TRAUMA & EXTREMITIES GROUP

ATN™ Trochanteric Nail

SURGICAL TECHNIQUE

DePuy
a Johnson & Johnson company

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ATN™ NAIL SYSTEM DESIGN RATIONALE

The ATN™ Trochanteric Nail System treats a wide range of proximal femoral fracture indications using a single set of user-friendly instruments. The ATN™ system is designed to provide improved resistance to cut-out and improved rotational control as compared to single screw fixation (i.e. one lag screw). The result is true rotational stability.

The nail, manufactured from TiMAX™ anodized titanium alloy for high fatigue strength and optimal stress transfer, can be used in conjunction with a single lag screw and/or an optional anti-rotation (AR) screw to maintain re-alignment of unstable fractures. The screws are closely spaced so most patient anatomies can accommodate both if required. An extensive range of neck/shaft angles, distal diameters and nail lengths – combined with the smaller proximal nail diameter – allow the surgeon to achieve a close match for each patient's anatomy. Reduced proximal nail height, together with a range of end cap sizes, allows the nail to be correctly seated and remain flush with the greater trochanter.

The instruments for this procedure are colour-coded and laid out for easy identification and correct selection. The radiolucent insertion and targeting jig allows good fluoroscopic visualisation of the nail and anatomy for proximal lag screw, anti-rotation screw and distal static and dynamic screw targeting.

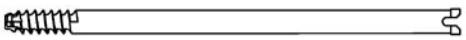
TiMAX™ is DePuy Trauma and Extremities Group's name for the titanium alloy Ti-6A1-4V treated* with a proprietary surface treatment. The increased surface hardness of TiMax™ permits these components to slide more easily relative to one another. The surgical goal for hip fixation is to achieve continuous compressive micromotion at the fracture site. The ability of the lag screw to effectively slide within the hip screw barrel is critical to achieve this goal.

* TiMax™ = Ti-6A1-4V + Proprietary Surface Treatment

IMPLANT SCHEMATIC

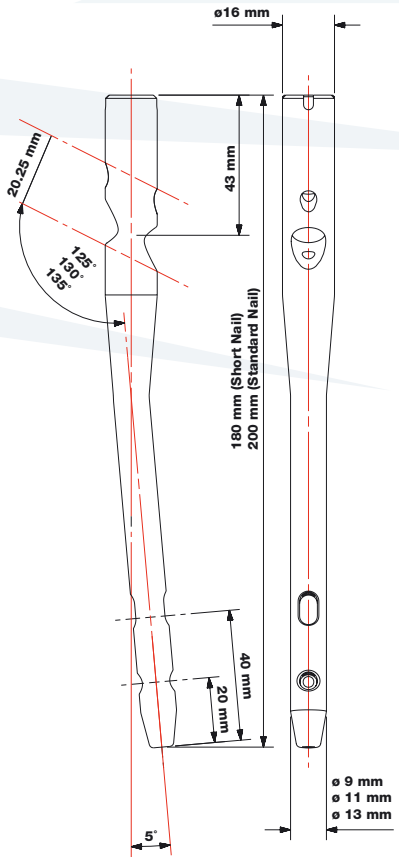
End Cap
0 - 25 mm
Sterile: 9032-08-0XX

Solid Cortical Bone Screw ø 4.5 mm
30 - 60 mm
Sterile: 8050-45-0XX
Non Sterile: 14022-XX



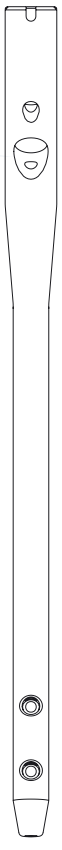
Anti-Rotation Screw ø 5 mm
60 - 100 mm
Sterile: 9033-05-XXX

Lag Screw ø 10.5 mm
60 - 120 mm
Sterile: 9033-11-XXX



Short Nail
180 mm

Standard Nail
200 mm



Long Nail
320 - 420 mm

See page 22 for full product code details

INDICATIONS/CONTRAINDICATIONS

The ATN™ Nail System* is designed for antegrade trochanteric insertion to treat the following fractures:

ATN™ (180 AND 200 MM)

Indications

The ATN™ Trochanteric Nail System is intended to treat stable and unstable proximal fractures of the femur including pertrochanteric fractures, intertrochanteric fractures, high subtrochanteric fractures and combinations of these fractures.

Contraindications

- Low subtrochanteric fractures
- Femoral shaft fractures
- Isolated or combined medial femoral neck fractures
- 9 mm Nail is intended for use with smaller patients

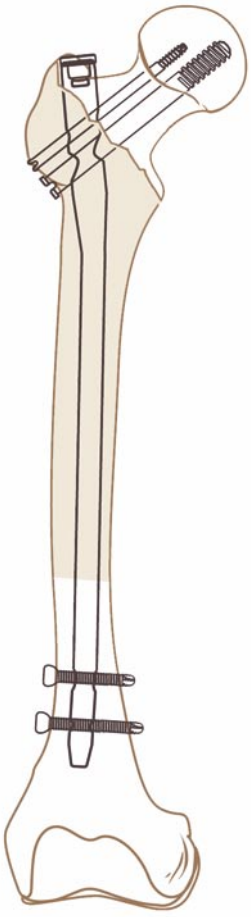
LONG ATN™ (320 - 420 MM)

Indications

The ATN™ Trochanteric Long Nail System is also indicated to treat pertrochanteric fractures associated with shaft fractures, pathologic fractures in osteoporotic bone of the trochanteric and diaphyseal areas, long subtrochanteric fractures, ipsilateral femoral fractures, proximal or distal non-unions and malunions and revision procedures.

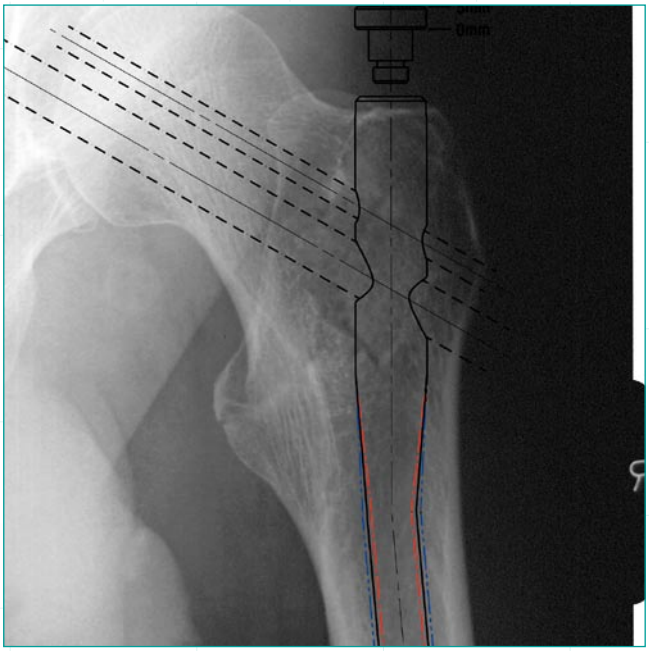
Contraindications

- Isolated or combined medial femoral neck fractures
- 9 mm Nail is intended for use with smaller patients



Please note: Bone screws referenced in this material are not approved for screw attachment or fixation to the posterior elements (pedicles) of the cervical thoracic or lumbar spine.

* System includes short, 180 mm; standard, 200 mm; and long, 320 - 420 mm nail, in 20 mm increments.



PREOPERATIVE PLANNING

The ATN™ Trochanteric Nail System offers the surgeon a comprehensive set of preoperative templates for use with radiographs at 15 percent magnification, in the true anterior/posterior plane. Laid over the uninjured side, these can be used to predict nail and screw size.

Preoperative templating provides a guide for appropriate nail length and neck angle, as well as an indication of the lag screw position, angle and optional AR screw.

Select a template with the appropriate neck angle 125˚, 130˚** or 135˚ and overlay to establish the distal position of the nail along the long axis of the femur.

Establish the lag screw position by adjusting the inferior/superior template position so that the lag screw is in the central to lower third of the femoral neck. Orient the lag screw in line with the axis of the femoral neck. Position the lag screw distal tip approximately 5 - 10 mm from the edge of the subchondral bone of the femoral head. This will estimate the lag screw length required.

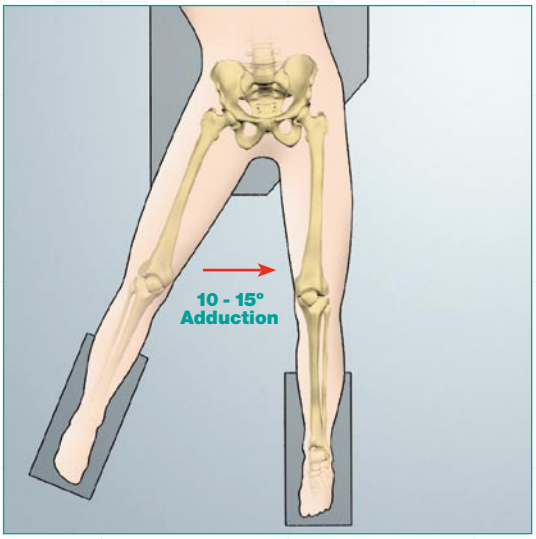
Note: For unstable fractures lacking a medial buttress support and a high degree of osteopenia, it is advised to insert the lag screw 10 mm from subchondral bone.

** 130° is the most frequently used neck angle.

Preoperative Planning, continued

If an AR screw is required, position the lag screw in the lower third of the femoral neck, with the anti-rotation screw within the superior third of the neck. Typically the anti-rotation screw should be 15 – 20 mm shorter than the lag screw. Take care to ensure that the threaded tip of the anti-rotation screw is beyond the fracture.

Distal locking options may be considered pre- or intra-operatively.



Patient Positioning

Place the patient in the supine position on a fracture table or radiolucent imaging table. Lateral access to the proximal femur is required. For the operation, access an image intensifier, or 'C-arm', to obtain fluoroscopic AP and lateral views during preoperative preparation (reduction) and throughout the procedure for nail insertion and locking, and for anteversion alignment. The affected leg must be adducted and the trunk securely bent toward the opposite side. The contralateral leg may be flexed at the hip or scissored below the affected leg.

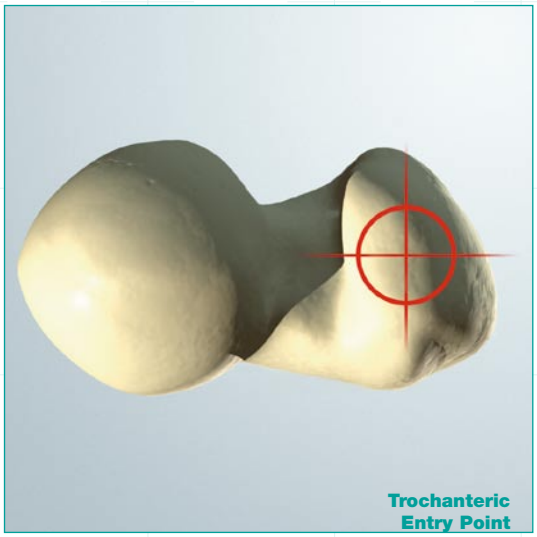
Fracture Reduction

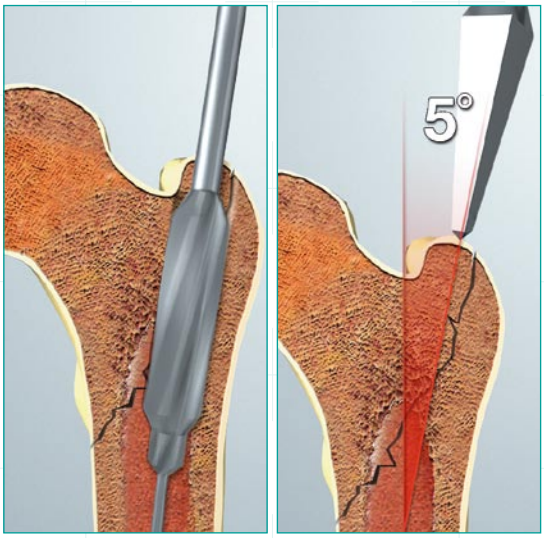
Fluoroscopy must be used to verify proper fracture reduction.

- Anatomic reduction is essential prior to incision.
- Surgeon must avoid varus malreduction.
- Rotation will depend on level of fracture.

Initial Incision

Make an incision proximal to the trochanteric region, in line with the femoral axis. Place a self-locking retractor to open the wound. Divide the fascia lata along its fibres. Access the tip of the greater trochanter.





Femoral Entry Preparation

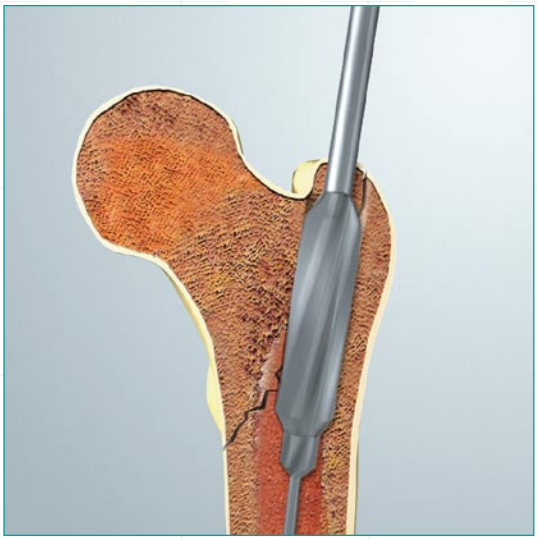
Opening the Femur Option 1:
Cannulated Entry Reamer (One-step 17 mm)
Attach the standard 3.2 mm guide wire to the guide wire grip handle or power source and pass it down through the trochanter into the centre of the femoral canal. Position entry at or slightly lateral to the tip of the trochanter.
Verify the position using fluoroscopic AP and lateral views. Attach the one-step cannulated entry reamer[1]* to the power source and pass it over the guide wire through the tubular skin protector. Use it to create an entry through the greater trochanter into the femoral canal.

Opening the Femur Option 2:
Large Pointed Awl[2]
Use the large pointed awl[2] to make an entry point just at the tip of the greater trochanter centrally anterior to posterior. The entry angle should correspond to the proximal part of the implant: 5 degrees toward the long axis of the femur. Verify the position and entry angle of the AP and lateral view using fluoroscopy. Introduce the awl, with a rotating motion, to at least half its blade length. This allows the reamer clear passage. Place a standard 3.2 mm guide wire through the opening into the femur, allowing introduction of the one-step cannulated entry reamer[1].

Femoral Preparation

Opening the Femur Option 3:
Cannulated Awl
Attach a standard 3.2 mm guide wire to the guide wire grip handle or power source and pass it down through the trochanter into the femoral canal. Pass the cannulated awl[2a] over the guide wire and introduce, with a rotating motion, to at least half its blade length.

* Relates to numbered instrumentation on the fold-out on page 24 at the end of this document.



Proximal Reaming

AP and lateral fluoroscopy are mandatory to confirm depth and reaming position.
Attach the cannulated entry reamer[1] to the T-handle quick couple[6] or powersource and pass it over the guide wire and through the tubular skin protector. It is essential to ream until at least the reamer's proximal shaft passes within the greater trochanter's cortical bone (the reamer nose's cylindrical length matches the implant's proximal portion length, above its tapered section). If access for reaming is inhibited by the soft tissues, attach the quick-couple power adaptor [8] to the reamer to increase the shaft length.

The 17 mm-diameter reamer is 1 mm greater in diameter than the nail to allow free passage of the nail within the proximal femur.

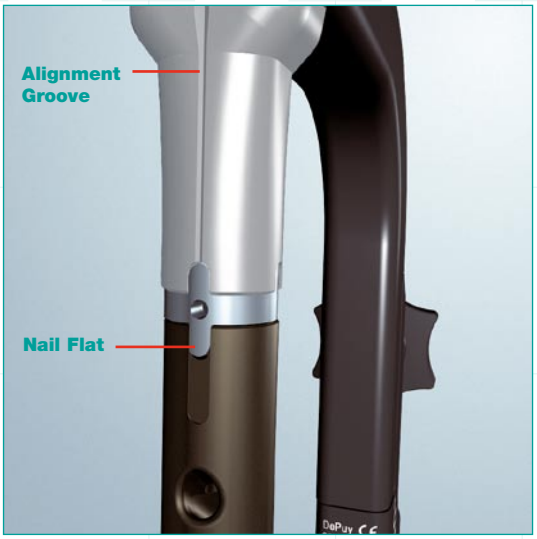
Using standard reamers
If using standard reamers, reaming stops at the appropriate depth and is completed with a 17 mm-diameter reamer, at least to the level of the lesser trochanter.

Jig Assembly

(130º neck angle most commonly used)

Select a targeting module[7] that corresponds to the neck angle determined during preoperative templating. Attach it to the insertion jig[4] and secure it using the targeting module locking nut[5].

Screw the locking bolt[9] using the T-handle locking wrench[3], and pass it through the insertion jig nose.



DO NOT HAMMER THE INSERTION JIG

Jig Assembly

Locate the selected nail on the insertion jig lug. Align the flat on its proximal tip with the groove on the jig's outside face so that the distal tip is oriented toward the targeting module. Once in place, use the T-handle locking wrench 3 to tighten the locking bolt 9 and secure the implant to the jig.

Check the assembly prior to nail introduction. Pass the lag screw sheath 10 through the targeting module. Proper assembly will direct the lag screw drill 14 through the sleeve and through the proximal lag screw hole in the assembled nail. Pass the distal sheath 26 and the 3.8-mm calibrated drill 29 through the targeting module to ensure correct alignment with the distal locking holes.

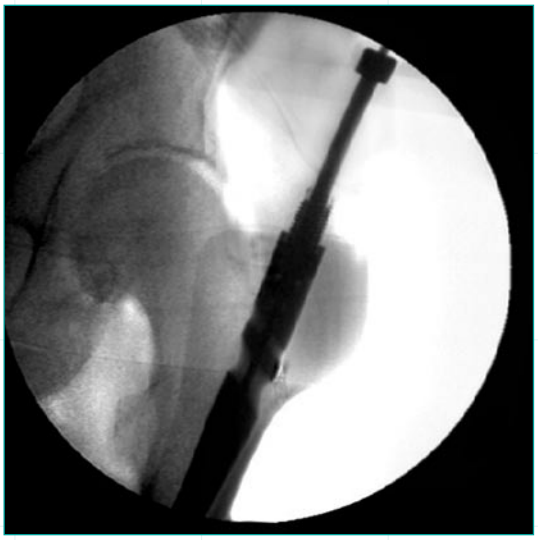
Nail Introduction

Introduce the nail, attached to the jig assembly, into the proximal femur by hand. Passage over the guide wire is optional.

Do not hammer the insertion jig. Do not use a sliding hammer with the short nails. It is only required during nail extraction.

If the nail is difficult to insert, or if fluoroscopy indicates impingement between the nail tip and the medial and anterior cortices, carry out additional proximal reaming to ease the nail introduction.

If extra distal reaming is required, follow a standard reaming technique using a ball nose guide wire and exchange tube.



Nail Introduction

As the nail is inserted, check the insertion depth, using fluoroscopy. This ensures correct lag screw hole alignment with the planned position for the screw in the femoral neck.

This is achieved by laying a guide wire over the targeting module and across the femur. The guide wire should be aligned with the appropriate mark on the targeting module, across the appropriate screw hole in the nail and align with the predicted screw position in the femur. If not, the nail should be moved proximally or distally until it's position is correct.

Maintenance of the reduction must be confirmed. Once the nail is positioned, introduce the lag screw guide wire.

Lag Screw Guide Pin Introduction

Insert the lag screw sheath 10 through the lag screw hole in the insertion jig assembly. Pass the trochar 11 through the sheath and make a suitable incision where the trochar contacts the skin. Push the trochar and sheath through the tissue until firm contact is made with the lateral femoral cortex. Gently tap the trochar tip with a hammer to create a starting point for the guide wire in the cortex. View its position under fluoroscopy.

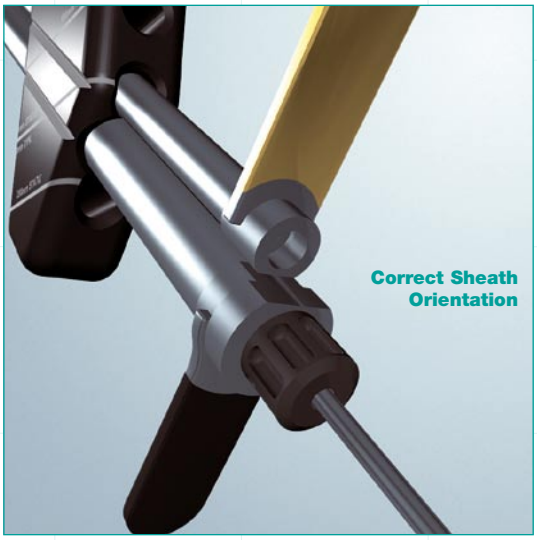
Remove the trochar while the sheath is held against the cortex. Screw the guide pin sheath 12 into the lag screw sheath. If the cortical bone is particularly dense, pre-drill the cortices (using the lag screw drill 13) to avoid bending the guide pin during insertion. Introduce the 3.2 mm guide pin under power through the sheath. Centrally align the pin within the lag screw hole in the nail, and **drill into position under fluoroscopic guidance.** Check the guide pin position within the centre of the femoral head and neck in both AP and lateral planes. Drill the guide pin to approximately 5 mm from subchondral bone.

Note: If at any time a guide pin is bent, replace it immediately.

AR Guide Pin Placement

If using the optional anti-rotation screw, leave the lag screw sheath and guide pin in place to maintain construct rigidity and ensure parallel screw positioning.

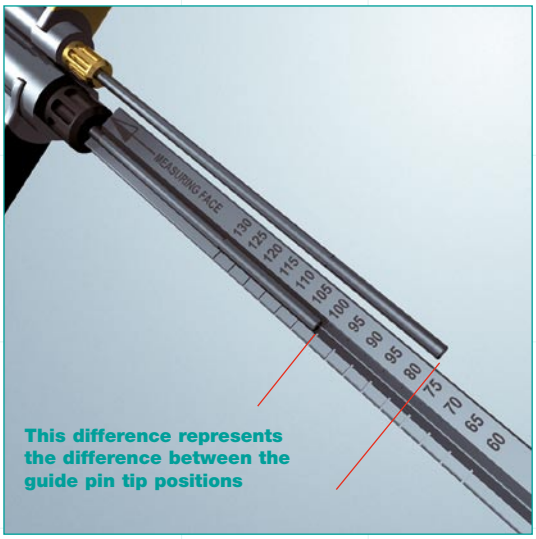
Widen the incision and drive the anti-rotation sheath[20] and trochar[21] into firm contact with the lateral cortex. Gently tap the trochar tip with a hammer to create a starting point for the guide wire in the cortex.



AR Guide Pin Placement

Note: The flat sections on the lag screw and anti-rotation screw sheaths must face each other (so that the coloured handles are at 180°) to allow assembly into the insertion jig.

Remove the trochar and insert the anti-rotation screw guide pin sheath[22] and screw it into the sleeve. If the cortical bone is particularly dense, pre-drill the cortices (using the anti-rotation screw drill[23]) to avoid bending the guide pin during insertion. Pass the 2.5 mm guide pin through the sheath and drill into place. Check the guide pin position during placement in both AP and ML planes, and use fluoroscopy to ensure that it passes through the anti-rotation screw hole centre in the nail and is correctly positioned within the femoral neck and head. Insert the guide pin until its tip is 15 - 20 mm short of the lag screw guide wire tip and is at least 16 mm beyond the fracture to allow firm fixation.

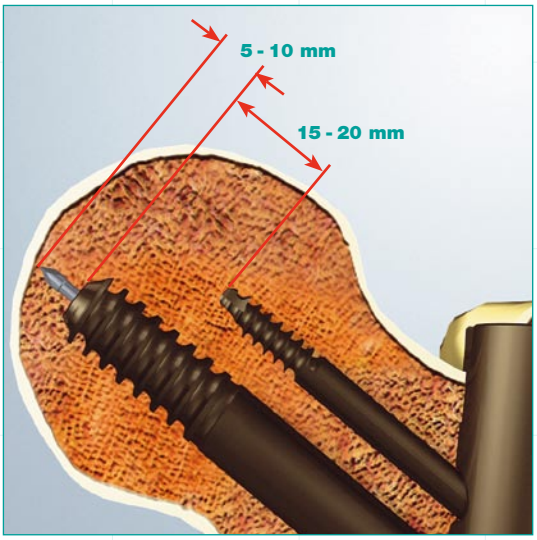


Screw Length Selection

Select the screw length with the lag screw and anti-rotation screw sheaths and guide pins in place.

- Firmly seat both sheaths onto the bone
- The depth gauge[13] is located against the proximal face of each sheath with the guide pin sheaths in place
- The depth gauge[13] measuring face arrow must point toward the sheath
- Read the protruding length of the guide pin
- System measures to the tip of the guide pin

Note: The seperation in between the guide pin tips in the femoral head can be visualised from the seperation of the protruding pins from the instrument sheaths

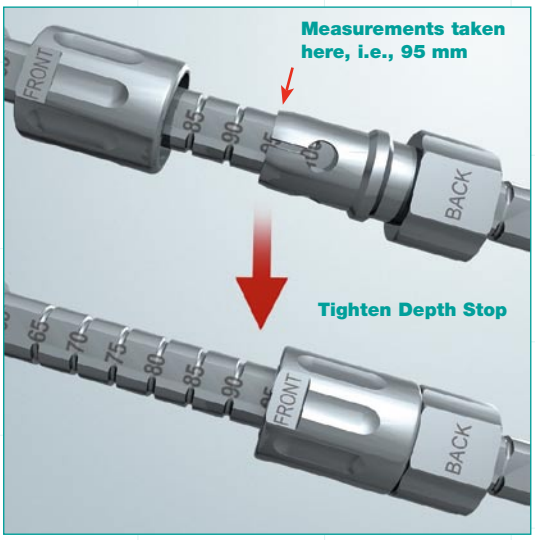


Screw Length Selection

Lag Screw Selection
The depth gauge indicates the guide pin length to its tip. Lag screw length is up to the surgeon's discretion.

Anti-rotation Screw Selection
Determine the anti-rotation screw length using the depth gauge. **No allowance for shortening is required.**

Once the lag and anti-rotation screw lengths have been determined, remove both guide pin sheaths.



Depth Stop Assembly

Assemble the depth stop[15] front and back parts onto the lag screw drill[14] separately. Pass the front piece over the drill first. Then pass the back piece over the drill until it locates in the previously decided depth groove. Lock the stop in place by tightening the front piece onto the back piece, ensuring the depth stop is secured.

The figure in line with and half covered by the front face of the depth stop assembly, is the set drill depth.

Lag Screw Drilling and Tapping

Drive the assembly over the guide wire to its desired depth. Use fluoroscopy during drilling to check the position of the guide wire and ensure that it is not driven forward by the drill.

Make a final check of the drill position, using fluoroscopy, before drill removal.

If the bone is particularly dense, use a cannulated tap[16] to cut a thread for the screw. Assemble the tap with the depth stop front and back parts in the same way as the lag screw. Then attach to the quick couple handle[6] and manually insert.

Lag Screw Insertion

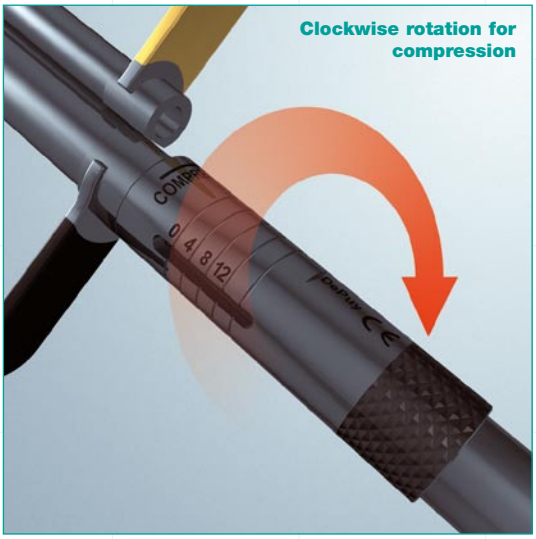
Pass the lag screw coupling rod 18 through the lag screw insertion wrench 17. Position the selected lag screw on the insertion wrench lugs and then screw the coupling rod to the lag screw.

If fracture compression is anticipated, screw the compression nut 19 onto the lag screw insertion wrench before the assembly is introduced to the femur. Zero compression is achieved when the thread on the insertion wrench aligns with '0' in the compression nut window.

Insert the lag screw assembly manually. When the insertion wrench abuts against the sleeve, the lag screw has reached its planned position.

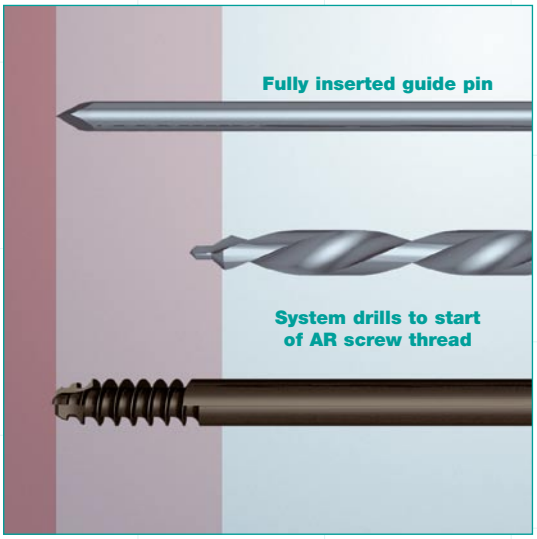
Note: The lateral end of the lag screw should not extend beyond the lateral cortex more than 1 cm.

Note: For unstable fractures lacking a medial buttress support and a high degree of osteopenia, it is advised to insert the lag screw 10 mm from subchondral bone.



Fracture Compression

Fracture compression can only be applied before the anti-rotation screw is inserted, without the anti-rotation sheath 20 in place. Clockwise rotation of the compression nut 19, while holding the lag screw insertion wrench handle 17, applies compression. Each full rotation of the compression nut pulls the lag screw and femoral head 2 mm distal/lateral. The compression applied is indicated in the gauge window. Take care to avoid pulling the lag screw from its engagement in the femoral head. It is recommended that no more than 4 - 6 mm of compression is applied.



Anti-rotation Screw Insertion

Note: Always insert the anti-rotation screw **after** the lag screw.

Remove both the anti-rotation guide pin sheath 22 and guide pin. Pass the anti-rotation screw drill 23 through the anti-rotation sheath 20 and drill into the bone. Stop drilling when the required depth mark on the drill is aligned with the face of the anti-rotation sheath. At this point the tip of the drill will match the **start of the threaded portion** of the anti-rotation screw, **not the depth** to which the 2.5 mm guide pin tip was inserted. This calibrated depth preserves crucial bone stock for screw location and should not be exceeded.

Note: Deciding drill depth by fluoroscopy will lead to incorrect placement and reduction of the bone stock for the anti-rotation screw.

Again, if the bone is particularly dense, use a tap 24 to cut a thread for the screw. The anti-rotation tap does not have a depth stop. Use the depth markings on the shaft to guide insertion.

Anti-rotation Screw Placement

Place the selected anti-rotation screw on the insertion wrench 25. Attach the T-handle quick couple 6 to the insertion wrench and manually insert the assembly. When the shoulder of the insertion wrench abuts the sleeve, the anti-rotation screw has reached its planned position.

Proximal locking is now complete. Remove both sheaths.

Distal Locking

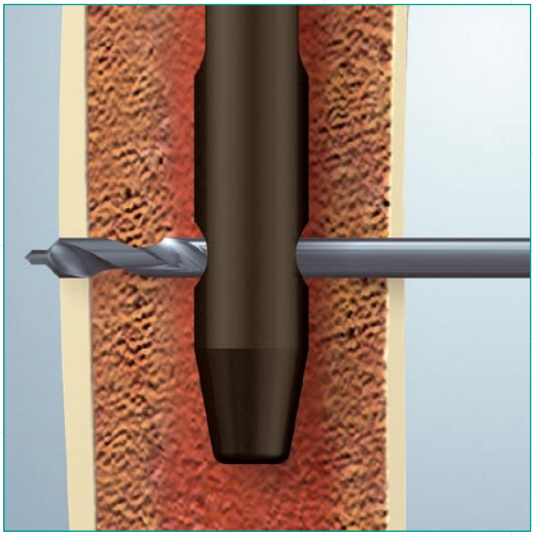
Choose static or dynamic distal locking. Select the appropriate targeting module hole that corresponds to the nail size implanted (180 or 200 mm). Locking options include static, dynamic, both or none.

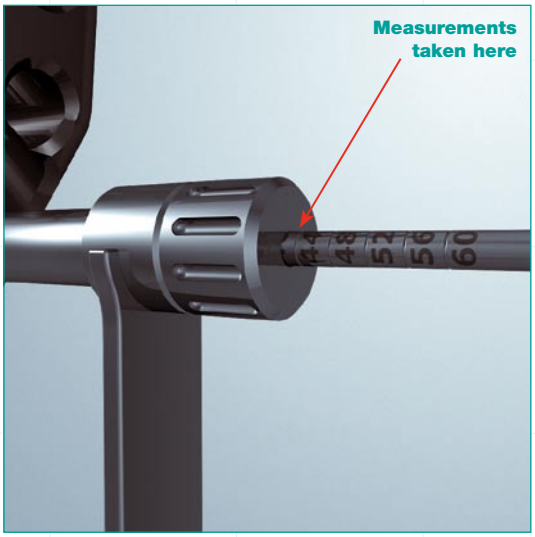
Distal Locking: Static

Pass the assembled distal sheath 26 and trochar 27 through the appropriate static hole for the 180 or 200 mm rod. Make a small incision at the point of skin contact.

Push the assembly through the soft tissue until firm contact is made with the lateral cortex and remove the trochar.

Insert the 3.8 mm drill guide 28 through the distal sheath and screw into the sleeve.





Distal Locking: Static

Advance the 3.8 mm calibrated drill[29] through the drill guide. Stop drilling when the medial cortex is penetrated. Note the depth mark on the drill at the level of the drill guide, and remove the drill. Maintain contact of the distal sleeve on bone, especially for depth checking or assessment.

An optional depth gauge, which passes through the drill guide may provide a final depth check. Select a 4.5 mm diameter screw, corresponding in length to the depth noted on the drill level. Use the hexagonal screwdriver[30] to introduce the screw through the distal sheath and drive it until its tip passes through the far cortex. Remove the sheath.

The nail is statically used at the surgeon's discretion. The second distal (dynamic) screw may also be inserted.

Distal Locking: Dynamic

Pass the distal sheath[26] through the appropriate 200 or 180 mm dynamic hole in the targeting module. Pass the trochar through the distal sheath and make a stab incision at the point of skin contact.

Push the assembly through the soft tissues until firm contact is made with the lateral cortex. Remove the trochar. Introduce the drill guide through the distal sheath. Introduce the 3.8 mm drill and advance through the lateral cortex. Stop drilling when the far cortex is penetrated. Note the depth mark on the drill, at the level of drill guide, and remove the drill.

Distal static or dynamic locking is now complete. Verify locking screw position using AP and lateral fluoroscopy image.

End Cap Insertion

Unscrew the locking bolt[9] on the insertion jig assembly[4] using the T-handle locking wrench[3]. Remove the assembly.

Use fluoroscopy to assess the depth from the tip of the greater trochanter to the proximal tip of the nail and select the corresponding size end cap.

Screw the end cap into the proximal end of the nail using the T-handle locking wrench[3].

Rehabilitation

For intertrochanteric fractures, early postoperative weight bearing is generally allowed.

Nail Removal

Open the incision and gain clear access to the nail end cap. Unscrew the end cap using the T-handle locking wrench[3].

Assemble the insertion jig[4] and the appropriate targeting module[7] and secure using the locking nut. (Use this same module for nail insertion. The procedure for selection and assembly is described on pages 6 and 7.)

Screw the locking bolt[9] into and pass it through the insertion jig nose. Use the locking wrench to tighten the locking bolt and secure the implant to the jig.

Pass the lag screw sheath[10] through the targeting module and make a stab incision at the previous incision scar.

Pass the lag screw trochar[11] through the lag screw sheath to the lateral cortex. Remove the trochar.

Assemble the lag screw coupling rod[18] and the insertion wrench[17]. Insert the assembly through the sheath and screw the coupling rod, clockwise to lock to the lag screw. Rotate the inserter wrench handle counterclockwise to extract the lag screw.

ROTATE COUNTERCLOCKWISE

ONLY USE HAMMER FOR NAIL EXTRACTION

AR Screw Removal

Access the anti-rotation screw head in the same way as the lag screw, using the dedicated anti-rotation screw instruments. Pass the anti-rotation screw wrench25 through the sheath20 and locate it on the distal tip of the anti-rotation screw. **Counterclockwise** rotation locks the wrench to the screw. Extract the screw by continued counterclockwise turns.

Distal Screw Removal

Extract the distal screws in the same way as the two proximal screws, using the dedicated distal screw instruments.

Nail Removal

The nail remains attached to the insertion jig for removal. Extraction should not require excessive force, but, if necessary, screw a sliding hammer to the jig at the location position marked. Ensure that the sliding hammer rod is fully threaded into the insertion jig before applying force.
Do not hammer the insertion jig. Only use impact/removal assembly (sliding hammer31 and impact/removal rod32) for nail extraction.

If the targeting insertion jig cannot be fitted to the nail, use the extraction adaptor33 to remove the nail. Connect the extraction adaptor to the nail before screw removal. Locate the proximal and distal screws and remove without the aid of the insertion jig. Screw the extraction adaptor into the nail's proximal end and then screw the sliding hammer rod into the adaptor. Apply force to remove the nail.

Once the screws and nail have been extracted, close the wounds.

Step 1: Preoperative Planning

The ATN™ Trochanteric Nail System offers the surgeon a comprehensive set of preoperative templates for use with radiographs at 15 percent magnification, in the true anterior/posterior plane. Laid over the uninjured side, these can be used to predict nail and screw size.

Preoperative templating provides a guide for appropriate nail length and neck angle, as well as an indication of the lag screw position, angle and optional AR screw.

Use the template to establish the distal position of the nail along the long axis of the femur.

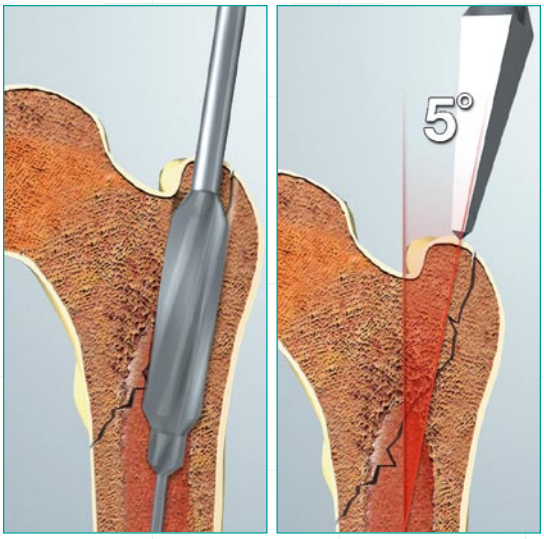
Establish the lag screw position by adjusting the inferior/ superior template position so that the lag screw is in the central to lower third of the femoral neck. Orient the lag screw in line with the axis of the femoral neck. Position the lag screw distal tip approximately 5 - 10 mm from the edge of the subchondral bone of the femoral head. This will estimate the lag screw length required.

Note: For unstable fractures lacking a medial buttress support and a high degree of osteopenia, it is advised to insert the lag screw 10 mm from subchondral bone.

Position the image intensifier for an AP view of the proximal femur. Verify fracture reduction. Place the radiographic ruler over the femur. Read the nail length directly from the ruler image and select the measurement that places the nail's distal end just proximal to the physeal scar with appropriate location of the lag screw in the femoral head and neck.

Position the image intensifier for an AP view of the femur at the level of the isthmus. Hold the radiographic ruler perpendicular to the femur and position the diameter tabs over the isthmus. Read the diameter measurement on the tab that fills the canal.

Note: Nail size can also be determined with Radiographic Ruler

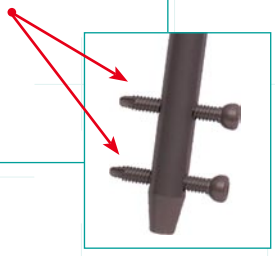


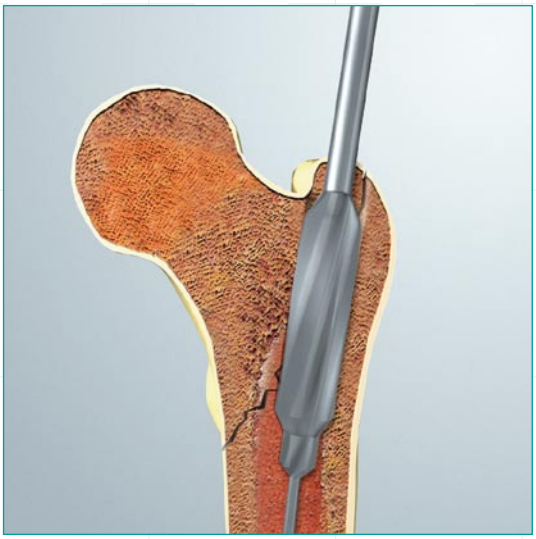
Step 2: Guide Wire and Insertion Point

In the AP view the insertion point is normally found at the tip or slightly lateral to the tip of the greater trochanter. The implant's mediolateral angle is 5º. This means that the 3.2 mm guide wire with the guide wire grip must be inserted laterally at a 5º angle to the shaft. Insert the guide wire manually or with power.

KEY NAIL FEATURES

- Lengths: 320 - 420 mm in 20 mm increments
- Two static distal screw holes
- Radius of curvature: 2.2 m
- Anteversion: 10º
- Anatomic 5º ML angle
- Left and right nails





Step 3: Open Femur

Guide the 17 mm cannulated entry reamer[1] through the tubular skin protector, over the guide wire or guide rod and ream manually with the T-handle quick couple[6] or by power[8].

Remove the tubular skin protector and guide wire. Do not re-use the guide wire. A cannulated awl[2a] may be used as an option to open the femur.

Step 4: Reaming Technique

Standard antegrade femoral reaming is necessary for long nails.

Over ream 1.0 - 2.0 mm over selected nail diameter.

Step 5: Nail Insertion

(320 - 420 mm in 20 mm increments)

Carefully manually insert the nail (can be over the guide wire or not) as far as possible into the femoral opening. Slight twisting hand movements help insertion.

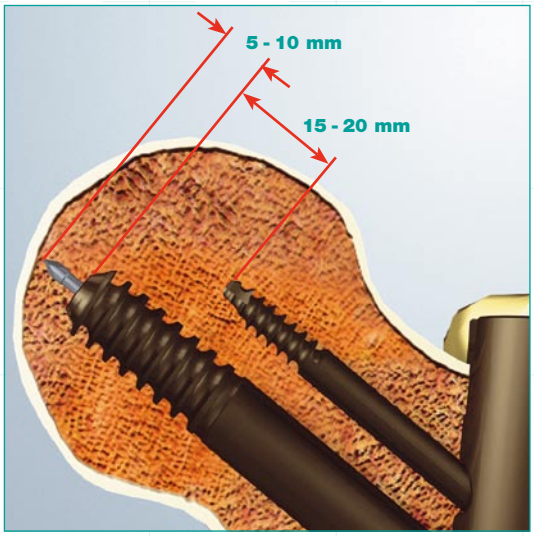
No Hammering is required for this procedure, and excessive force may cause secondary fractures.

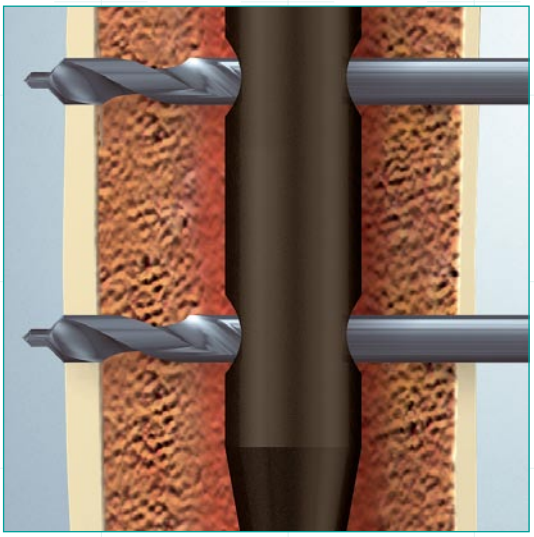
If the nail is difficult to insert, or if fluoroscopy indicates impingement between the nail tip and the medial and anterior cortries, additional proximal reaming should be carried out.

If extra distal reaming is required, follow the standard reaming technique, using a ball nose guide wire and exchange tube.

The long nail insertion assembly includes:

- Nail Insertion Jig[4]
- Targeting Module[7]
- Targeting Module Locking Nut[5]
- Locking Bolt[9]
- Long Nail (320-420 mm in 20 mm increments)





Step 6: Insert Lag Screw and Optional AR Screw

Please refer to the ATN™ standard surgical technique and choose the appropriate targeting module[7].

Step 7: Distal Locking

After proximal fixation, distal locking is usually performed with two locking bolts. Ensure maintenance of femoral reduction in length and rotation prior to distal locking.

The long nail includes **two static holes.** Various techniques can be used to guide drilling and insertion of screws through the distal holes. The image intensifier and the freehand distal target device[34] may be used.

Perform standard freehand distal locking. Align fluoroscopy beam parallel to the axis of the distal screw holes, producing perfect circles. Centre the trochar tip drill in the hole's centre and drill through with intermittent use of fluoroscopy. If freehand locking is done without the radiolucent drill, it is usually easiest to gently tap the drill bit through the proximal hole. Drill the far cortex. The standard depth gauge is used to measure screw length.

Step 8: Insert End Cap

(0 - 25 mm in 5 mm increments)

Please refer to the ATN™ standard surgical technique.

ONLY USE HAMMER FOR NAIL EXTRACTION

Step 9: Implant Removal

Having made an incision through the old scar, the screws may be localised using palpation or the image intensifier. First, remove the end cap and insert the nail insertion jig or nail extraction adapter into the nail's proximal end. Second, remove the lag screw and/or AR screw and distal screw(s).

IMPLANTS - PRODUCT ORDERING INFORMATION

ATN™ Trochanteric Nail Lag Screws (10.5 mm)

Sterile

Cat. No.	Description
9033-11-060	60 mm
9033-11-065	65 mm
9033-11-070	70 mm
9033-11-075	75 mm
9033-11-080	80 mm
9033-11-085	85 mm
9033-11-090	90 mm
9033-11-095	95 mm
9033-11-100	100 mm
9033-11-105	105 mm
9033-11-110	110 mm
9033-11-115	115 mm
9033-11-120	120 mm

ATN™ Trochanteric Nail Anti-rotation Screws (5 mm)

Sterile

Cat. No.	Description
9033-05-060	60 mm
9033-05-065	65 mm
9033-05-070	70 mm
9033-05-075	75 mm
9033-05-080	80 mm
9033-05-085	85 mm
9033-05-090	90 mm
9033-05-095	95 mm
9033-05-100	100 mm

ATN™ Trochanteric Nail End Caps

Sterile

Cat. No.	Description
9032-08-000	0 mm
9032-08-005	5 mm
9032-08-010	10 mm
9032-08-015	15 mm
9032-08-020	20 mm
9032-08-025	25 mm

ATN™ 4.5 mm Cortical Screws

Non-Sterile	Sterile	
Cat. No.	Cat. No.	Description
1402230	8050-45-030	30 mm
1402232	8050-45-032	32 mm
1402234	8050-45-034	34 mm
1402236	8050-45-036	36 mm
1402238	8050-45-038	38 mm
1402240	8050-45-040	40 mm
1402242	8050-45-042	42 mm
1402244	8050-45-044	44 mm
1402246	8050-45-046	46 mm
1402248	8050-45-048	48 mm
1402250	8050-45-050	50 mm
1402252	8050-45-052	52 mm
1402254	8050-45-054	54 mm
1402256	8050-45-056	56 mm
1402258	8050-45-058	58 mm
1402260	8050-45-060	60 mm

INSTRUMENTS - PRODUCT ORDERING INFORMATION

Insertion Instruments

Cat. No.	Description
1122	Large Pointed Awl - Cannulated (optional)
1125	Large Pointed Awl
1280	Tubular Skin Protector
9030-01-001	Cannulated Entry Reamer
9030-01-002	T-handle Locking Wrench
9030-02-001	Trochanteric Nail Insertion Jig
9030-02-008	Targeting Module Locking Nut
9030-02-011	Locking Bolt
9030-02-002	130˚ Targeting Module
9030-02-003	135˚ Targeting Module
9030-02-004	125˚ Targeting Module

Distal Locking Instruments

Cat. No.	Description
9030-05-001	Distal Sheath
9030-05-002	Distal Trochar
9030-05-003	Distal Drill Guide (3.8 mm)
9030-05-004	3.8 mm Calibrated Drill (Disposable)
9030-05-005	4.5 mm Hex Screwdriver
9030-05-006	Distal Depth Gauge

Ancillary Instruments

Cat. No.	Description
1202	Freehand Distal Target Device
9030-07-006	Quick Couple Power Adaptor
9030-07-005	T-handle Quick Couple
1095	Impactor Rod
1796	Sliding Hammer
9030-07-001	Nail Extraction Adaptor
1291	Guide Wire Grip
9030-10-002	Long Nail X-Ray Templates
9030-10-003	X-ray Templates
8092-30-028	Ball Nose 3.0 x 28" - Sterile Guide Wire (Disposable)
8092-32-228	Driving Wire 3.2 x 28" - Sterile Guide Wire (Disposable)

Proximal Locking Instruments

Cat. No.	Description
9030-03-101	Sheath (Lag Screw)
9030-03-104	Trochar (Lag Screw)
9030-03-103	Guide Pin Sheath (Lag Screw)
9030-03-004	3.2 mm Threaded Guide Pin (Single use)
9030-03-005	Depth Gauge
9030-03-106	Cannulated Step Drill (Lag Screw)
9030-03-007	Depth Stop
9030-03-120	Cannulated Lag Screw Tap
9030-03-109	Lag Screw Insertion Wrench
9030-03-010	Lag Screw Coupling Rod
9030-03-013	Compression Nut
9030-04-101	Sheath (Anti-rotation screw)
9030-04-104	Trochar (Anti-rotation screw)
9030-04-103	Guide Pin Sheath (Anti-rotation screw)
9030-04-004	2.5 mm Guide Pin (Single use)
9030-04-105	Drill (Anti-rotation screw) (Disposable)
9030-04-106	Tap (Anti-rotation screw)
9030-04-107	AR Screw Insertion Wrench
9030-04-008	AR Screw Removal Wrench

ATN™ Trochanteric Nail Instrument Trays

Cat. No.	Description
9030-20-001	Trochanteric Nail Instrument Tray 1
9030-20-002	Trochanteric Nail Instrument Tray 2

IMPLANTS - PRODUCT ORDERING INFORMATION

ATN™ Trochanteric Nails
Long Trochanteric Nails
9 mm Distal Diameter, 340 - 400 mm

Cat. No. Left	Length	Angle
9252-09-340	340 mm	130º
9252-09-360	360 mm	130º
9252-09-380	380 mm	130º
9252-09-400	400 mm	130º

Long Trochanteric Nails
11 mm Distal Diameter, 320 - 420 mm

Cat. No. Left	Length	Angle
9252-00-320	320 mm	130º
9252-11-340	340 mm	130º
9252-11-360	360 mm	130º
9252-11-380	380 mm	130º
9252-11-400	400 mm	130º
9252-11-420	420 mm	130º

Long Trochanteric Nails
13 mm Distal Diameter, 340 - 420 mm

Cat. No. Left	Length	Angle
9252-13-340	340 mm	130º
9252-13-360	360 mm	130º
9252-13-380	380 mm	130º
9252-13-400	400 mm	130º
9252-13-420	420 mm	130º

ATN™ Trochanteric Nails
Long Trochanteric Nails
9 mm Distal Diameter, 340 - 400 mm

Cat. No. Right	Length	Angle
9262-09-340	340 mm	130º
9262-09-360	360 mm	130º
9262-09-380	380 mm	130º
9262-09-400	400 mm	130º

Long Trochanteric Nails
11 mm Distal Diameter, 320 - 420 mm

Cat. No. Right	Length	Angle
9262-11-320	320 mm	130º
9262-11-340	340 mm	130º
9262-11-360	360 mm	130º
9262-11-380	380 mm	130º
9262-11-400	400 mm	130º
9262-11-420	420 mm	130º

Long Trochanteric Nails
13 mm Distal Diameter, 340 - 420 mm

Cat. No. Right	Length	Angle
9262-13-340	340 mm	130º
9262-13-360	360 mm	130º
9262-13-380	380 mm	130º
9262-13-400	400 mm	130º
9262-13-420	420 mm	130º

ATN™ Trochanteric Nails
Short Trochanteric Nails - 180 mm

Cat. No.	Diameter	Angle
9032-09-125	9 mm	125º
9032-09-130	9 mm	130º
9032-09-135	9 mm	135º

Standard Trochanteric Nails - 200 mm

Cat. No.	Diameter	Angle
9032-11-225	11 mm	125º
9032-11-230	11 mm	130º
9032-11-235	11 mm	135º
9032-13-225	13 mm	125º
9032-13-230	13 mm	130º
9032-13-235	13 mm	135º

NOTES:

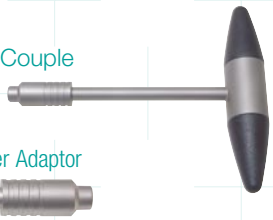
NAIL INSERTION PREPARATION INSTRUMENTS

1 9030-01-001 Cannulated Entry Reamer

3 9030-01-002 T-handle Locking Wrench

5 9030-02-008 Targeting Module Locking Nut

6 9030-07-005 T-handle Quick Couple



8 9030-07-006 Quick Couple Power Adaptor

2 1125 Large Pointed Awl

2a 1122 Cannulated Awl (not shown)

4 9030-02-001 Trochanteric Nail Insertion Jig

7 9030-02-00X 125°, 130°, 135° Targeting Modules

9 9030-02-011 Locking Bolt

LAG SCREW INSTRUMENTS

10 9030-03-101 Sheath (Lag Screw)

12 9030-03-103 Guide Pin Sheath (Lag Screw)

14 9030-03-106 Cannulated Step Drill (Lag Screw)

16 9030-03-120 Cannulated Tap (Lag Screw)

18 9030-03-010 Lag Screw Coupling Rod

11 9030-03-104 Trochar (Lag Screw)

13 9030-03-005 Depth Gauge

15 9030-03-007 Depth Stop

17 9030-03-109 Lag Screw Insertion Wrench

19 9030-03-013 Compression Nut

AR SCREW INSTRUMENTS

20 9030-04-101 Sheath (Anti-rotation Screw)

22 9030-04-103 Guide Pin Sheath (Anti-rotation Screw)

24 9030-04-106 Tap (Anti-rotation Screw)

21 9030-04-104 Trochar (Anti-rotation Screw)

23 9030-04-105 Drill (Anti-rotation Screw)

25 9030-04-107 Anti-rotation Screw Insertion Wrench

DISTAL SCREW INSTRUMENTS

26 9030-05-001 Distal Sheath

28 9030-05-003 Distal Drill Guide

27 9030-05-002 Distal Trochar

29 9030-05-004 3.8 mm Calibrated Drill

30 9030-05-005 4.5 mm Hex Screwdriver

ANCILLARY INSTRUMENTS

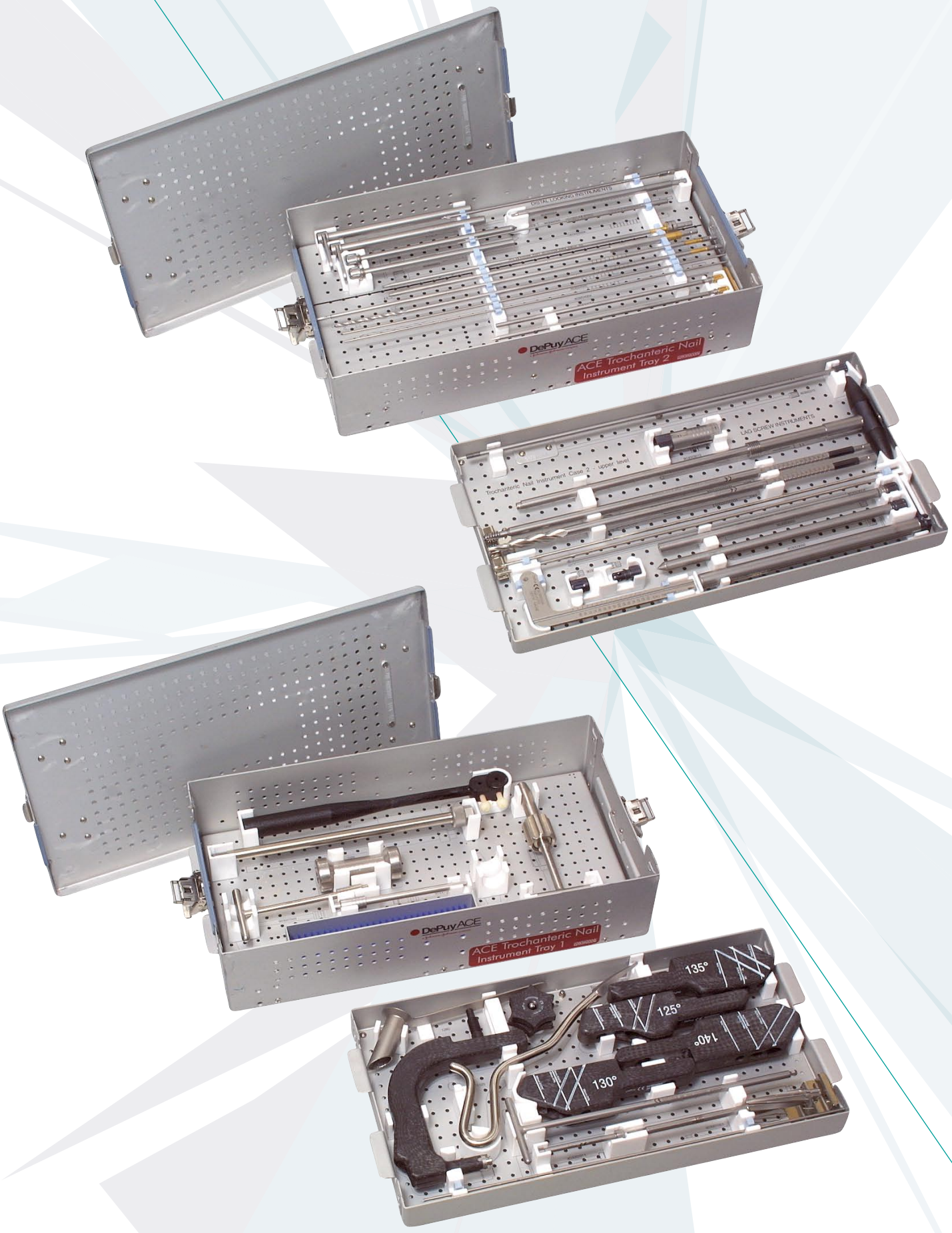
31 1796 Sliding Hammer

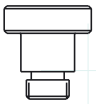
32 1095 Impactor/Removal Rod for Long Nail

33 9030-07-001 Nail Extraction Adaptor

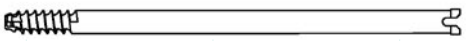
34 1202 Freehand Distal Targeting Device (Long Nail)

See page 22 for full product code details


DePuy ACE
ACE Trochanteric Nail
Instrument Tray 2
Trochanteric Nail Instrument Case 2 - upper level
LAG SCREW INSTRUMENTS
DePuy ACE
ACE Trochanteric Nail
Instrument Tray 1
135°
125°
140°
130°



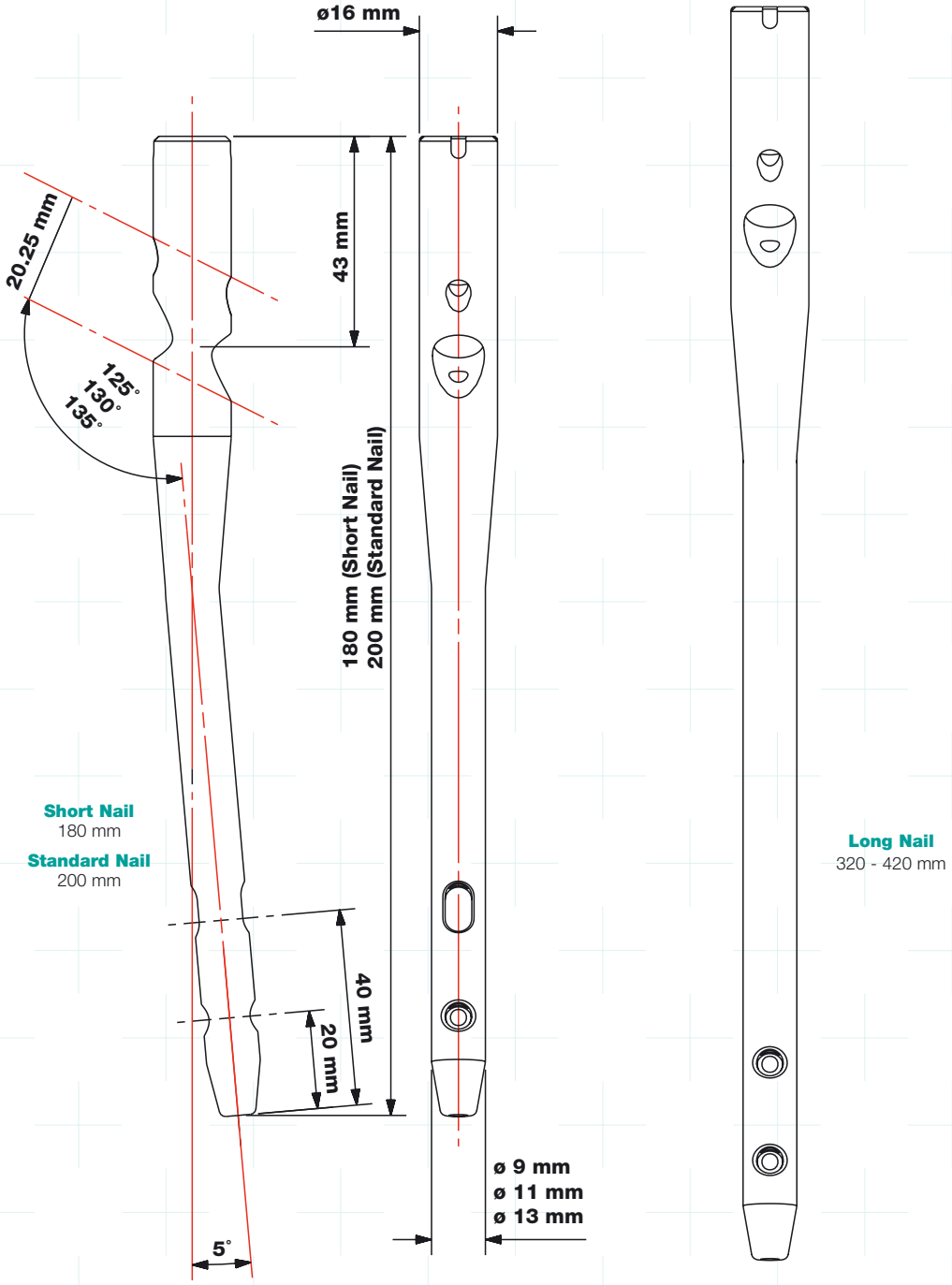
End Cap
0 - 25 mm
Sterile: 9032-08-XXX



Anti-Rotation Screw ø 5 mm
60 - 100 mm
Sterile: 9033-05-XXX

Solid Cortical Bone Screw ø 4.5 mm
30 - 60 mm
Sterile: 8050-45-0XX
Non Sterile: 14022-XX

Lag Screw ø 10.5 mm
60 - 120 mm
Sterile: 9033-11-XXX



Short Nail
180 mm

Standard Nail
200 mm

Long Nail
320 - 420 mm

See page 22 for full product code details

Important
This essential product information does not include all of the information necessary for selection and use of a device. Please also see full labelling.

Indications
Intramedullary Nails are indicated for long bone fixation including fixation of fractures and reconstructive surgeries.

Contraindications
- Active infection
- Crossing epiphyseal plates in skeletally immature patients
- Insufficient bone quality or quantity
- Obliterated medullary canal
- Conditions that would retard healing, such as previous infection
- Foreign body sensitivity (Retrograde Nails)
- History of septic arthritis of the knee
- Knee extension contracture with inability for 45° of flexion

Warnings and Precautions
Device cannot be expected to withstand the unsupported stresses of full weight bearing. External support and restricted physical activities should be employed until firm bone union is achieved. Proper implant selection should be made for size and shape limitations. Implants should not be bent, notched or scratched during implantation and handling. If other metallic devices are used, they should be manufactured from a similar metal to avoid galvanic corrosion. NO METALLIC IMPLANT SHOULD BE REUSED. Patient should receive detailed instructions on the use and limitations of the device. Implants should be removed whenever possible.

Adverse Effects
The following are the most frequent adverse effects involving the use of intramedullary nails: Loosening, bending, cracking or fracture of the nail or loss of fixation due to nonunion or osteoporosis; loss of anatomic position with nonunion or malunion with rotation or angulation; infection; allergies and other reaction to the device material.

Cat No: 0602-76-001 version 1

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