal screw, the skin incision area is identified using the Cephalic Screw Guide inserted in the correct position on the Handle and pushed down to the skin. The skin is incised and a track made down to the bone by blunt dissection as before. The Screw Guide with Trocar is inserted down to the bone and locked in place with the Screw Guide Locking Cam (17926).

The Trocar is removed, and the Cephalic Drill Bit (17970) inserted until its wider base reaches the top of the Screw Guide.



INSTRUMENTATION

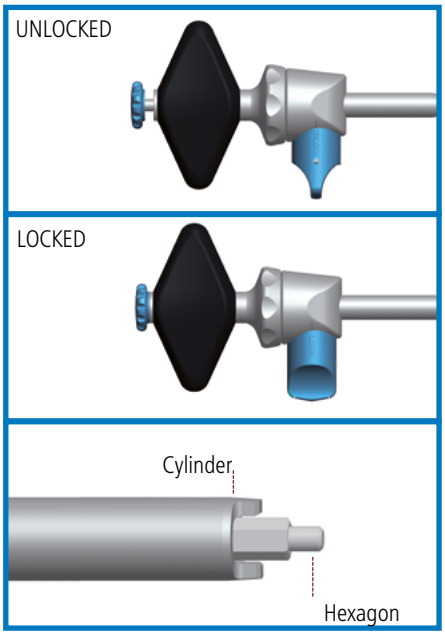
17970
Cephalic Drill Bit,
Ø 7.5mm

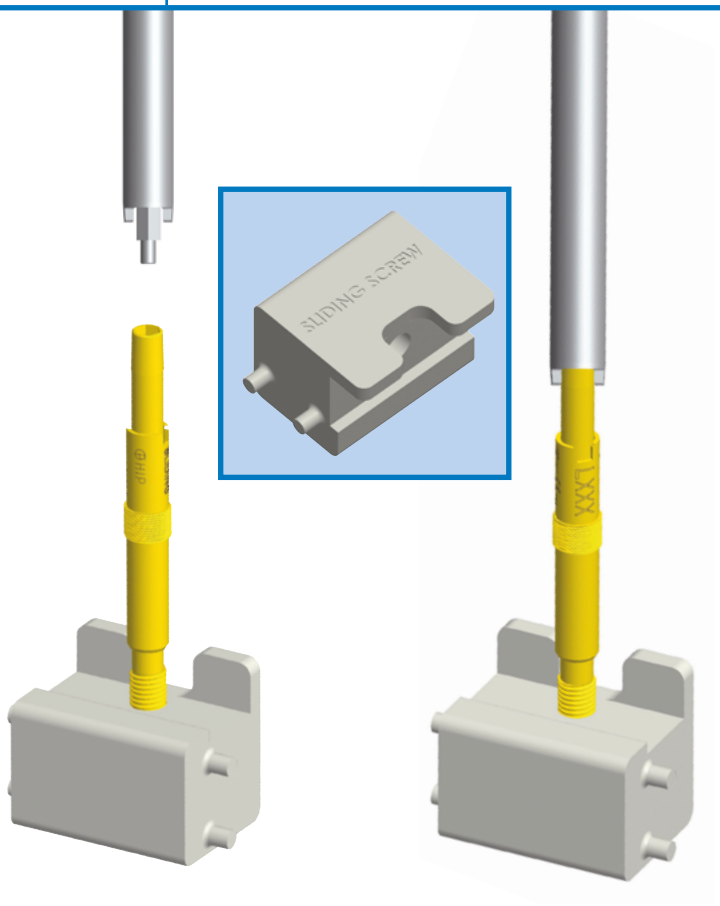


The Drill Bit is removed, and the correct length screw inserted with the Cephalic Screwdriver (17963).

The Cephalic Screwdriver comprises:
a) Rod with External Knob (marked 1), Handle (marked 2) and Compression Nut (marked 3)
b) Cylinder with a Locking Switch (marked 4)

The Locking Switch is turned 90° anti-clockwise to loosen the Cylinder (UNLOCK position).
For screw attachment, the Handle should be moved up into contact with the Cylinder.
The locking switch is turned 90° to lock it in place.



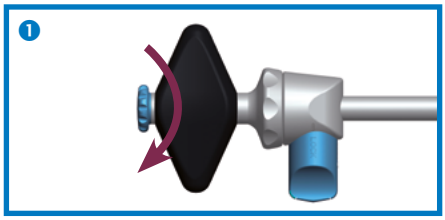


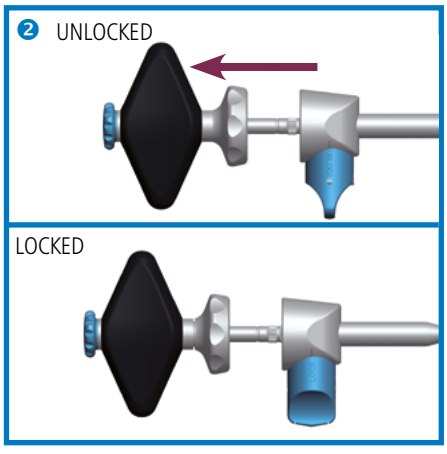
Parallel sliding screws
The screw should ALWAYS be yellow for parallel sliding screw configuration.

YELLOW SLIDING AND GREEN FIXED SCREWS SHOULD NEVER BE USED TOGETHER, because there is a risk of screw breakage owing to differential loading.

With the screw placed into the appropriate recess in the steri-box, the hexagon of the screwdriver is inserted into the end of a sliding screw of the correct length.

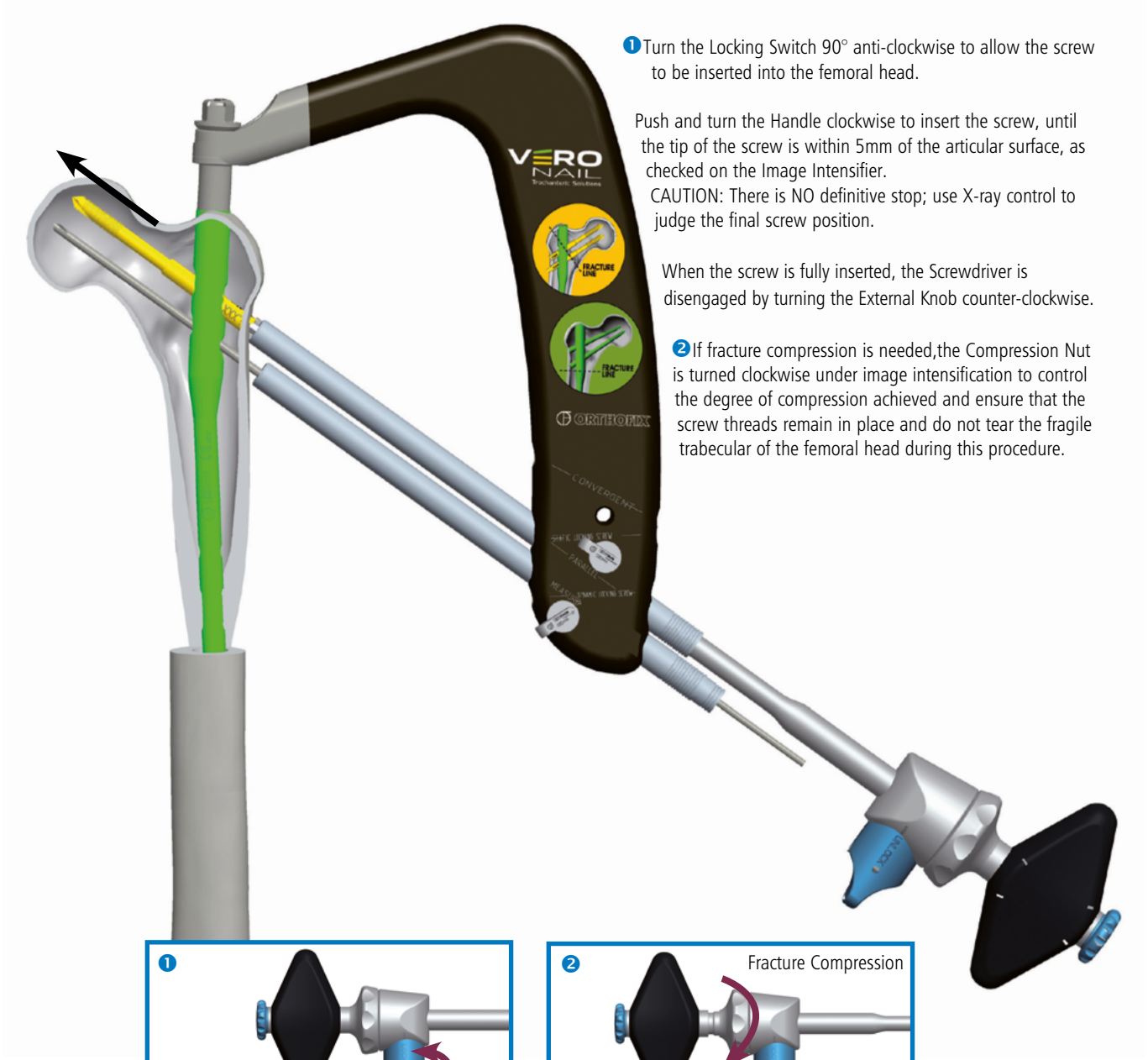
1. Lock screw in place by pushing and turning the External Knob clockwise.
2. Turn the Locking Switch 90° counter-clockwise into the UNLOCK position, and pull Handle from Cylinder, to advance barrel up to the screw thread. Turn the Locking Switch 90° clockwise (LOCK position).





The screw is now inserted through the Screw Guide into the hole in the nail. The Handle (marked 2) is turned clockwise to engage the thread on the screw sleeve into the nail, until a definitive stop is reached.

The screw sleeve must be firmly screwed into the nail before the screw is advanced.



❶ Turn the Locking Switch 90° anti-clockwise to allow the screw to be inserted into the femoral head.

Push and turn the Handle clockwise to insert the screw, until the tip of the screw is within 5mm of the articular surface, as checked on the Image Intensifier.
CAUTION: There is NO definitive stop; use X-ray control to judge the final screw position.

When the screw is fully inserted, the Screwdriver is disengaged by turning the External Knob counter-clockwise.

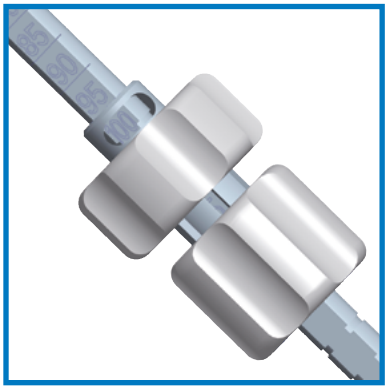
❷ If fracture compression is needed,the Compression Nut is turned clockwise under image intensification to control the degree of compression achieved and ensure that the screw threads remain in place and do not tear the fragile trabecular of the femoral head during this procedure.

The distal K-Wire and related Wire Guide are removed. The Cephalic Drill Bit (17970) is used as before until it will pass no further.

The Drill Bit is removed, and the correct size of screw inserted with the Cephalic Screwdriver. Care should be taken that the sleeve of the sliding screw or the shaft of the locked screw are tightened firmly into the nail.

Note: If the distal screw is very close to the calcar and screw insertion is difficult, the 7.5mm diameter Optional Calcar Drill Bit (17971) can be used to open up the screw track. The Calcar Drill Stop (17946) must be set to the correct length before starting drilling. The drilled section will then be the same length as the unthreaded portion of the screw.

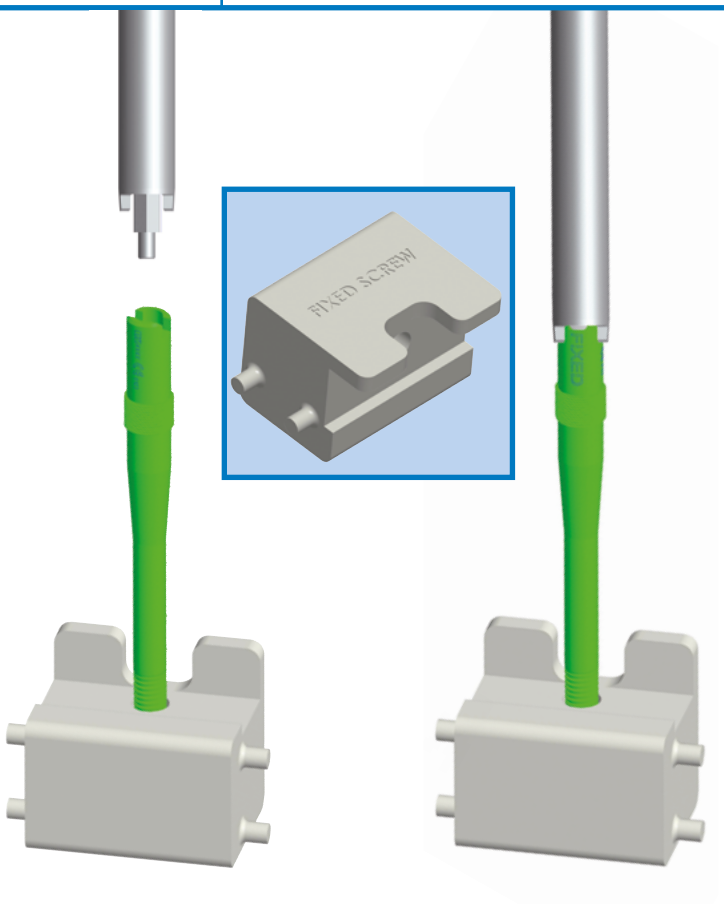
If the fracture has been compressed, check the position of the distal K-Wire and reassess the length of the distal screw using the Screw Ruler.



The second screw is then inserted using the same procedure as described for the first Cephalic Screw.

17971
Optional Calcar Drill Bit, Ø 7.5mm

17946
Calcar Drill Stop



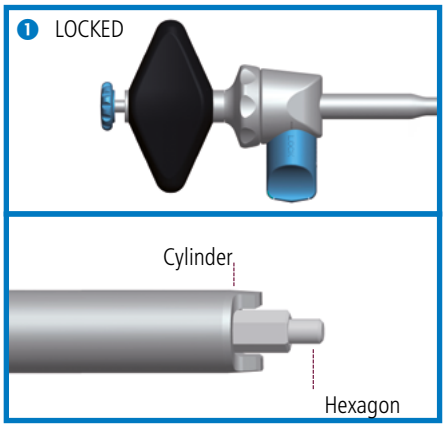
Convergent locked screws
The screws should ALWAYS be green for convergent locked screw configuration.

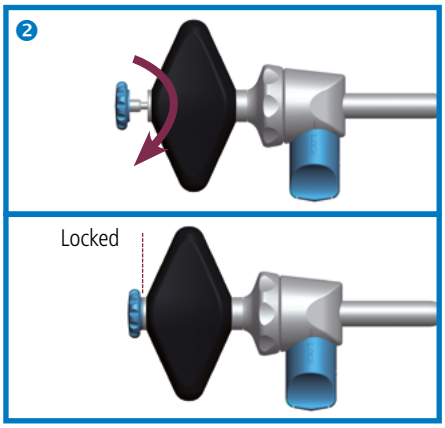
Green screws: these are locked into the nail and do not slide. They should NOT be used in trochanteric fractures of types 31.A1 and 31.A2, but only in trochanteric fractures types 31.A3 and in fractures in which the screws will not cross the fracture site. The green screws are normally used in a convergent configuration.

YELLOW SLIDING AND GREEN FIXED SCREWS SHOULD NEVER BE USED TOGETHER, because there is a risk of screw breakage owing to differential loading.

The Locking Switch is turned 90° counter-clockwise to loosen the Cylinder (UNLOCK position).
The Handle should be in contact with the Cylinder.

1. The Locking Switch is then locked with the hexagon protruding from the end of the cylinder. With the Cephalic Screwdriver locked in the position described, the hexagon is inserted into the head of the screw, which was previously placed into the appropriate recess in the steri-box.
2. The screw is locked in place by pushing and turning the External Knob, ensuring that the projections on the end of the cylinder fit into the matching recesses in the screw.

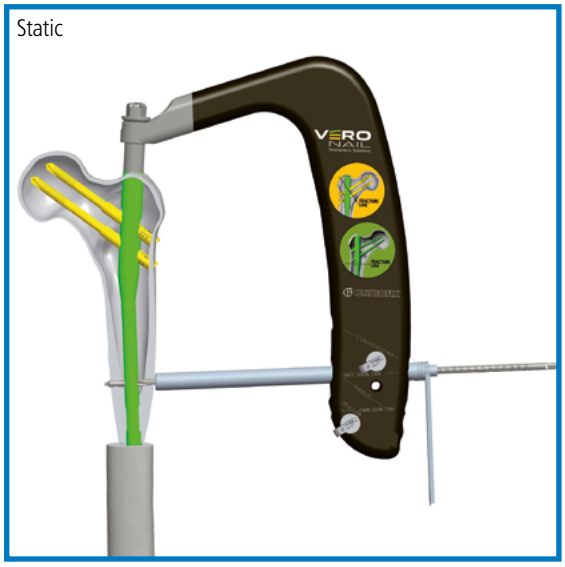




The screw is inserted through the Screw Guide into the nail, and screwed into place until a firm end point is reached. The screw should now be completely inserted and locked into the nail, and the position is confirmed by Image Intensifier.

The Screwdriver is disengaged by turning the External Knob counter-clockwise.

Static



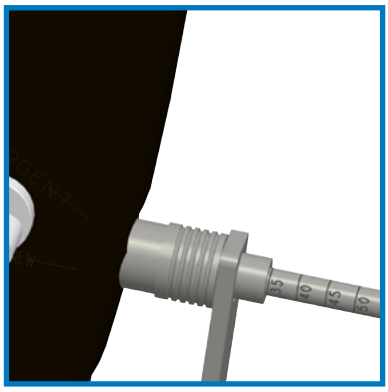
Distal locking

Short nail

Distal locking, when necessary, is performed in the proximal position (round hole) for static locking, or in the distal position (oval hole) for dynamic locking, as shown by the markings on the Handle. The Screw Guide (17942) is used to mark the skin, which is incised and the bone exposed by blunt dissection. The screw guide is inserted with a Trocar down to the bone and locked in place. By using the Trocar, the Screw Guide is inserted until it comes into contact with bone.

The Trocar is removed, the Drill Guide (17943) inserted, and both cortices drilled with the 4.8mm Graduated Drill Bit (1102001).

Dynamic



The length of the locking screw is read from the scale on the Drill Bit immediately above the top of the Drill Guide (see inset).

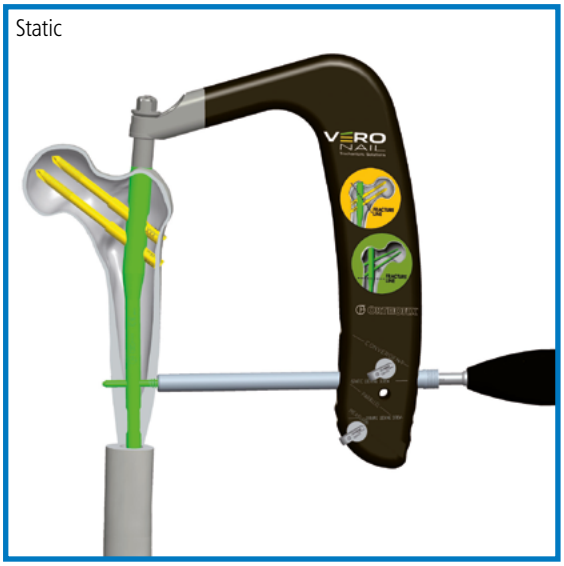
INSTRUMENTATION

17942
Screw Guide

17943
Drill Guide

1102001
4.8mm
Graduated
Drill Bit

Static



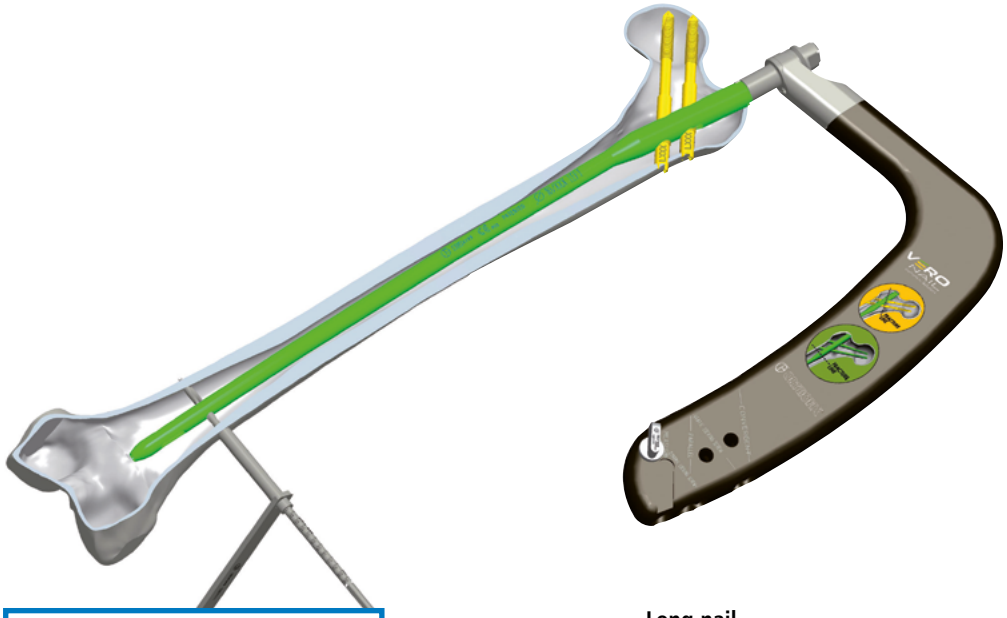
Dynamic

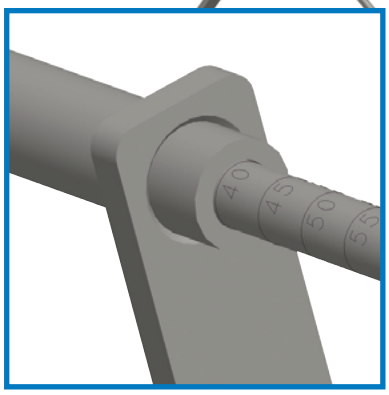
The correct size locking screw is inserted with the 3.5mm Cannulated Screw Driver (173320).

Note: the locking screw is threaded on the external end only, so at first it is just pushed and only afterwards screwed to anchor the thread in the first cortex.

Additionally, the head of the distal locking screw is threaded to permit implant removal if necessary. The head of the screw should not be recessed into the lateral cortex.

173320
3.5mm
Cannulated
Screw Driver





Long nail

Distal locking in the long nail is performed with a free hand technique. The Image Intensifier is moved to a true lateral position in the usual way, by obtaining a perfect circle at the level of the static hole. The locking hole is drilled by whatever technique the surgeon favours. Once the short 4.8mm drill bit (17976) has been inserted, the Short Drill Guide (17949) can be passed over it down to the bone, and the length of the locking screw read at the top of the drill guide (see insert).

Note: the locking screw is threaded on the external end only, so at first it is just pushed and only afterwards screwed to anchor the thread on the first cortex.

INSTRUMENTATION

17976
Short Graduated Drill Bit

17949
Short Drill Guide

The Screw Guide is removed, and the Locking Rod loosened with the 6mm Polyhedral T-Handle Wrench and the Handle removed. The nail end cap (T79401) is inserted. For ease of insertion, it is useful to push the cap onto the Cannulated Screw Driver (173320), and the K-Wire (173287) into them both. The wire is inserted into the top of the nail, and used to guide the Screw Driver and end cap into position, where it is tightened.

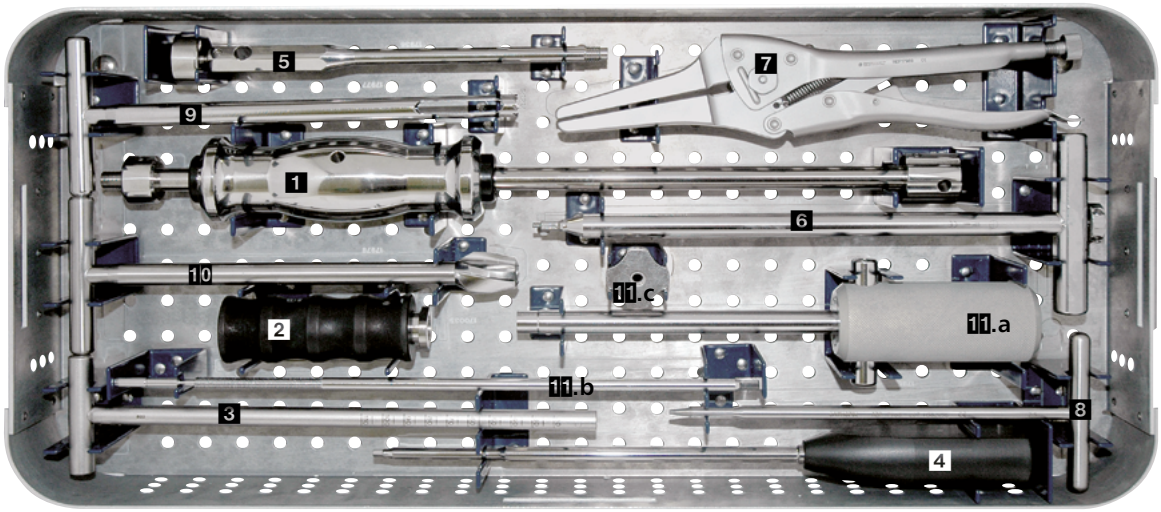
POST-OPERATIVE MANAGEMENT

The patient may be allowed to sit up on the first post-operative day. In stable fractures (31.A1), full weightbearing should begin immediately. In less stable fractures, the patient will generally regulate the amount of weightbearing, and studies have shown that they tend to fully weightbear only when the fracture is stable as a result of compaction and/or callus formation. Therefore the advice should be that they can weightbear as tolerated by the limits of pain. In all cases, hip and knee mobility, within pain limits, should always be encouraged. The best clinical results are obtained by encouraging mobility and full weightbearing as early as possible, within pain limits, and according to the patient's specific local and general conditions.

T79401
Nail End Cap

NAIL EXTRACTION

The instruments are available in a specific sterilisation box (17996) that comprises:

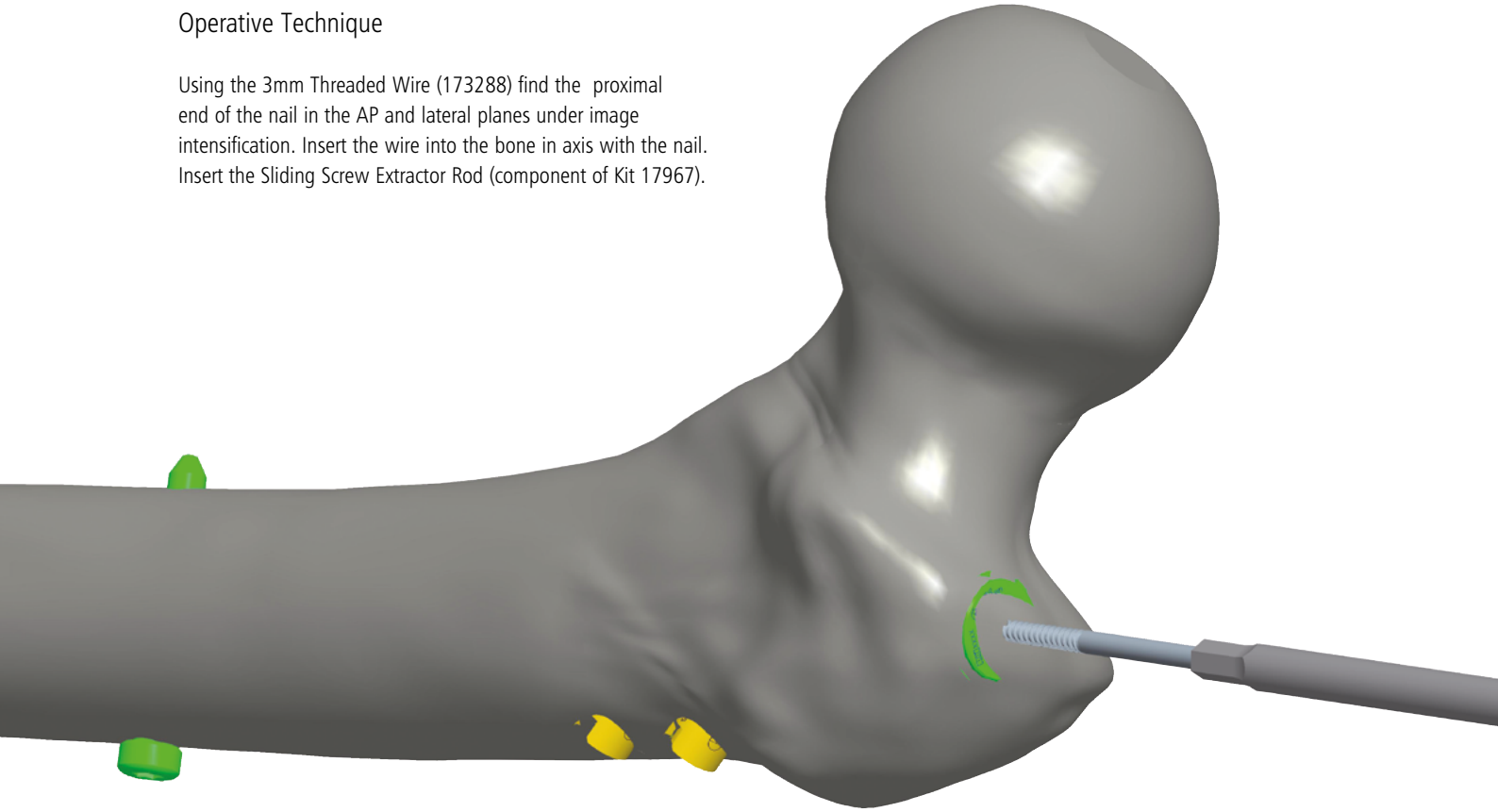


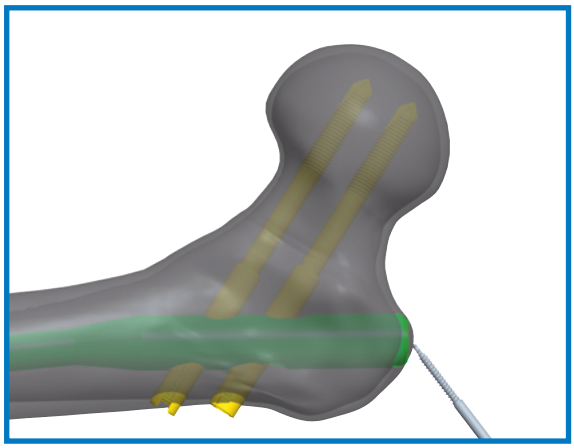
Tray			
Part #		Description	Qty
173370	1	SLIDING HAMMER	1
170035	2	BLACK HANDLE WITH BAYONET FITTING	1
17652	3	LOCKING SCREW EXTRACTOR	1
173320	4	CANNULATED SCREW DRIVER	1
17936	5	VERONAIL EXTRACTOR	1
17966	6	HEX SCREW DRIVER	1
17969	7	NEEDLE NOSE LOCKING PLIERS - 9 1/2"	1
17968	8	EXTRACTOR DIAMETER 2,5 MM	2
17977	9	MANUAL TRAPHINE	1
17978	10	PLIER CUTTER	1
17967	11	SLIDING SCREW EXTRACTOR (KIT)	1

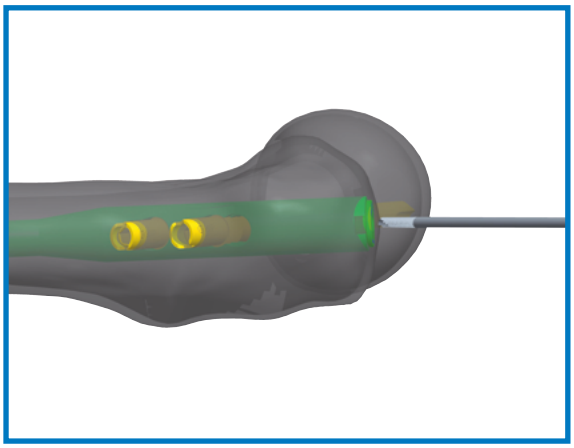
MATERIAL OUT OF THE TRAY	
K-Wire d. 2 x 200mm	173287
Threaded Wire 3 x 400mm	173288

Operative Technique

Using the 3mm Threaded Wire (173288) find the proximal end of the nail in the AP and lateral planes under image intensification. Insert the wire into the bone in axis with the nail. Insert the Sliding Screw Extractor Rod (component of Kit 17967).



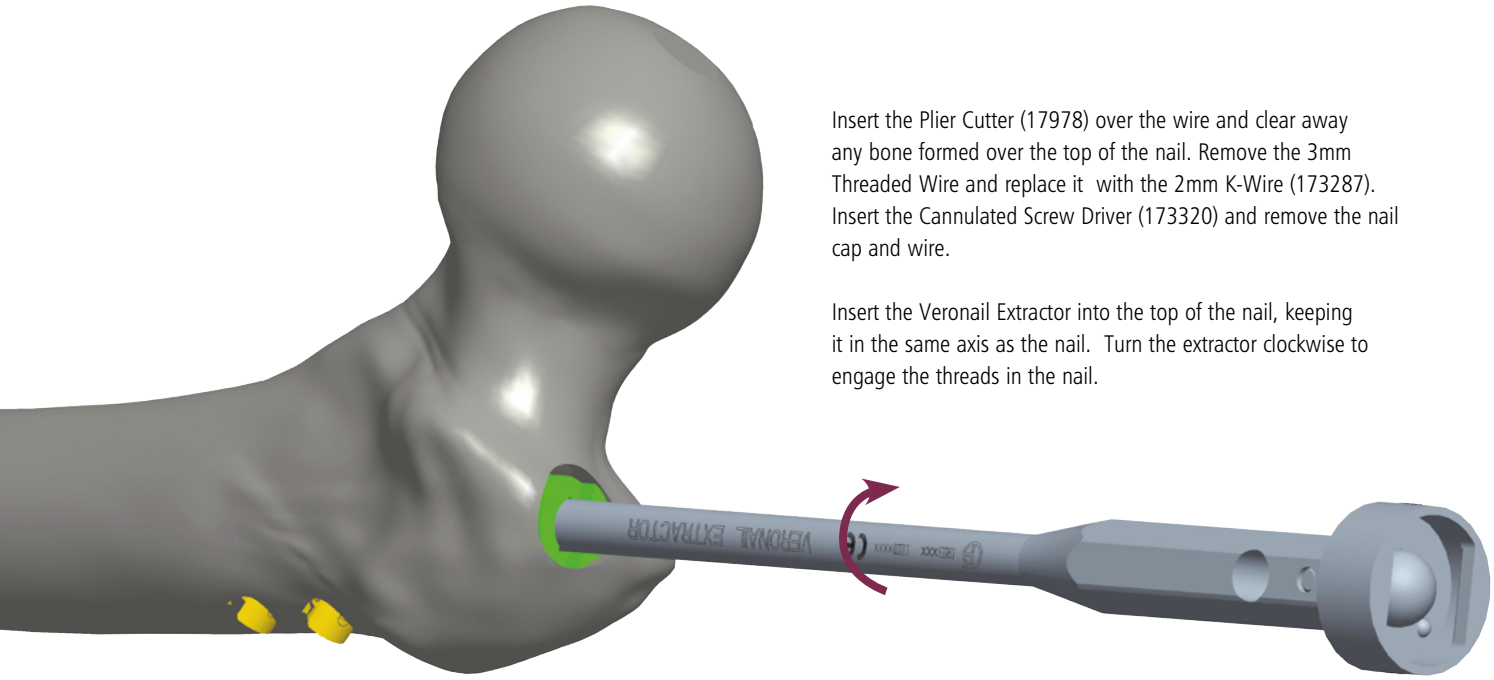




INSTRUMENTATION

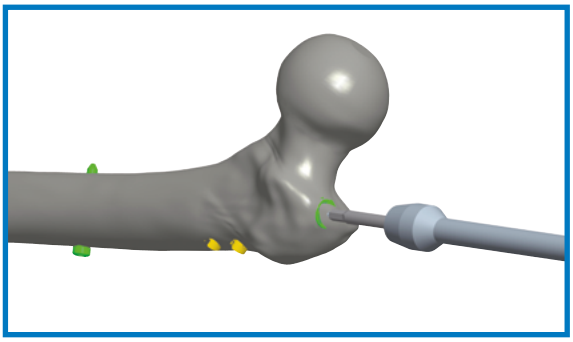
173288
Threaded Wire
3x400mm

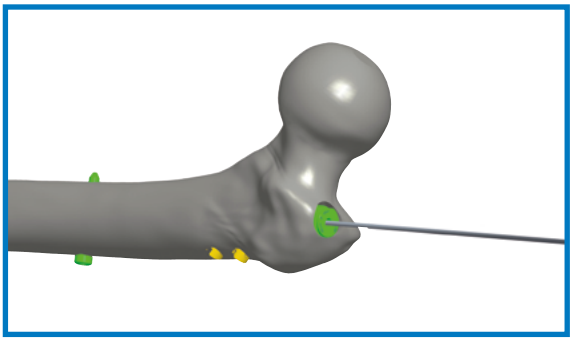
17967
Sliding Screw Extractor
Rod

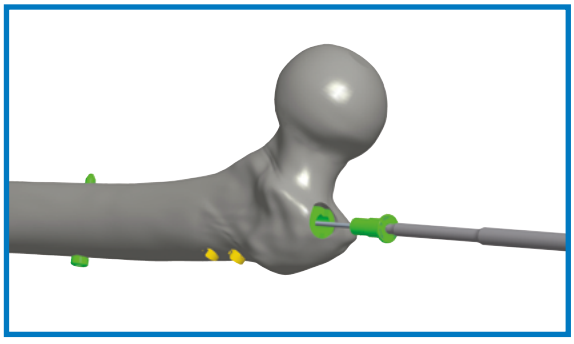


Insert the Plier Cutter (17978) over the wire and clear away any bone formed over the top of the nail. Remove the 3mm Threaded Wire and replace it with the 2mm K-Wire (173287). Insert the Cannulated Screw Driver (173320) and remove the nail cap and wire.

Insert the Veronail Extractor into the top of the nail, keeping it in the same axis as the nail. Turn the extractor clockwise to engage the threads in the nail.







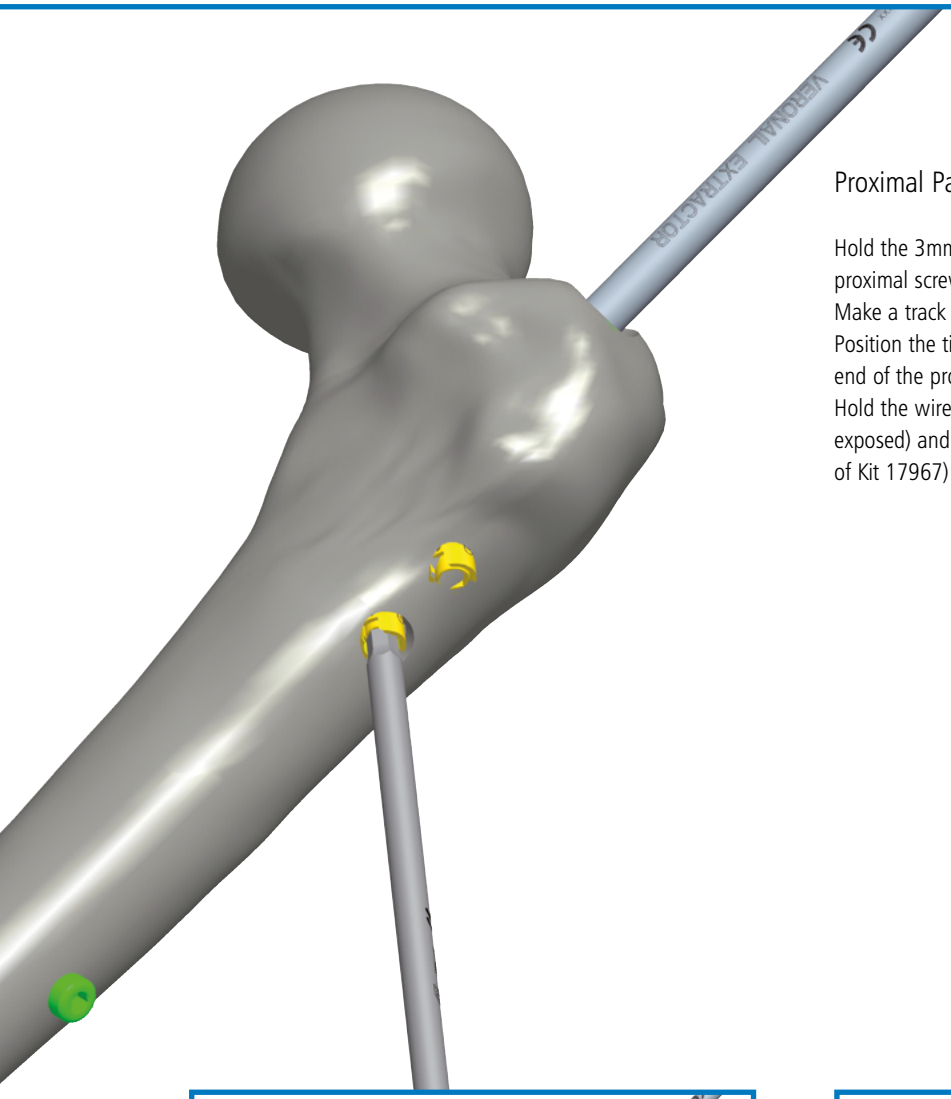
INSTRUMENTATION

17978
Plier Cutter

173287
K-Wire 2mm

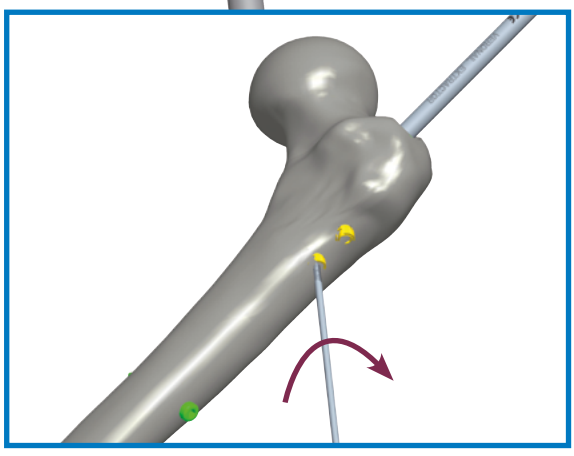
173320
Cannulated Screw Driver

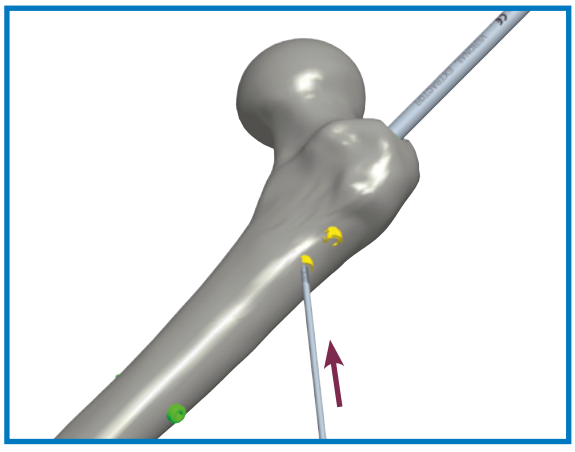
17936
Veronail Extractor



Proximal Parallel Sliding Screws

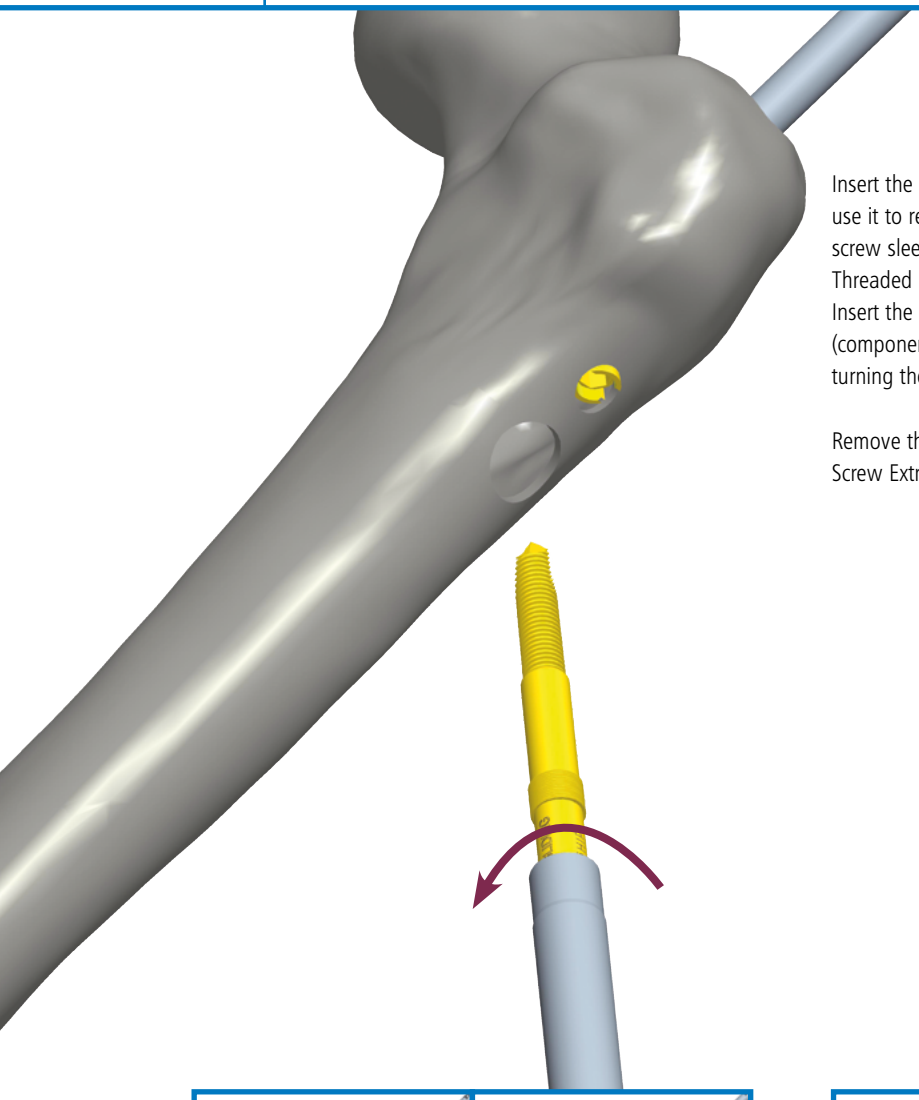
Hold the 3mm Threaded Wire (173288) in line with the proximal screws to guide the position of the skin incision. Make a track down to the bone with blunt dissection. Position the tip of the 3mm Threaded Wire (173288) over the end of the proximal sliding screw under image intensification. Hold the wire in the bone (or in the end of the screw if it is exposed) and insert the Sliding Screw Extractor Rod (component of Kit 17967) over the wire.





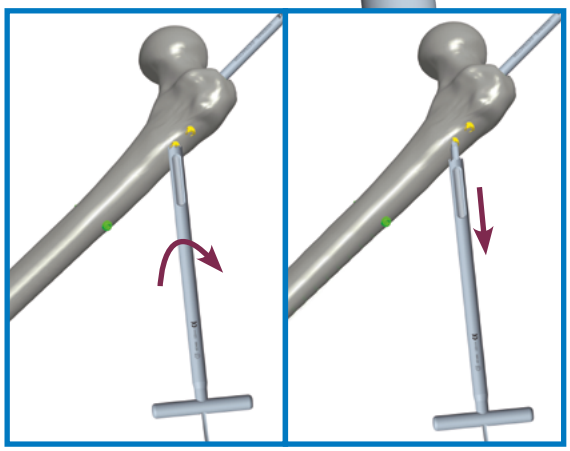
173288
Threaded Wire
3x400mm

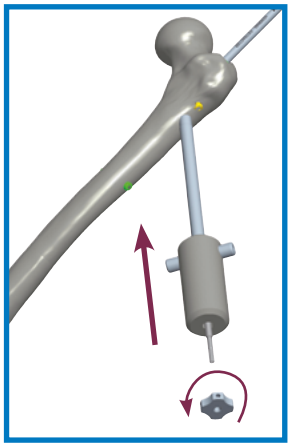
17967
Sliding Screw Extractor
Rod



Insert the Manual Trephine (17977) over the Extractor Rod and use it to remove the bone around the outer end of the sliding screw sleeve. Remove the Manual Trephine and the 3mm Threaded Wire, leaving the Sliding Screw Extractor Rod in place. Insert the 3mm Wire and the Sliding Screw Extractor Handle (component of Kit 17967) over the rod and lock it in place by turning the nut (component of Kit 17967) COUNTER-CLOCKWISE.

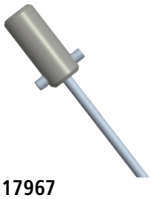
Remove the proximal parallel sliding screw by turning the Sliding Screw Extractor Handle counter-clockwise.





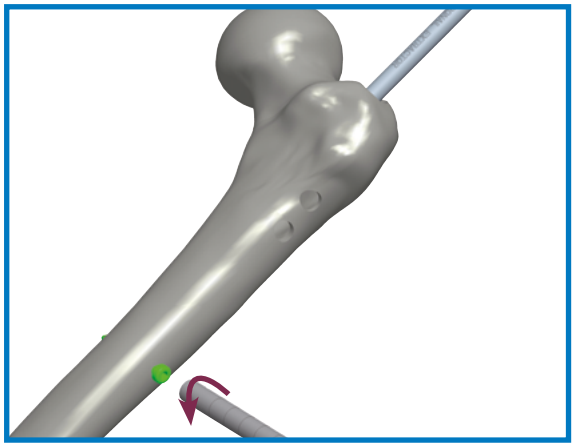
INSTRUMENTATION

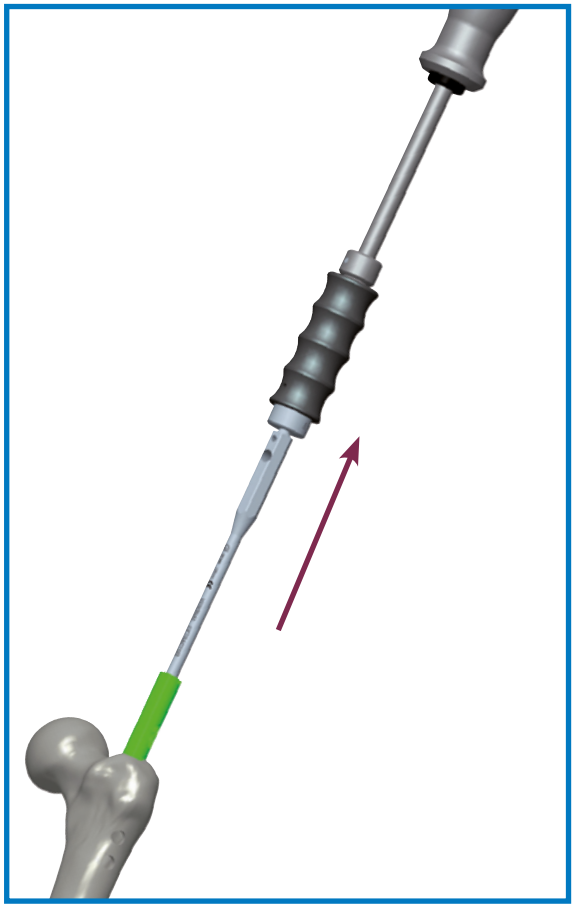
17977
Manual Trephine



17967
Sliding Screw Extractor Handle

17967
Nut





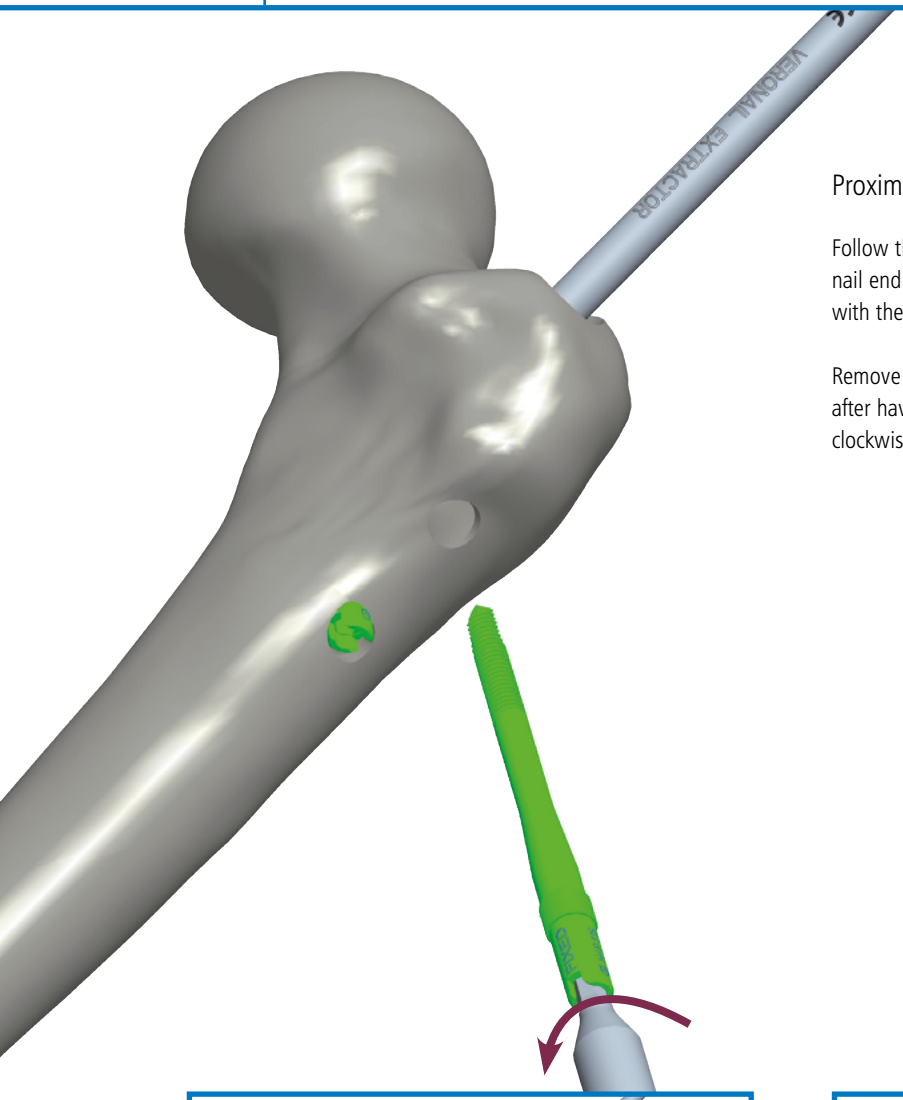
Remove the distal screws using the Locking Screw Extractor (17652).

Attach the Extractor Handle (170035) to the Veronail Extractor and then the Sliding Hammer (173370). Remove the nail by reverse hammering.

17652
Locking Screw Etractor

170035
Extractor Handle

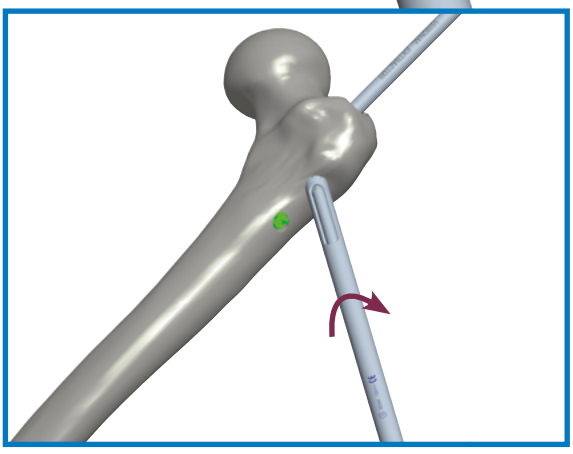
173370
Sliding Hammer

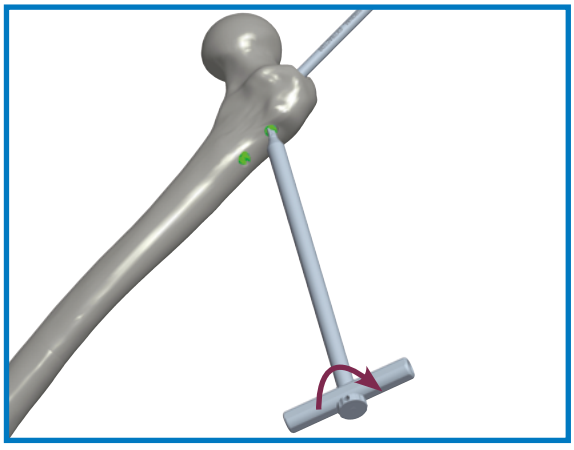


Proximal Fixed Screws

Follow the procedures described on pages 29-31 to remove the nail end cap and clean the bone around the proximal screws with the Manual Trephine.

Remove the proximal screws with the Hex Screwdriver (17966), after having locked it to the screw by turning the external knob clockwise.

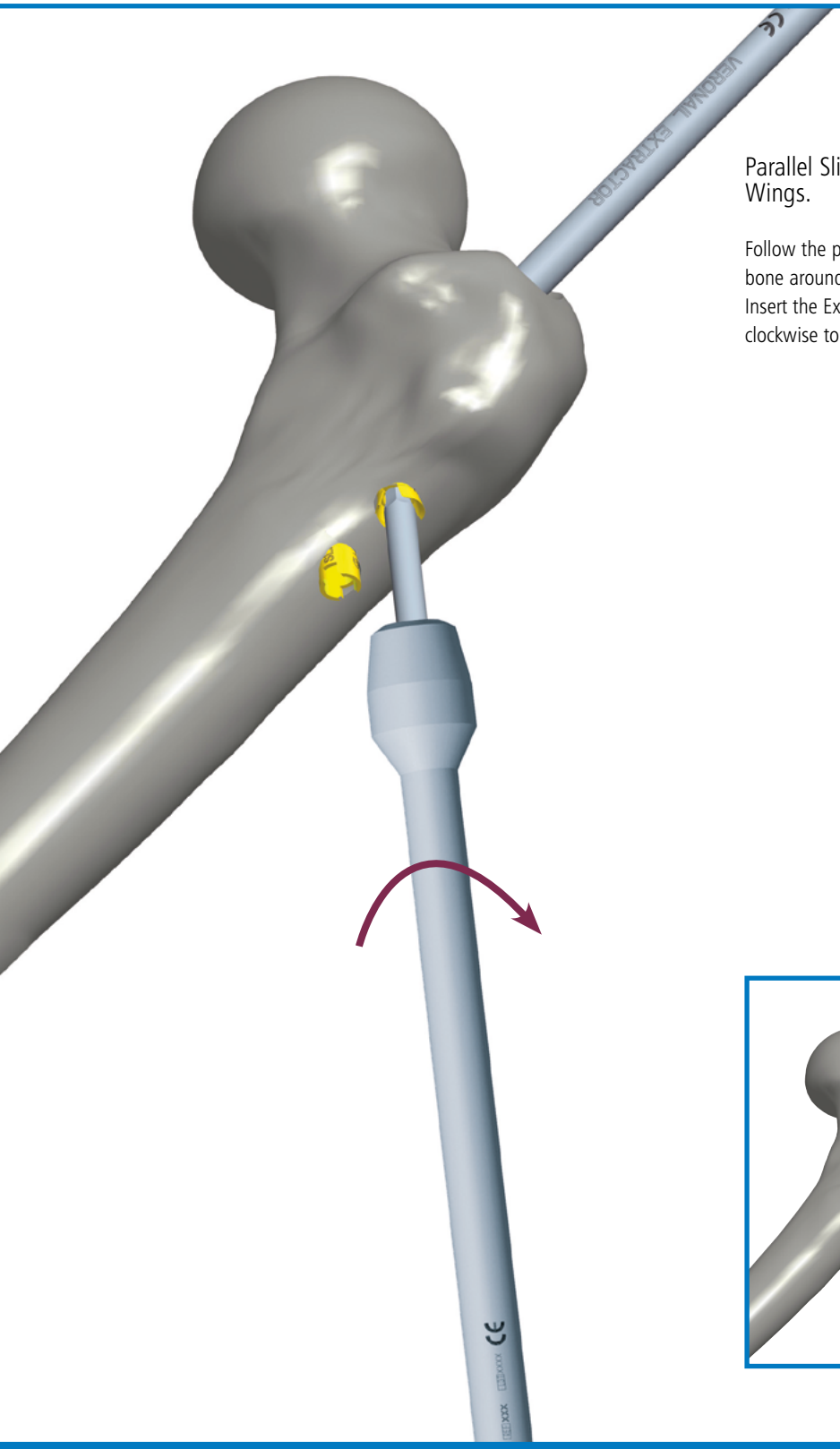




INSTRUMENTATION

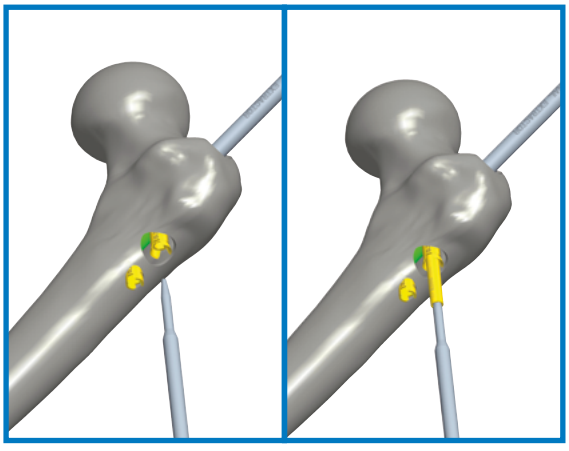
17977
Manual Trephine

17966
Hex Screwdriver



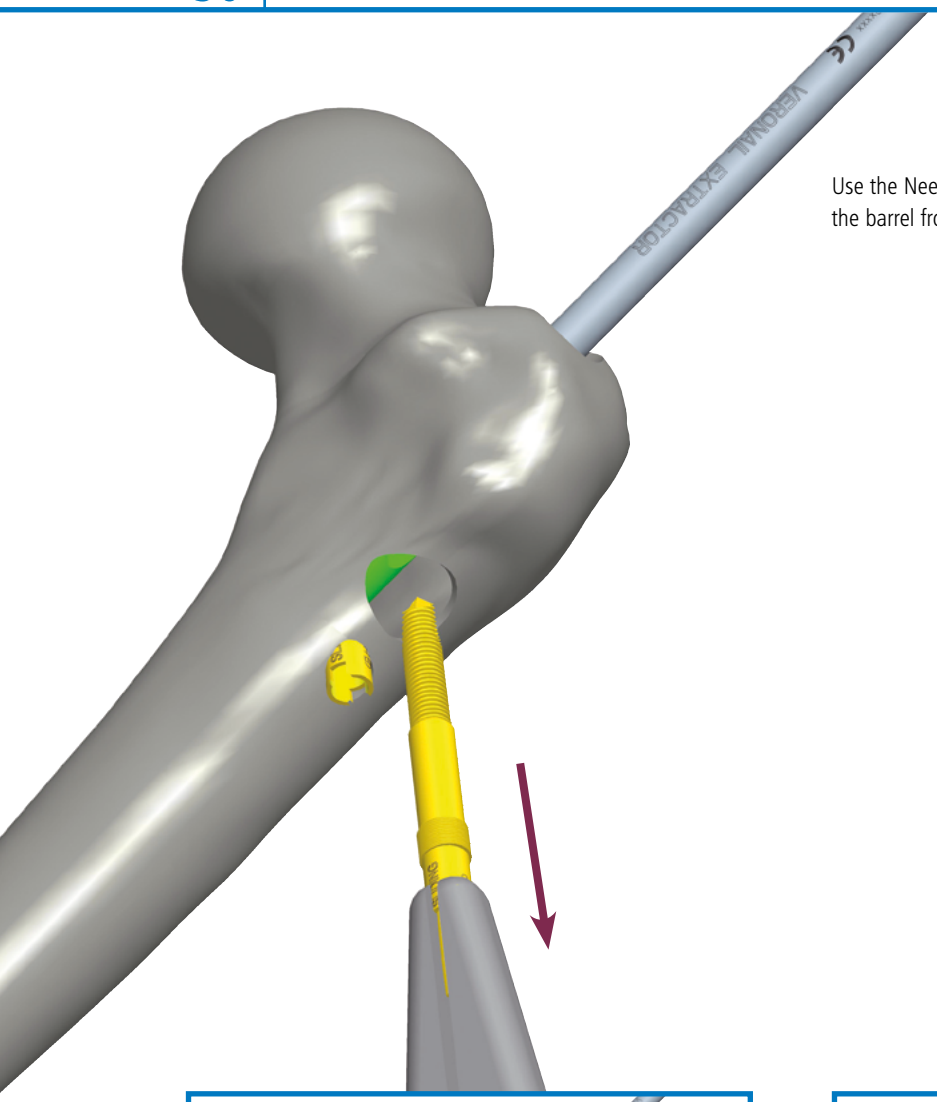
Parallel Sliding Locking Screws With Damaged Wings.

Follow the procedures described on pages 29-31. Clean the bone around the proximal screws with the Plier Cutter (17978). Insert the Extractor Diameter 2.5mm (17968) and turn it anti-clockwise to loosen the inner part of the sliding screw.

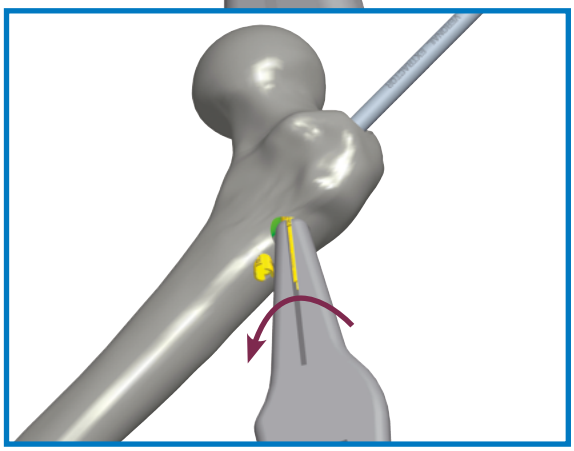


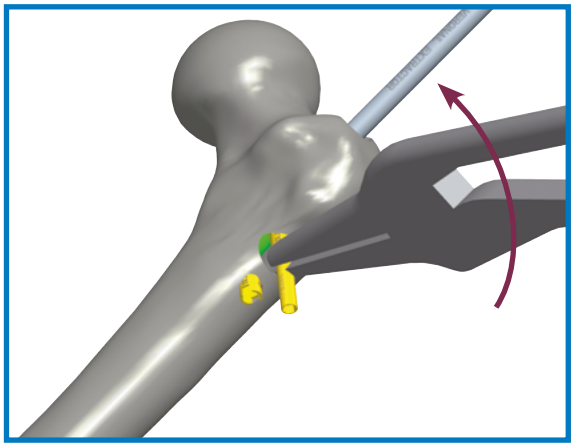
17978
Plier Cutter

17968
Extractor Diameter 2.5mm



Use the Needle Nose Locking Pliers 9 1/2 (17969) to unscrew the barrel from the nail and remove the proximal locking screw.





INSTRUMENTATION

17969
Needle Nose Locking
Pliers
9 1/2"

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.

Electronic Instructions for use available at the website http://ifu.orthofix.it

Electronic Instructions for use - Minimum requirements for consultation:
- Internet connection (56 Kbit/s)
- Device capable to visualize PDF (ISO/IEC 32000-1) files
- Disk space: 50 Mbytes

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