

Expert Nailing System

# Titanium Cannulated Retrograde/Antegrade Femoral Nail

Surgical Technique





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## MR Information

The Titanium Cannulated Retrograde/Antegrade Femoral Nail System has not been evaluated for safety and compatibility in the MR environment. It has not been tested for heating, migration or image artifact in the MR environment. The safety of the Titanium Cannulated Retrograde/Antegrade Femoral Nail System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.

 Image intensifier control

# TITANIUM CANNULATED RETROGRADE/ANTEGRADE FEMORAL NAIL—EXPERT NAILING SYSTEM

## ADVANCED SOLUTIONS

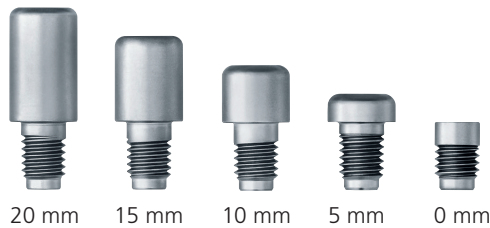
### Nail features

- Universal design for retrograde and antegrade insertion in left or right femur
- Anatomic AP curvature for ease in insertion and extraction
- Cannulated nails enable insertion over a guide wire, for reamed or unreamed techniques
- All DePuy Synthes Trauma 2.5 mm or 3.0 mm ball-tipped reaming rods may be removed through the nail and insertion handle assembly (no exchange tube required)
- Nail diameters from 9.0 mm to 15.0 mm and lengths ranging from 160 mm to 480 mm
- Multiple locking options for static, dynamic, standard, and spiral blade locking
- Intraoperatively choose between spiral blade locking (with one spiral blade and one locking screw) and standard locking (with two locking screws)
- Titanium alloy\*



### End caps for Femoral Nails-EX (gray)

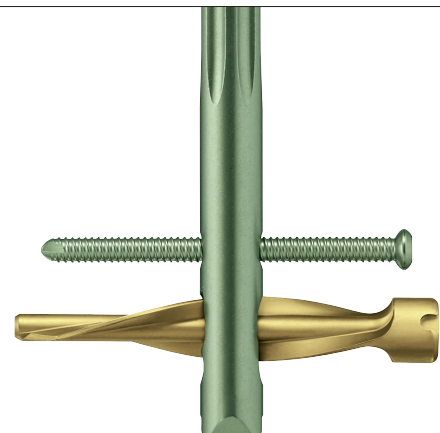
- Self-retaining T40 StarDrive™ Recess facilitates secure end cap pick-up and insertion
- End cap protects the nail connection threads from bone ingrowth and facilitates nail removal
- 0 mm end cap sits flush with nail and securely locks most distal locking screw (retrograde) to create a fixed-angle construct
- 5, 10, 15, and 20 mm end caps extend nail height if nail is overinserted
- Titanium alloy\*



### End caps for Femoral Nails-EX

#### Spiral Blade Locking (gold)

- Self-retaining T40 StarDrive Recess facilitates secure end cap pick-up and insertion
- Securely locks with spiral blade, to create a fixed-angle construct
- Sits flush with end of nail
- Titanium alloy\*



\*Titanium-6% Aluminum-7% Niobium alloy.

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### Spiral blades

- Cannulated for use over a 3.2 mm guide wire
- 12.5 mm blade diameter
- Front-cutting end
- Increased surface area provides increased stability, even in osteoporotic bone<sup>1</sup>
- Securely locks with spiral blade end cap to create a fixed-angle construct
- Titanium alloy\* for improved mechanical and fatigue properties



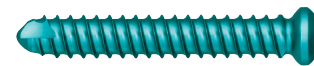
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### Locking screws

- Double-lead thread for ease of insertion
- Thread closer to screw head providing better bone purchase and improved stability
- Self-retaining StarDrive Recess allows improved torque transmission and increased resistance to stripping relative to a hex recess, and secure locking screw pick-up
- Titanium alloy\* for improved mechanical and fatigue properties
- 5.0 mm diameter, for 9.0 mm–13.0 mm diameter nails
- 6.0 mm diameter, for 14.0 mm and 15.0 mm diameter nails
- Lengths:
  - 26 mm–100 mm for 5.0 mm locking screws
  - 26 mm–125 mm for 6.0 mm locking screws



5 mm



6 mm

1. Ito, Keita, et al. "Improved intramedullary nail interlocking in osteoporotic bone." *Journal of Orthopaedic Trauma*. 2001;15.3:192-196.

\*Titanium-6% Aluminum-7% Niobium alloy.

# AO PRINCIPLES

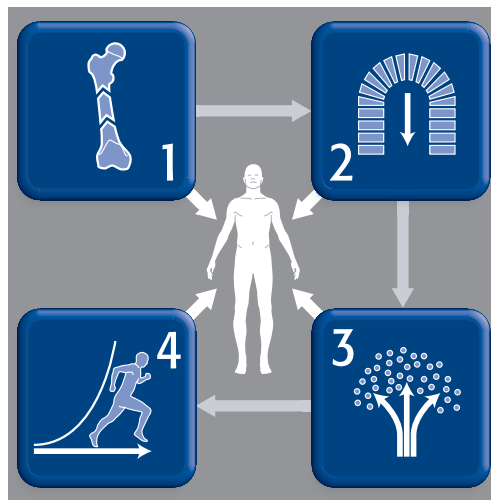
In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.<sup>2,3</sup>

## **Anatomic reduction**

Fracture reduction and fixation to restore anatomical relationships.

## **Early, active mobilization**

Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.



## **Stable fixation**

Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.

## **Preservation of blood supply**

Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.

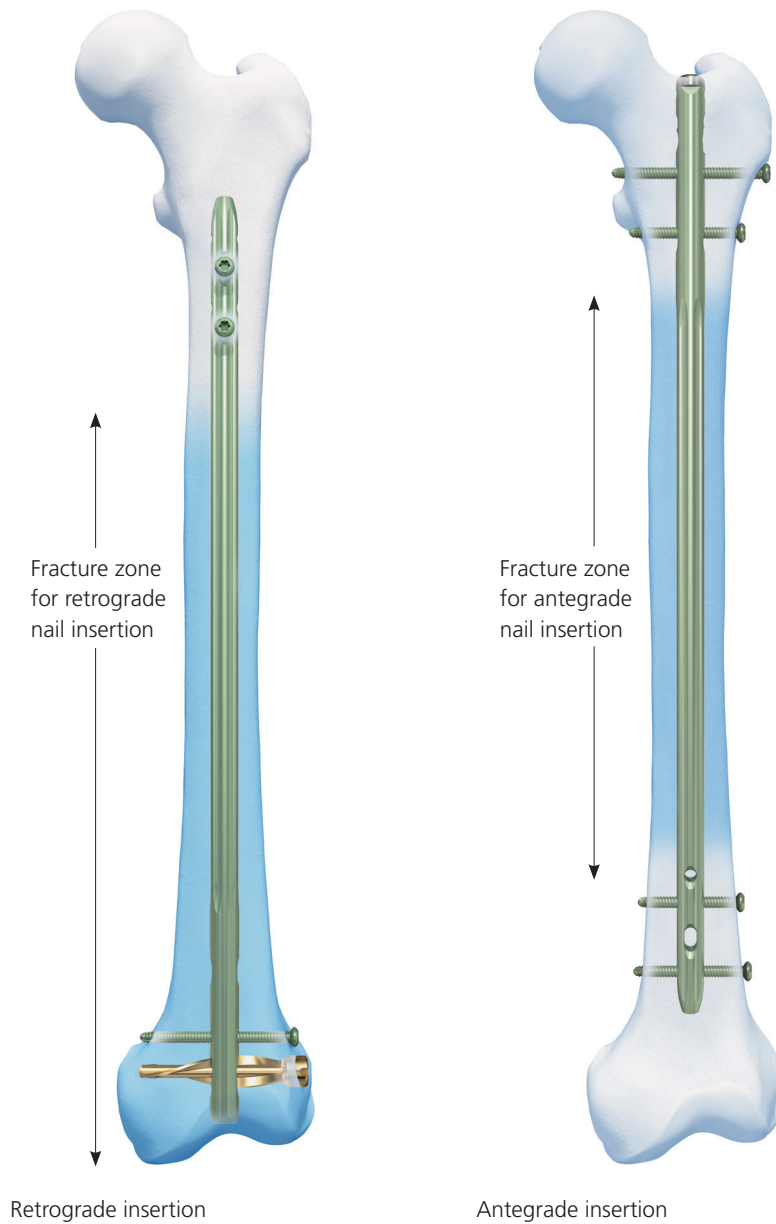
2. Müller ME, Allgöwer M, Schneider R, Willenegger H. *Manual of Internal Fixation*. 3rd ed. Berlin, Heidelberg, New York: Springer-Verlag; 1991.

3. Rüedi TP, RE Buckley, CG Moran. *AO Principles of Fracture Management*. 2nd ed. Stuttgart, New York: Thieme; 2007.

# INDICATIONS

The Titanium Cannulated Retrograde Femoral Nail and Retrograde/Antegrade Femoral Nail–EX are indicated to stabilize fractures of the distal femur and the femoral shaft, including:

- Supracondylar fractures, including those with intra-articular extension
- Ipsilateral hip/shaft fractures
- Ipsilateral femur/tibia fractures
- Femoral fractures in multiple trauma patients
- Fractures proximal to a total knee arthroplasty
- Fractures distal to a hip implant
- Fractures in the morbidly obese patient
- Fractures in osteoporotic bone
- Impending pathologic fractures
- Malunions and nonunions



# CLINICAL CASES

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## Case 1

Retrograde approach—  
standard locking



Preoperative



Postoperative



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## Case 2

Retrograde approach—  
spiral blade locking



Preoperative



Postoperative



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## Case 3

Antegrade approach—  
standard locking



Preoperative



Postoperative





# PREOPERATIVE PLANNING

Use the AO preoperative planner template for the Retrograde Femoral Nail–EX or Retrograde/Antegrade Femoral Nail–EX to estimate nail diameter, nail length, and spiral blade length.

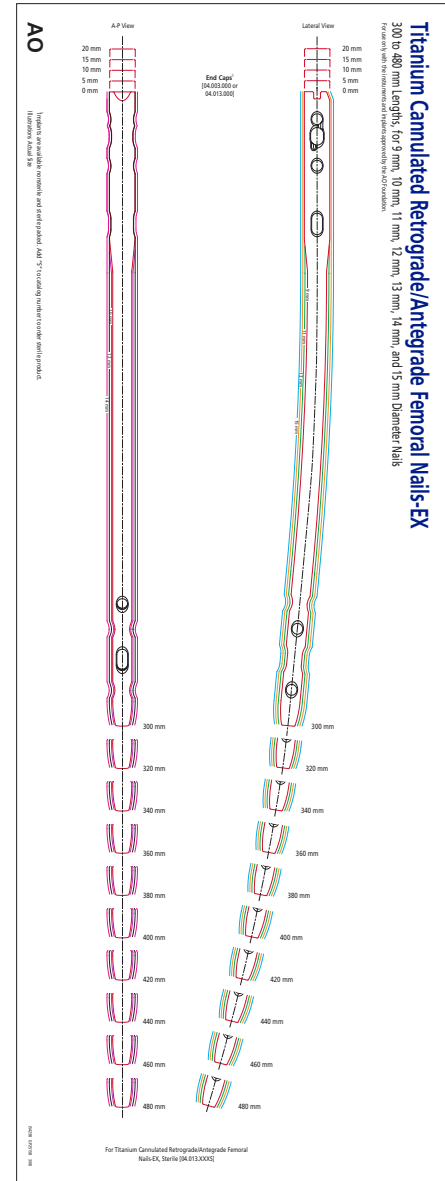
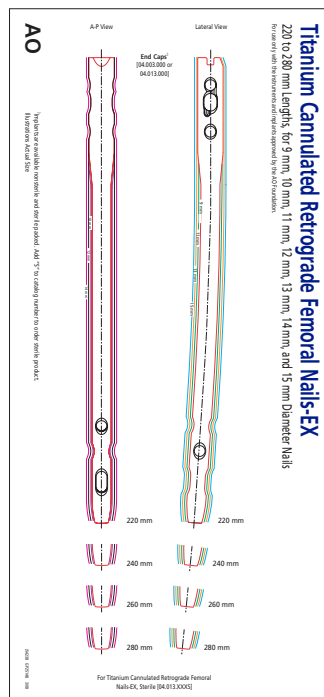
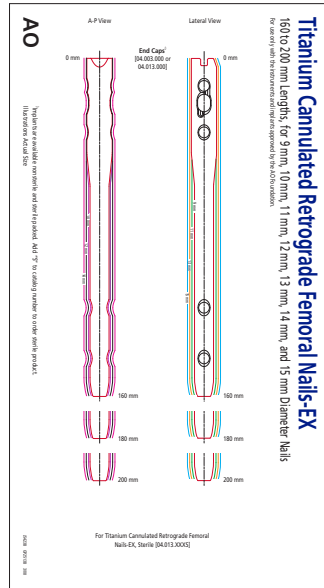
To estimate nail diameter, place the template on the AP or lateral x-ray of the uninjured femur and measure the diameter of the medullary canal at the narrowest part that will contain the nail.

To estimate nail length, place the template on the AP x-ray of the uninjured femur and select the appropriate nail length based on patient anatomy or previous implant.

To estimate spiral blade length, place the template on the AP x-ray of the uninjured femoral condyles and select a spiral blade length that ends flush with the medial surface.

When selecting nail size, consider canal diameter, fracture pattern, patient anatomy and postoperative protocol.

**Note: Templates are available in two sizes: actual size and 115% magnification, in which the image is enlarged 15% to correspond to typical radiographic magnification; however, variations in magnification levels are common.**



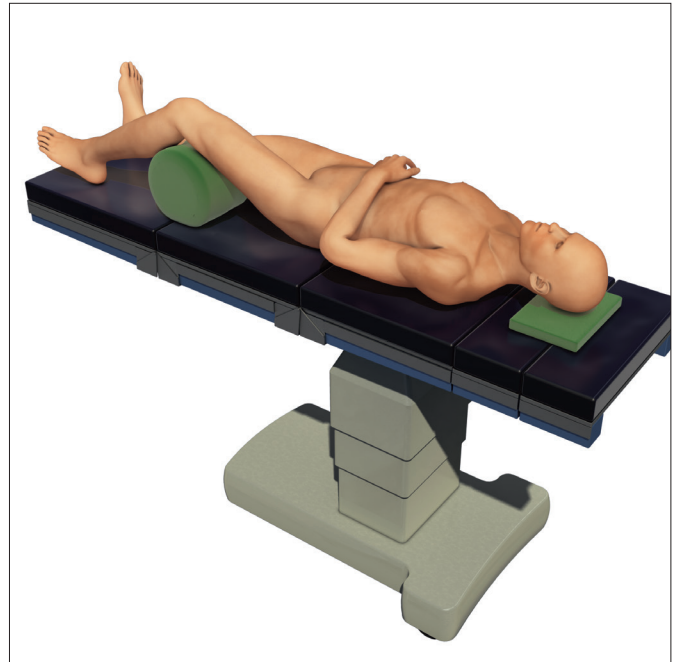
# RETROGRADE APPROACH— OPENING THE DISTAL FEMUR

## 1

### Position patient

Position the patient supine on a radiolucent table. The knee of the injured leg should be flexed 30°–40°. A leg roll may be used to allow proper reduction and stabilization of the fracture.

- Position the image intensifier to allow visualization of the proximal and distal femur in AP and lateral views.



## 2

### Reduce fracture

#### Instrument

394.35*	Large Distractor
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- Perform closed reduction manually by axial traction, under image intensification. The use of the large distractor may be appropriate in certain circumstances.

**Note:** Intra-articular fractures should be stabilized with interfragmentary screw fixation before insertion of the nail. The screws should be positioned to not interfere with the path of the nail.



\*Also available.

### 3

#### Confirm nail length

##### Instruments

03.010.020	Radiographic Ruler, for Titanium Cannulated Femoral Nails
03.010.023	Radiographic Canal Width Estimator

The required nail length must be determined after reduction of the fracture.

- 1 Position the image intensifier for an AP view of the distal femur. Using long forceps, hold the ruler parallel to the femur on the lateral side of the upper leg at the level of the femur. Position the ruler with the distal end at the desired nail insertion depth. Mark the skin at that site.
- 2 Move the image intensifier toward the proximal end of the femur, align the distal end of the ruler with the skin marking and take an AP image of the proximal femur. Verify fracture reduction. Read the required nail length directly from the ruler as it appears on the x-ray.

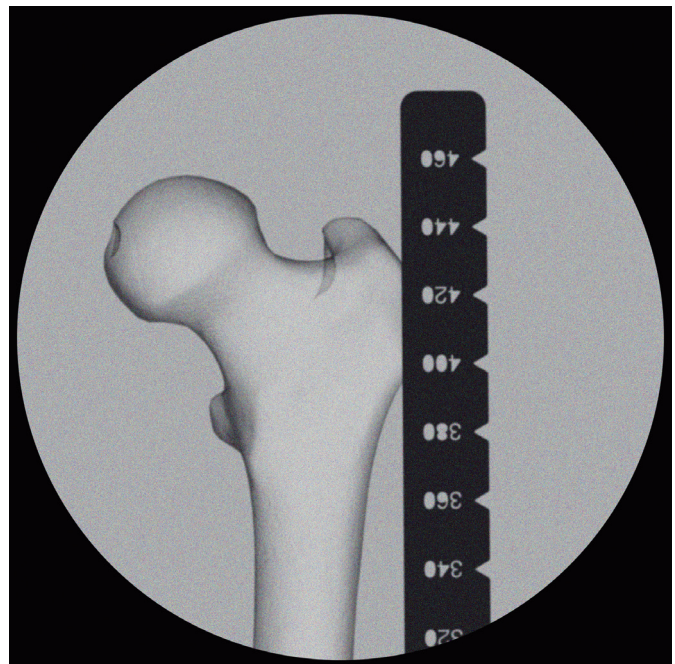
##### Precautions:

- **It is recommended that the tip of the nail is at least 5 cm above the most proximal extension of the fracture zone. Attention must be paid in the area 4 to 6 cm below the Lesser Trochanter because of the A. femoralis and the branches of the N. femoralis. In cases where such long nails (>320 mm) are used, it is recommended to place the AP locking as proximal as possible and above the Lesser Trochanter.**
- **The possibility of dynamization must also be considered when determining the nail length and a correspondingly shorter nail should be chosen. The locking screw in the dynamic locking option can move by up to 5 mm distally.**

##### Alternative techniques

Determine nail length using the above procedure on the uninjured leg before draping (nonsterile).

Insert a reaming rod into the medullary canal of the injured leg and use an identical length reaming rod to determine the length.



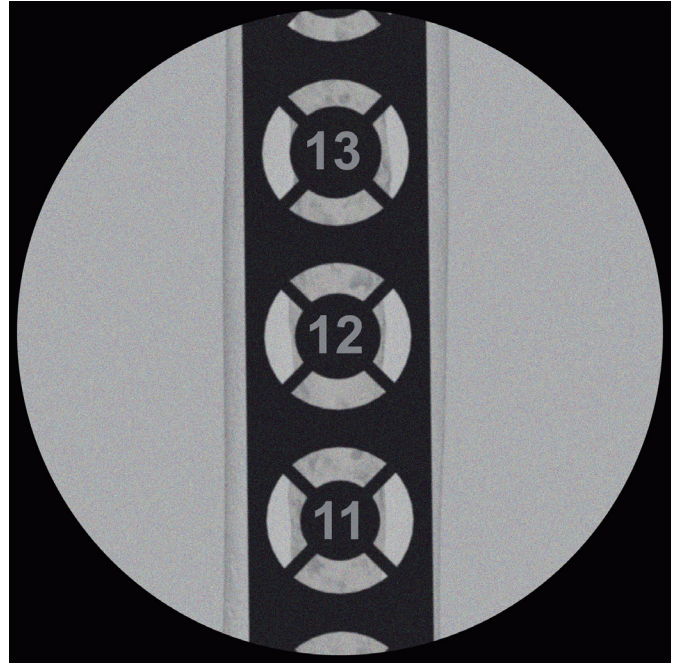
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#### 4

##### Confirm nail diameter

- Position the image intensifier for an AP or lateral view of the femur at the level of the isthmus. Hold the radiographic ruler over the femur so that the diameter gauge is centered over the narrowest part of the medullary canal. Read the diameter measurement on the circular indicator that fills the canal.

**Note:** The ruler is not at the same level as the femur. This affects the accuracy of the measurement, providing only an estimate of the canal diameter.



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#### 5

##### Approach

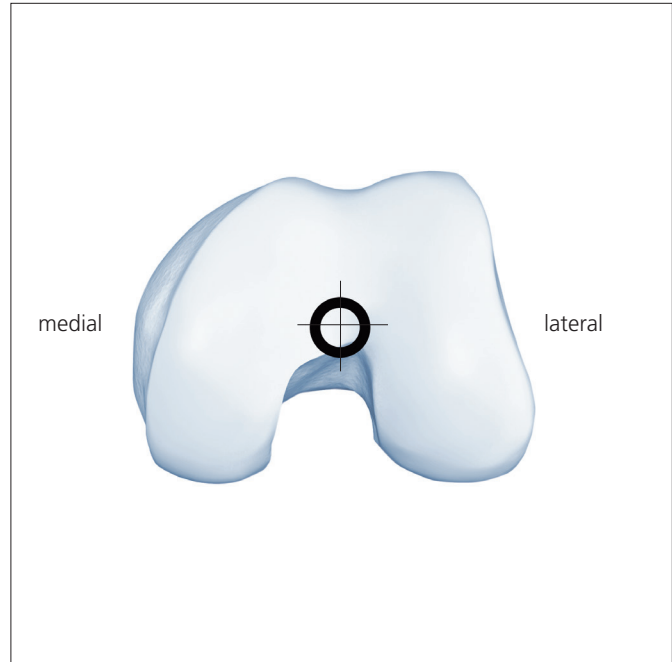
Make a medial parapatellar incision. Retract the patellar tendon laterally.

**6**

**Determine entry point**

The entry point for the Retrograde/Antegrade Femoral Nail–EX is in line with the medullary canal. The entry point is at the top of the intercondylar notch, just anterior and lateral to the femoral attachment of the posterior cruciate ligament.

The entry point determines the anatomic position of the nail in the medullary canal. Special care should be taken to ensure an accurate entry point.



**7**

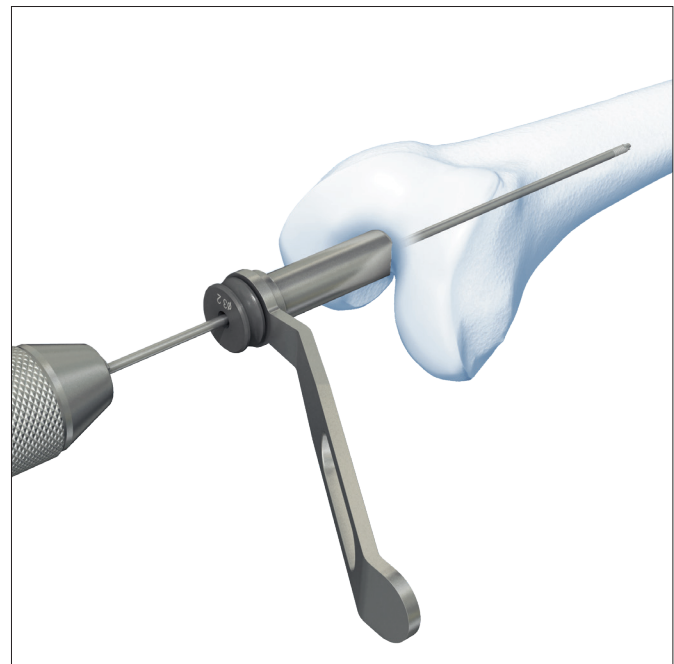
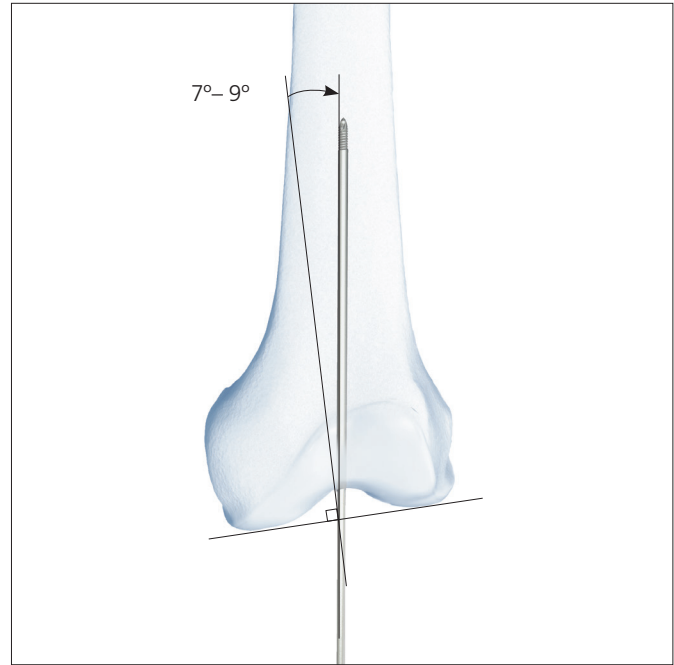
**Insert guide wire**

**Instruments**

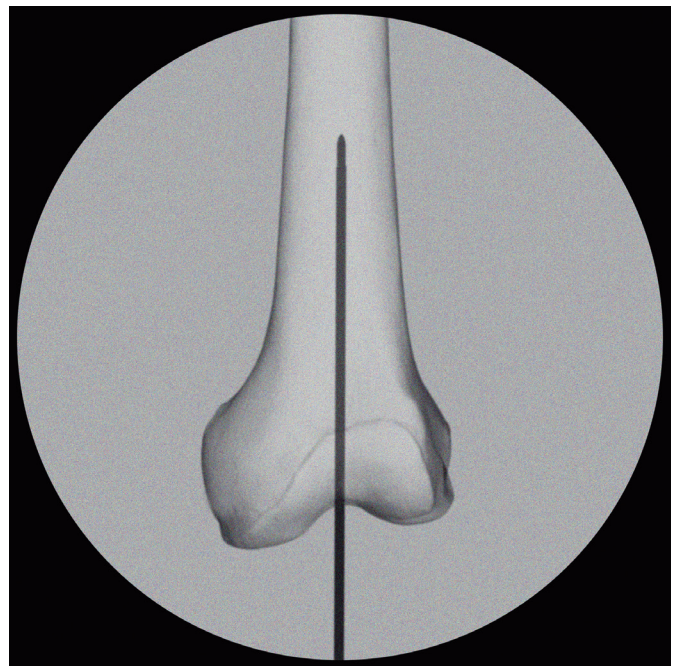
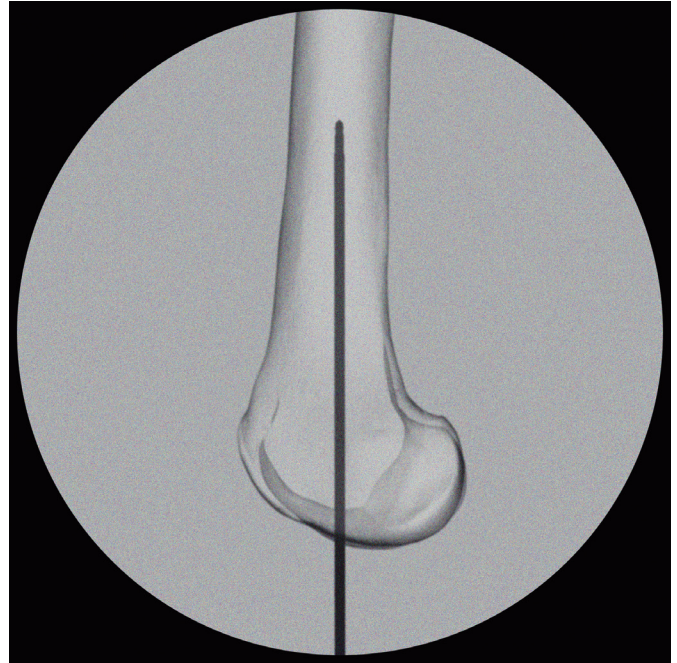
03.010.115	3.2 mm Guide Wire, 290 mm
357.127	13.0 mm Protection Sleeve, (for retrograde insertion)
357.128	13.0 mm/3.2 mm Trocar, (for retrograde insertion)

Thread the drill sleeve/trocar into the protection sleeve. Insert the assembly through the incision to the bone. Hold the protection sleeve firmly and insert the guide wire through the drill sleeve.

Insert the guide wire for approximately 10 cm to 15 cm in line with the anatomic axis of the femur, which is 7° to 9° lateral to a line perpendicular to the articular surface.



- Verify guide wire position under image intensification with AP and lateral views. Remove the trocar.



## 8

### Open medullary canal

#### Instrument

351.27            13.0 mm Cannulated Drill Bit, 300 mm

Pass the drill bit over the guide wire and through the protection sleeve to the bone. Drill to a depth of approximately 3 cm to 5 cm.

#### Precautions:

- The use of the drill bit for opening the medullary canal is suitable for 9.0 mm to 12.0 mm nails. For the larger 13.0 mm to 15.0 mm nails, the use of a reaming system is recommended.
- Take care not to plunge the drill bit into the fracture site, as this may displace the fracture.

Remove the drill bit and protection sleeve.

Dispose of the guide wire. Do not reuse.

#### Alternative instrument

03.010.041            14.0 mm Cannulated Awl

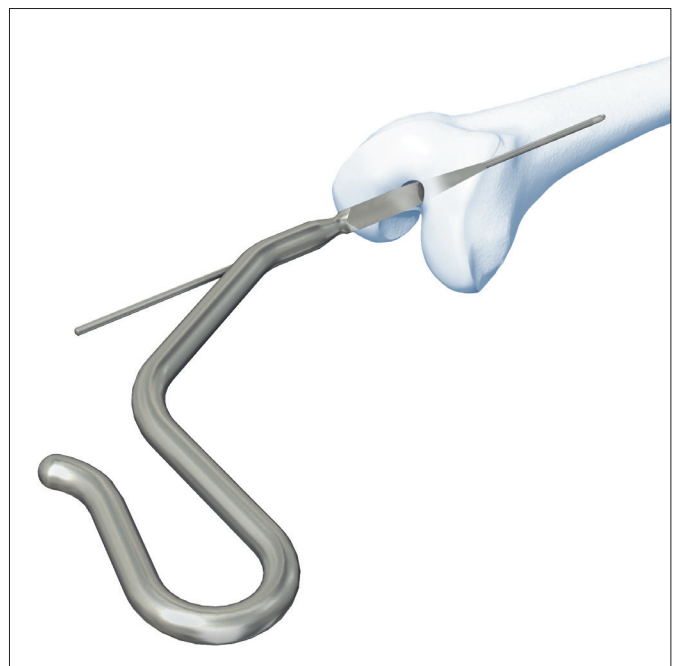
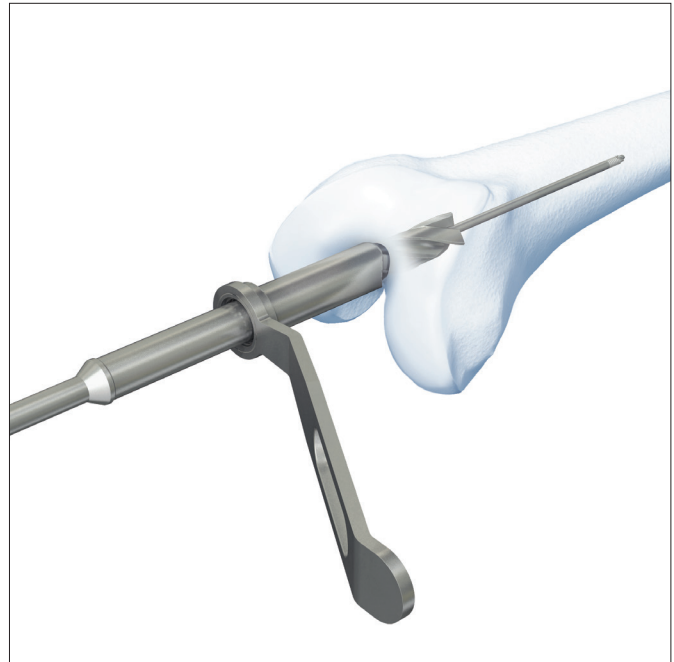
Alternatively, the awl may be used to open the medullary canal. Remove the protection sleeve. Pass the awl over the guide wire and open the medullary canal.

#### Precautions:

- The use of the awl for opening the medullary canal is suitable for 9.0 mm to 13.0 mm nails. For the larger, 14.0 mm and 15.0 mm nails, the use of a reaming system is recommended.
- Take care not to plunge the awl into the fracture site, as this may displace the fracture.

Remove the awl.

Dispose of the guide wire. Do not reuse.





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**Ream medullary canal (optional)**

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**Required set**

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150.060 Flexible Reamer Set for IM Nails

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**Alternative set**

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105.309 Reamer/Irrigator/Aspirator Instrument Set

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**Instruments**

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03.010.024 Holding Device, for Guide Wires and Reaming Rods

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03.010.093 Reaming Rod Push Rod

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351.706S 2.5 mm Reaming Rod with ball tip, 950 mm, sterile

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351.707S 2.5 mm Reaming Rod with ball tip and extension, 950 mm, sterile

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351.708S 2.5 mm Reaming Rod with ball tip, 1150 mm, sterile

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351.782 Holding Forceps

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393.10 Universal T-Handle Chuck

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If necessary, enlarge the femoral canal with the medullary reamer up to the desired diameter.

- ⓘ Check fracture reduction with the image intensifier.



### Ream medullary canal (optional)

#### Inserting the reaming rod

Insert the reaming rod with ball tip into the medullary canal, using the holding device or T-handle chuck, to the desired nail insertion depth.

If using the holding device, set the thumb switch to the 'RELEASE' or 'LOCK' position (Figure 1).

Insert guide wire/reaming rod. Apply force to the lever as far from the pivot as possible (Figure 2).

RELEASE position: The clamp will free the wire upon releasing the handle (Figure 3).

LOCK position: The clamp will retain the wire. The device will click when set to the LOCK position.

**Note: To release a wire retained in the LOCK position, apply force to the lever on its lower end, then push the thumb switch to the RELEASE position (Figure 3). This relaxes the engagement of the locking mechanism by deflecting the lever.**

To bend reaming rods, insert the extension tip into 'reaming rod' hole on the back of the handle. Bend until the reaming rod contacts the handle. This allows for a 15° bend on the reaming rod tip (Figure 4).



Figure 1

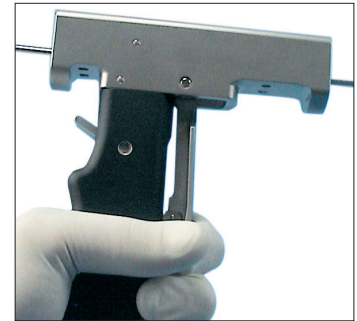


Figure 2

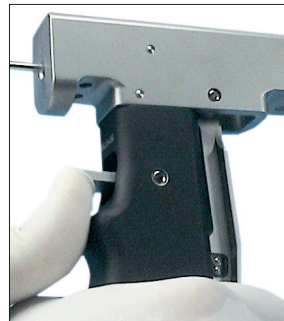


Figure 3



Figure 4

### Reaming

Starting with the 8.5 mm diameter reaming head, ream to a diameter of 0.5 mm–1.0 mm greater than the nail diameter. Ream in 0.5 mm increments and advance the reamer with steady, moderate pressure. Do not force the reamer. Partially retract the reamer often to clear debris from the medullary canal.

The holding forceps can be used to control the rotation of the reaming rod.

**Precaution: All Expert Retrograde/Antegrade Femoral Nails can be inserted over the reaming rod. The tip of the reaming rod must be correctly positioned in the medullary canal since it determines the final proximal position of the nail.**

### Optional technique

Use the reaming rod push rod to help retain the reaming rod during reamer extraction.

A reaming rod exchange tube is not required.

Ensure the reaming rod is positioned properly in the medullary canal. This defines the final position of the nail in the canal.



# RETROGRADE APPROACH— INSERT NAIL

## 1

### Assemble insertion instruments

#### Instruments

03.010.044	Cannulated Connecting Screw, for Standard Insertion Handle
03.010.045	Standard Insertion Handle
03.010.093	Reaming Rod Push Rod

Slide the connecting screw onto the reaming rod push rod until it is secured and insert it into the insertion handle. Match the tang of the handle to the notch of the nail.

The anterior bow of the nail must be aligned with the anterior bow of the femur. Orient the insertion handle anteriorly, match the notch on the insertion handle to the nail, and tighten the connecting screw.



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**Alternative instrument**

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03.010.092      Ball Hex Screwdriver, 8 mm

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Use the ball hex screwdriver to assemble the insertion instruments to the nail.



## 2

### Insert nail

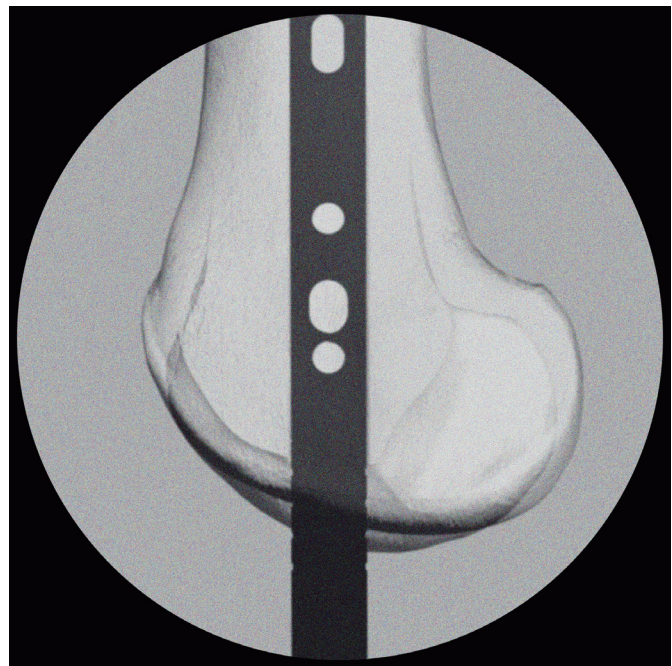
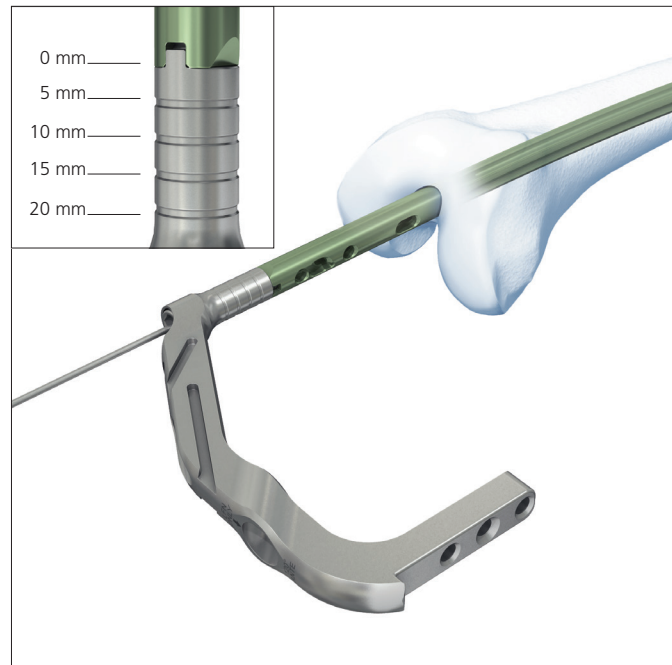
Using the insertion handle, insert the nail, over the reaming rod if used, into the medullary canal as far as possible by hand. Small twisting motions can help advance the nail.

- 1 Monitor nail passage across the fracture. Control in two planes to avoid malalignment. Use the insertion assembly to manipulate the nail across the fracture. Verify fracture reduction.

Insert the nail until the distal end is inserted 5 mm to 10 mm beyond the articular cartilage. Insertion depth is indicated by the grooves on the insertion handle.

- 2 Insertion depth can be verified with a lateral image. Use Blumensaat's line as a reference. Check the final position of the nail in AP and lateral views.

**Note:** For distal locking, mount the aiming arm after the nail has been completely inserted; otherwise the aiming arm may loosen during nail insertion.



**Alternative instruments**

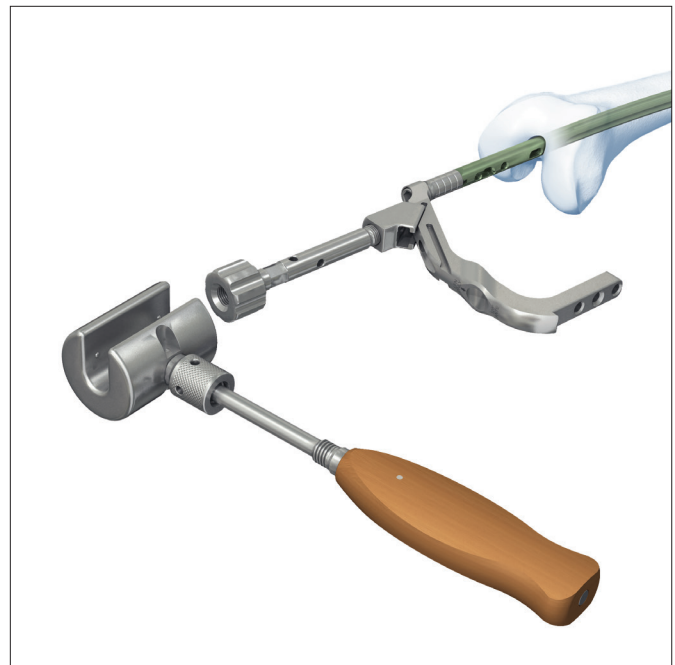
03.010.047	Driving Cap
03.010.056	Slide/Fixed Hammer, 700 grams
321.17	4.5 mm Pin Wrench
321.20	11 mm Ratchet Wrench
357.22	Hammer Guide, for Slide Hammer
357.398	Cannulated Shaft with 8 mm hex

If necessary, insert the nail with light hammer blows. Attach the driving cap to the insertion handle in the first (medial) slot and tighten it to the insertion handle. Use the slide/fixed hammer in the fixed mode.

If necessary, the hammer guide can be threaded onto the driving cap and the hammer can be used as a slide hammer. Loosen the nut from the threads located below the hammer head and secure it onto the threads located above the handle.

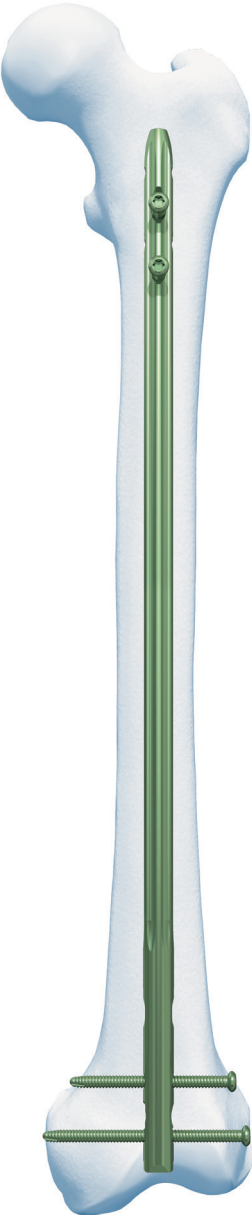
**Notes:**

- **If insertion is difficult, choose a nail with a smaller diameter or enlarge the entry canal by reaming the medullary canal to a larger diameter.**
- **Do not strike the insertion handle directly.**
- **Confirm that the nail is securely connected to the insertion handle, especially after hammering, using either the 8 mm ball hex screwdriver or the cannulated shaft with 8 mm hex.**

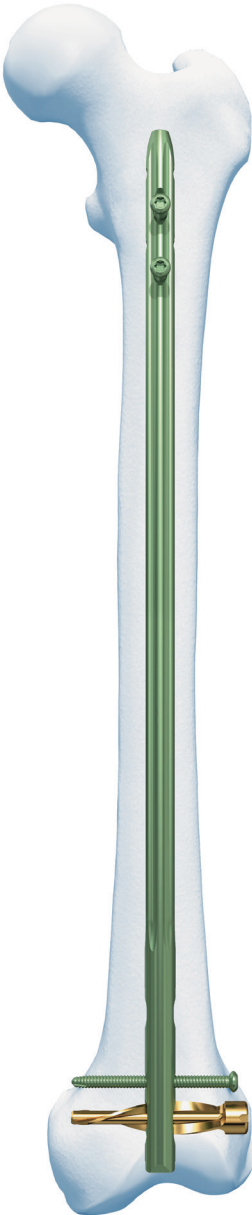


# RETROGRADE APPROACH— LOCKING OPTIONS

**Retrograde insertion**



Standard locking



Spiral blade locking



# RETROGRADE APPROACH— STANDARD LOCKING

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## 1

### Choose locking screws and instruments

Choose the locking screws and instruments appropriate for the nail size.

Nail diameter	Locking screws	Protection sleeve	Drill sleeve	Trocar	Calibrated drill bit
9.0 mm–13.0 mm (green)	5.0 mm (green)	12.0 mm/8.0 mm (03.010.063)	8.0 mm/4.2 mm (03.010.065)	4.2 mm (03.010.070)	4.2 mm (03.010.061)
14.0 mm and 15.0 mm (aqua)	6.0 mm (aqua)	12.0 mm/8.0 mm (03.010.063)	8.0 mm/5.0 mm (03.010.066)	5.0 mm (03.010.071)	5.0 mm (03.010.062)

## 2

### Connect aiming arm

#### Instrument

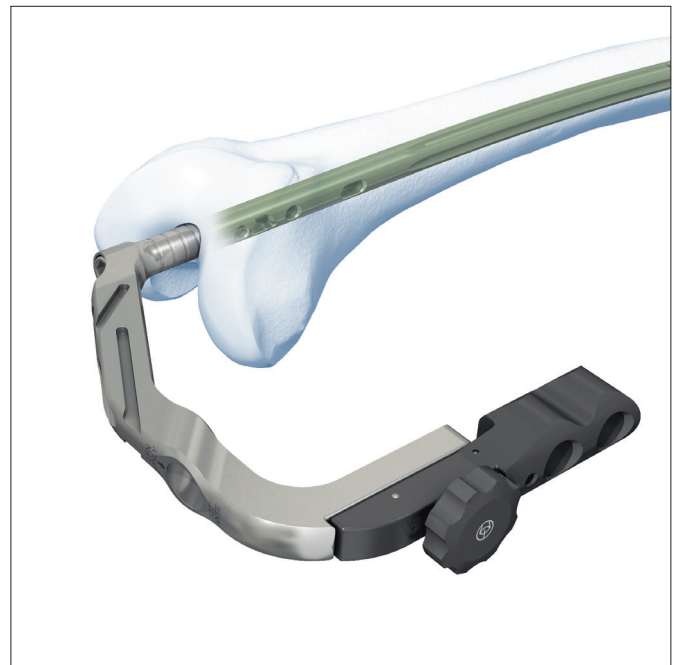
03.010.050	Aiming Arm, for Retrograde Standard Locking
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Attach the aiming arm to the insertion handle.

#### Notes:

- If insertion is not easily possible, you may choose a nail with a smaller diameter or enlarge the entry canal by reaming the medullary canal to a larger diameter.
- Do not strike the insertion handle directly.
- Confirm that the nail is securely connected to the insertion handle, especially after hammering, using either the 8 mm ball hex screwdriver or the cannulated shaft with 8 mm hex.

**Precaution:** Do not exert force on the aiming arm, protection sleeve, drill sleeves and drill bits. These forces may prevent accurate targeting through the locking holes and damage the drill bits.



## 3

### Insert trocar combination

#### Instruments

03.010.063	12.0 mm/8.0 mm Protection Sleeve
03.010.065	8.0 mm/4.2 mm Drill Sleeve
03.010.066	8.0 mm/5.0 mm Drill Sleeve
03.010.070	4.2 mm Trocar
03.010.071	5.0 mm Trocar

Assemble the three-part trocar combination (protection sleeve, drill sleeve and trocar) and insert it through the desired LM hole in the aiming arm. Make a stab incision and insert the trocar to the bone. Remove the trocar.



#### 4

#### Drill and measure for locking screw length

##### Instruments

03.010.061	4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration
03.010.062	5.0 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration

Ensure that the drill sleeve is pressed firmly to the near cortex. Using the appropriate drill bit (see table, Step 1), drill through both cortices until the tip of the drill bit penetrates the far cortex.

- Confirm drill bit position.

Ensure that the drill sleeve is pressed firmly to the near cortex and read the measurement from the drill bit at the back of the drill sleeve. This measurement corresponds to the appropriate length locking screw. Remove the drill bit and the drill sleeve.

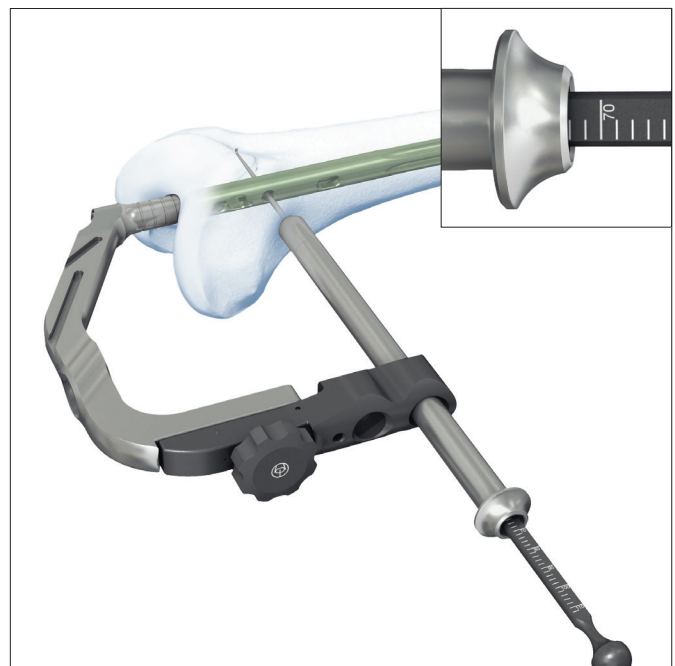
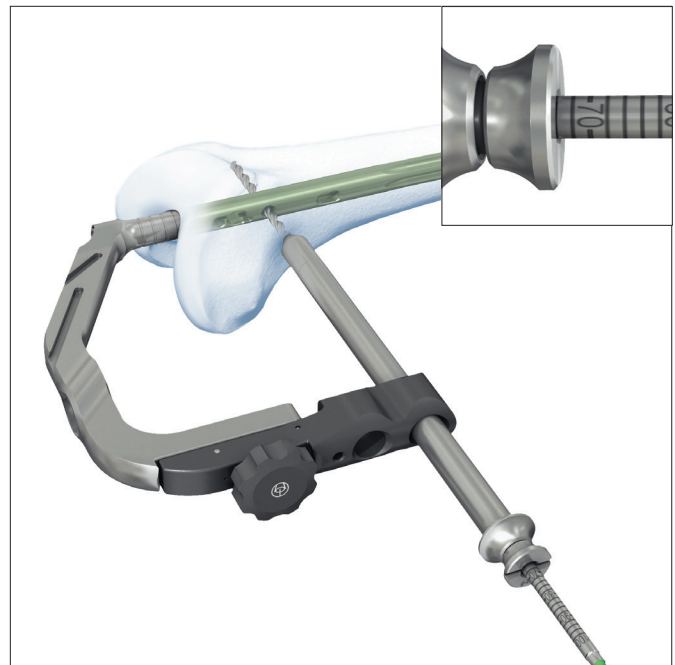
##### Alternative instrument

03.010.072	Depth Gauge, for Locking Screws to 100 mm
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After drilling both cortices, remove the drill bit and the drill sleeve.

Disassemble the depth gauge into two parts: the sleeve and the slider with hook. Insert the slider with hook into the protection sleeve. Make sure that the hook is just beyond the far cortex and that the protection sleeve is firmly pressed against the near cortex.

- Confirm depth gauge position in the far cortex of the femur. Read the measurement from the back of the protection sleeve, to determine the appropriate length locking screw.



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**5**

**Insert locking screw**

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**Instrument**

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03.010.107 StarDrive Screwdriver, T25, self-retaining

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Use the screwdriver to insert the appropriate length locking screw through the protection sleeve, until the head of the locking screw lies against the near cortex and the tip of the locking screw projects no more than 2 mm beyond the far cortex.

Repeat Steps 3 through 5 for the second distal locking screw.

Remove the nail insertion instruments.



## 6

### Insert end cap

#### Instrument

03.010.110 Cannulated StarDrive Screwdriver, T40, self-retaining

Engage the gray end cap with the cannulated T40 StarDrive Screwdriver by exerting axial pressure. To prevent cross-threading, align the end cap with the nail axis and turn the end cap counterclockwise, until the thread of the end cap aligns with that of the nail. Thread the end cap into the nail until it engages the most distal screw.

The end cap can be inserted through the insertion handle (with the connecting screw removed) to aid in aligning the end cap with the top of the nail.

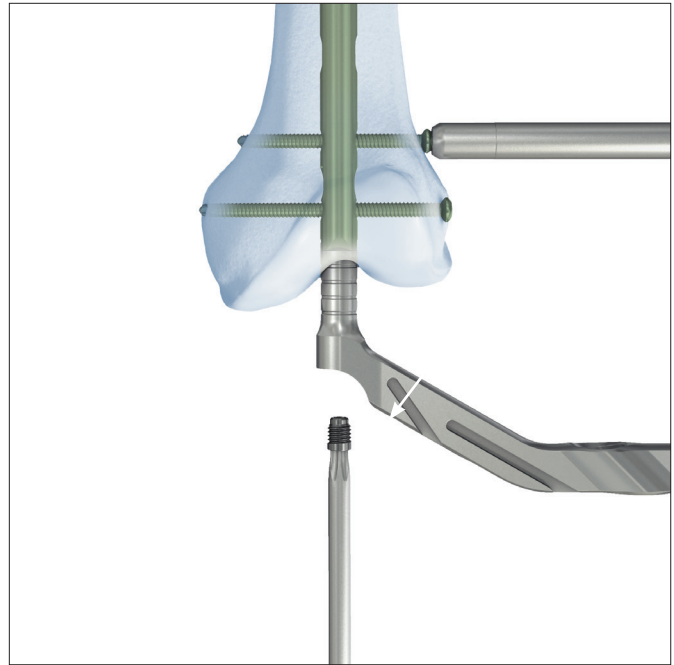
#### Alternative instrument

03.010.115 3.2 mm Guide Wire, 290 mm

The end cap and screwdriver are cannulated for use over a guide wire, if necessary.

Follow the procedure described above.

**Precaution:** Utilize the gray Titanium End Cap, 0 mm extension, for Femoral Nails–EX (04.003.000) to protect the nail connection threads from bone ingrowth. This facilitates nail removal and locks the most distal screw, providing a stable, fixed-angle construct.



# RETROGRADE APPROACH— SPIRAL BLADE LOCKING

## 1

### Connect aiming arm

#### Instrument

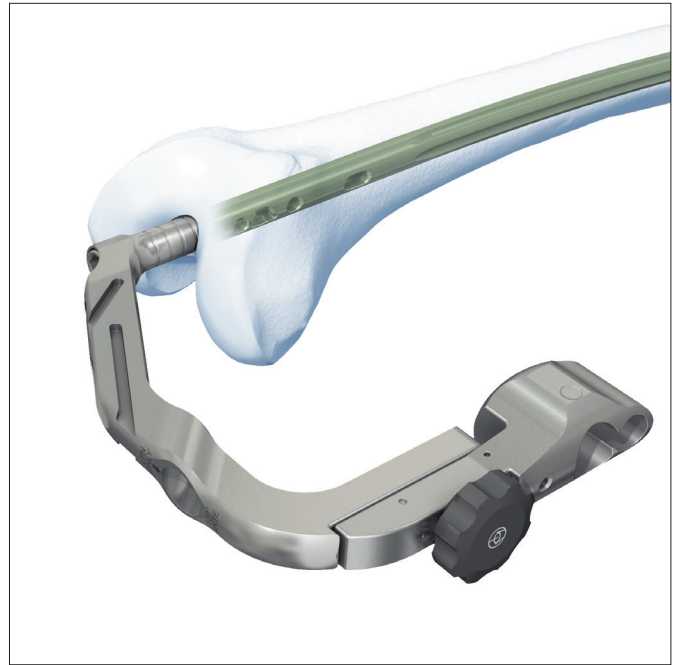
03.010.051     Aiming Arm, for Retrograde Spiral Blade Locking

Attach the aiming arm to the insertion handle.

**Precaution: Do not exert forces on the aiming arm, protection sleeve, drill sleeves and drill bits. These forces may prevent accurate targeting through the distal locking holes and damage the drill bits.**

#### Insert superior locking screw

When using the spiral blade locking option, the superior locking screw must be inserted first. Refer to “Retrograde Approach—Standard Locking,” Steps 3 through 5, pages 24–26.



## 2

### Insert spiral blade protection sleeve and wire guide

#### Instruments

03.010.081     15.0 mm/13.0 mm Protection Sleeve, for Spiral Blade Aiming Arm

03.010.082     13.0 mm/3.2 mm Wire Guide, for Spiral Blade Aiming Arm

Assemble the protection sleeve and wire guide. Insert the sleeve combination into the aiming arm. Make a lateral stab incision and advance the sleeves to the bone.



### 3

#### Insert guide wire

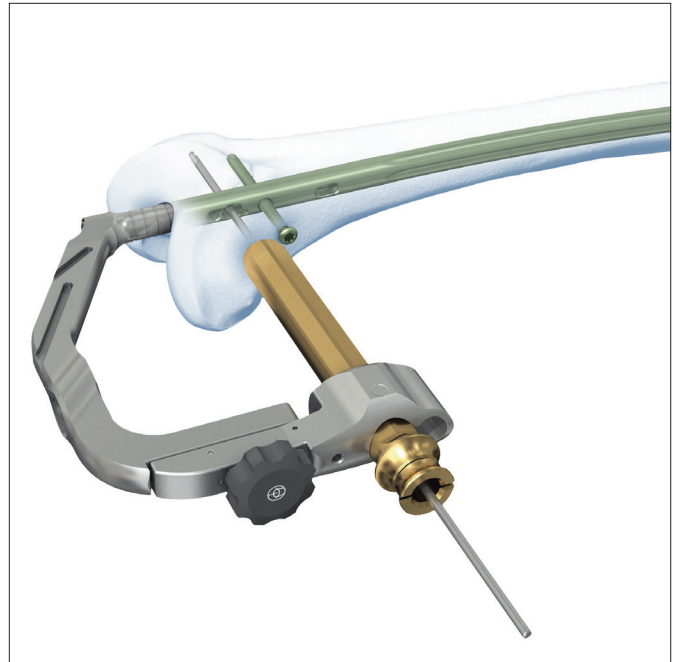
#### Instrument

03.010.115      3.2 mm Guide Wire, 290 mm

Insert a guide wire through the sleeve combination into the femoral condyles until the tip is flush with the medial cortex.

- ⦿ Confirm guide wire position radiographically.

**Precaution:** When monitoring the position of the guide wire in AP view, the trapezoidal shape of the condyles must be taken into account. Turning the leg slightly, for a better view of the guide wire tip with respect to the medial cortex, will ensure an accurate measurement.



#### 4

##### Measure for spiral blade length

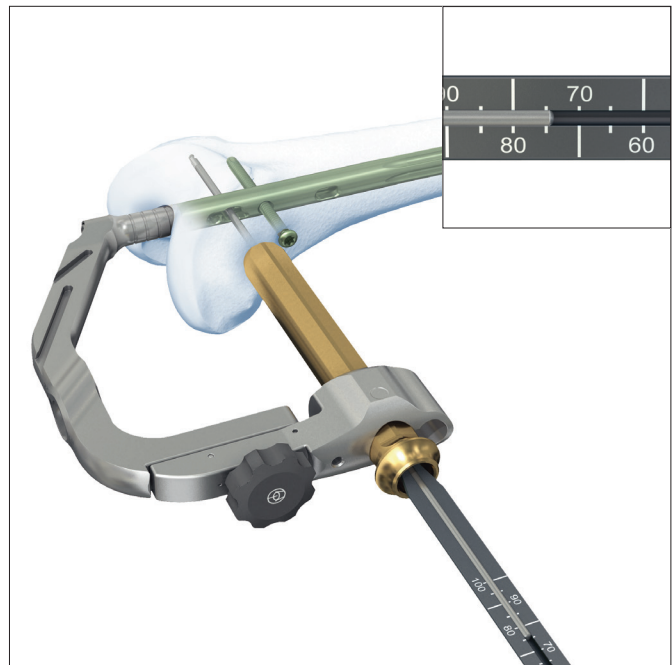
###### Instrument

03.010.083      Spiral Blade Measuring Device, for Retrograde Femoral Nails–EX

Remove the wire guide.

Place the measuring device over the guide wire and advance it to the bone. Read the graduation of the measuring device at the end of the guide wire to determine the appropriate length of the spiral blade.

Remove the measuring device.



#### 5

##### Open lateral cortex

###### Instrument

351.27      13.0 mm Cannulated Drill Bit, 300 mm

Insert the drill bit over the guide wire and through the protection sleeve to perforate the lateral cortex. An automatic stop prevents the drill bit from penetrating too far.

Remove the drill bit and the protection sleeve.





## 6

### Insert spiral blade

#### Instruments

03.010.056	Slide/Fixed Hammer, 700 grams
03.010.084	Spiral Blade Inserter, for Retrograde Femoral Nails–EX
357.34	Connecting Screw, for Spiral Blade Inserter

Use the connecting screw to attach the appropriate length spiral blade to the spiral blade inserter.

Pass the spiral blade assembly over the guide wire. Advance the inserter through the aiming arm, ensuring engagement of the inserter's helical grooves with the mating pins of the aiming arm.

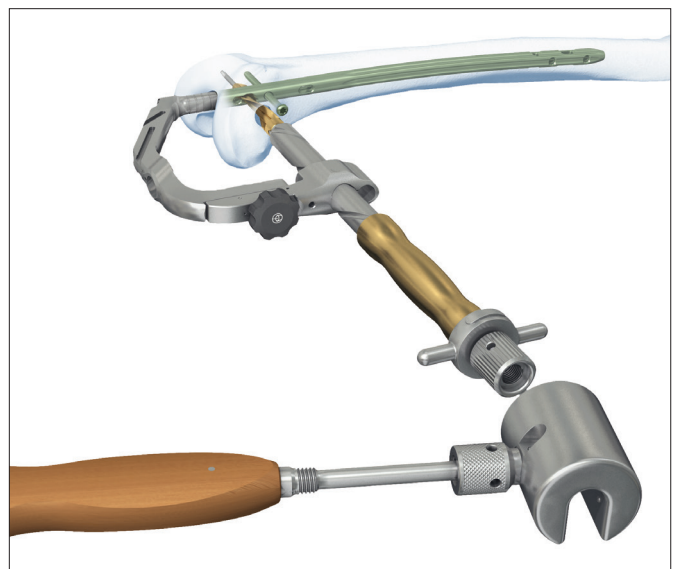
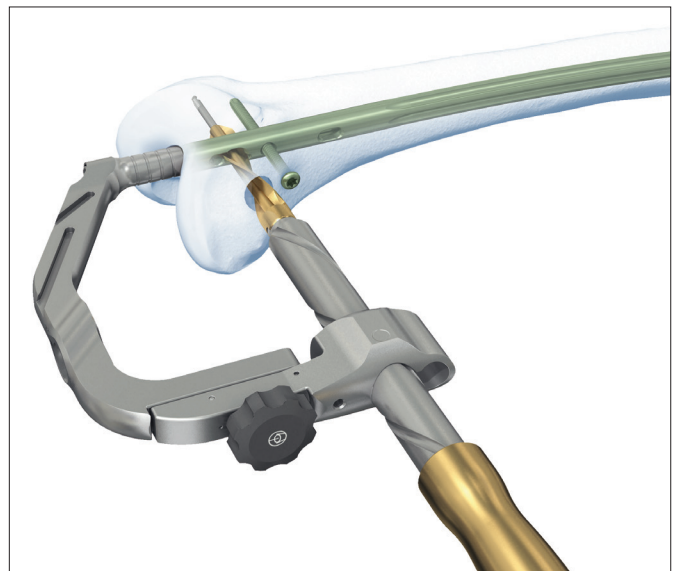
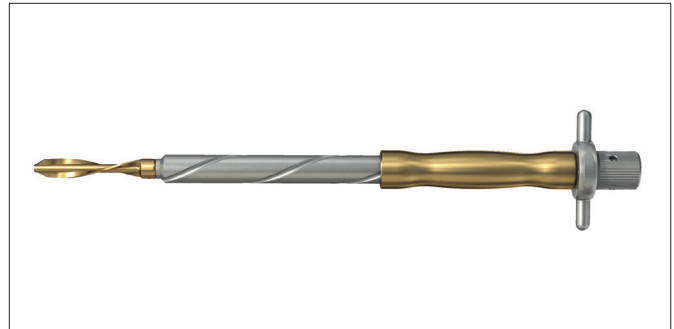
Manually advance the spiral blade to the bone.

Use light, controlled blows of the slide/fixed hammer, in the fixed position, to seat the spiral blade.

- Monitor advancement radiographically.

The correct insertion depth is reached when the spiral blade head is flush with the lateral cortex.

Remove the cannulated connecting screw that attaches the insertion handle to the nail. Do not remove the connecting screw for the spiral blade inserter.



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## 7

### Insert end cap

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#### Instrument

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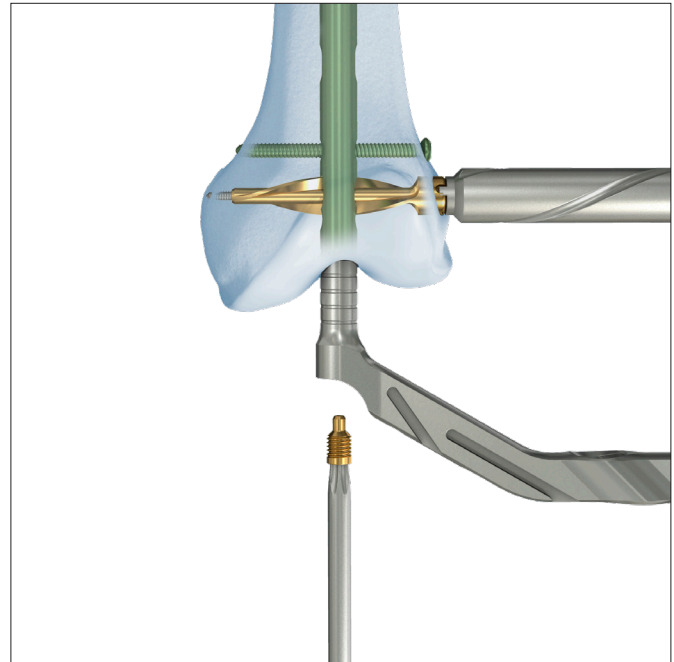
03.010.110 Cannulated StarDrive Screwdriver, T40, self-retaining

---

Engage the gold cannulated end cap with the screwdriver by exerting axial pressure. To prevent cross-threading, align the end cap with the nail axis and turn the end cap counterclockwise, until the thread of the end cap aligns with that of the nail. Thread the end cap into the nail until it engages the spiral blade.

**Precaution: The use of the gold end cap for spiral blade is mandatory. It protects the nail connection threads from bone ingrowth and locks the spiral blade, providing a stable fixed-angle construct.**

The end cap can be inserted through the insertion handle (with the cannulated connecting screw removed) to aid in aligning the end cap with the nail.



---

## 8

### Remove the spiral blade inserter

Remove the spiral blade connecting screw, then loosen the black thumb screw on the aiming arm. Remove the aiming arm and spiral blade inserter simultaneously.

Remove the insertion handle.

# RETROGRADE APPROACH— FREEHAND LOCKING

## 1

### Choose locking screws and instruments

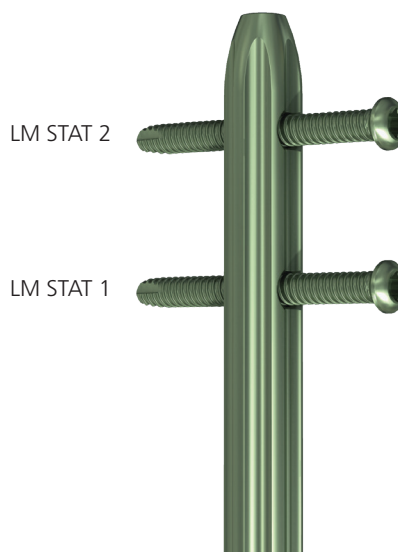
Choose the locking screws and instruments appropriate for the nail diameter.

Nail diameter	Locking screws	Drill bit
9.0 mm–13.0 mm (green)	5.0 mm (green)	4.2 mm (03.010.104 or 03.010.101*)
14.0 mm and 15.0 mm (aqua)	6.0 mm (aqua)	5.0 mm (03.010.105 or 03.010.102*)

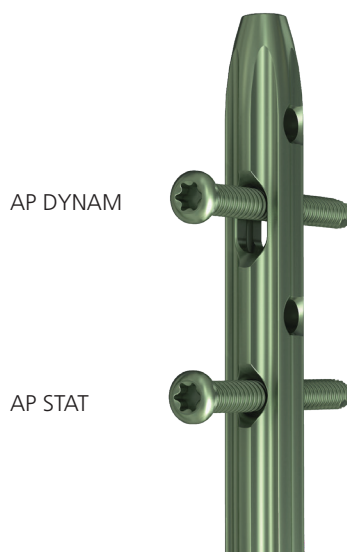
For short nails (160 mm–200 mm lengths), use the two LM holes for proximal locking.

For intermediate and long nails (220 mm–480 mm lengths), use the AP hole and AP slot for proximal locking. The dynamic locking option corresponds to the proximal position of the AP slot, to allow dynamization of the bone fragments.

Nails 160 mm–200 mm



Nails 220 mm–480 mm



\*Also available.

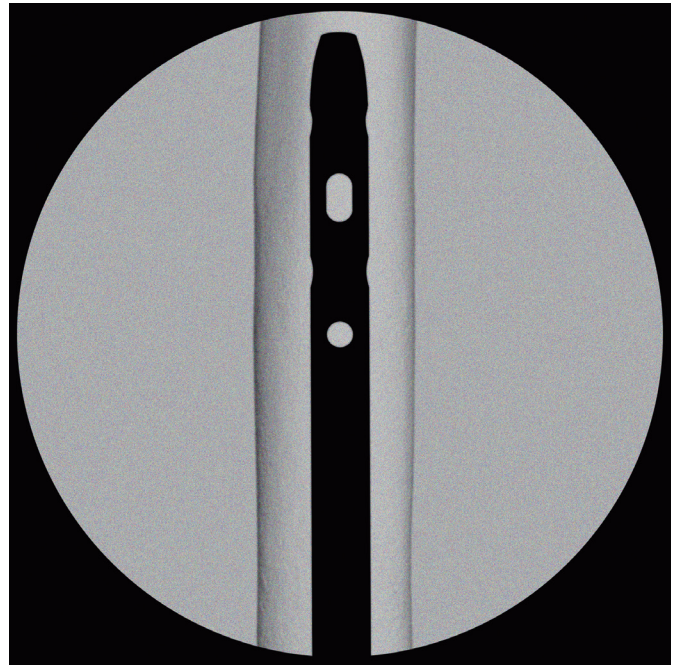
---

**2**

**Align image intensifier**

- ⌚ Check the reduction, the correct alignment of the fragments, and the leg length before locking the nail.

Align the image intensifier with the hole in the nail closest to the fracture until a perfect circle is visible in the center of the screen.

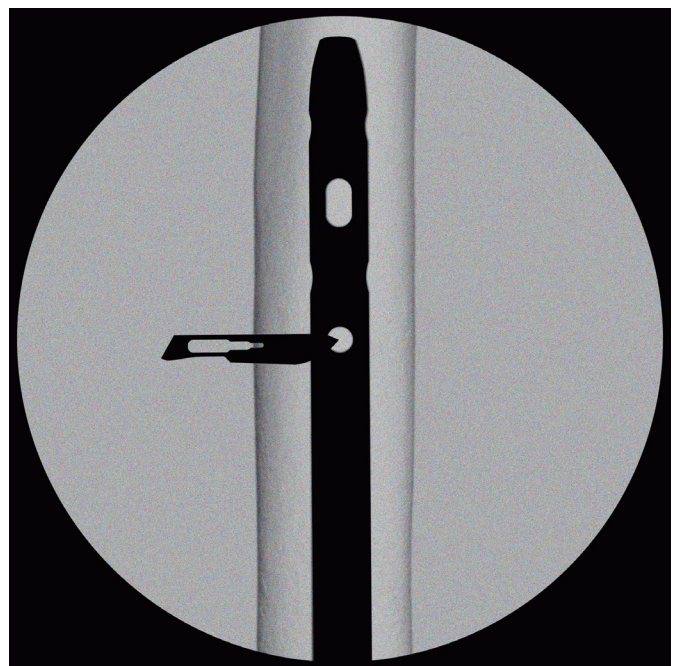


---

**3**

**Make incision**

- ⌚ Place a scalpel blade on the skin over the center of the hole to mark the incision point and make a stab incision.



## 4

### Drill

#### Instruments

03.010.101*	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.102*	5.0 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
511.30*	Radiolucent Drive

Insert the drill bit into the radiolucent drive and insert it, through the incision, down to the bone.

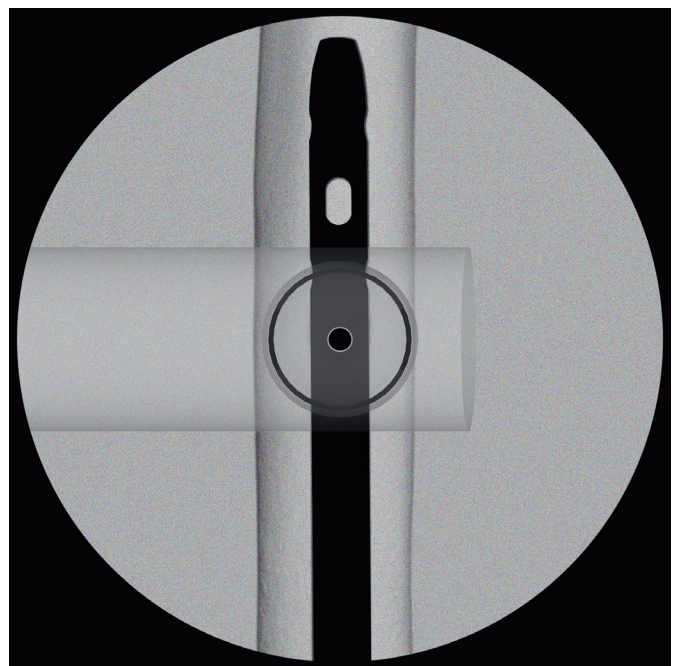
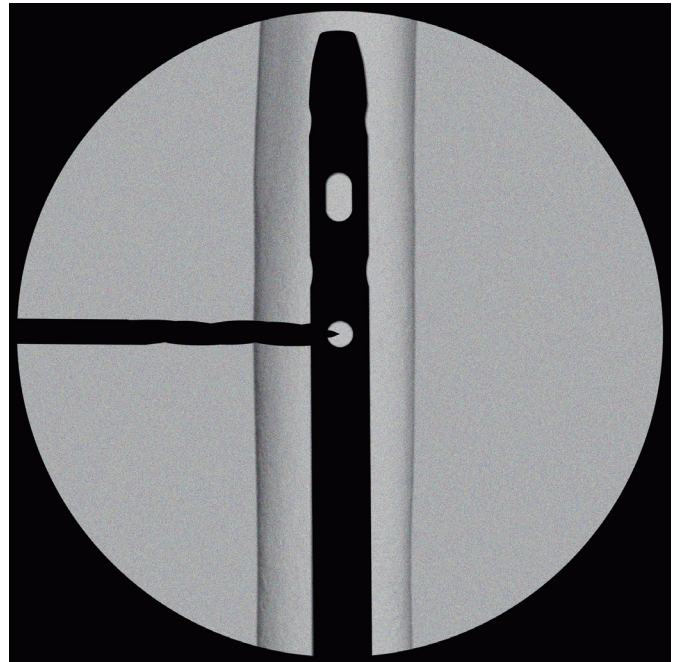
- 1 Incline the drive so that the tip of the drill bit is centered over the locking hole. The drill bit should almost completely fill the circle of the locking hole. Hold the drill bit in this position and drill through both cortices.

**Note:** For greater drill bit control, discontinue drill power after perforating the near cortex. Manually guide the drill bit through the nail before resuming power to drill the far cortex.

#### Alternative instruments

03.010.104	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm
03.010.105	5.0 mm Three-Fluted Drill Bit, quick coupling, 145 mm

Standard freehand locking technique can be performed without the radiolucent drive. Use a quick coupling drill bit.



\*Also available.

## 5

### Measure for locking screw length

#### Instrument

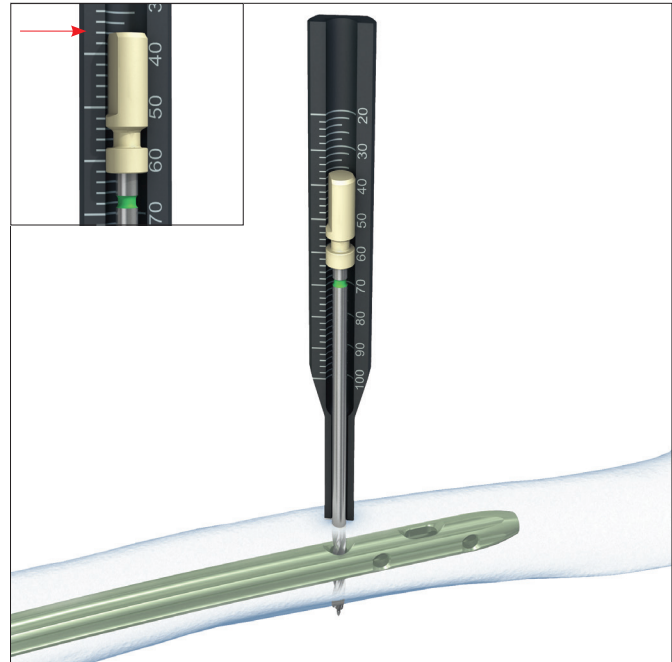
03.010.106 Direct Measuring Device, for Locking Screws to 100 mm

Stop drilling immediately after both cortices and disassemble the drill bit from the power equipment. Slide the measuring device onto the drill bit.

- 1 Ensure the correct position of the drill bit beyond the far cortex, and that the measuring device is against the bone.

Read the measurement on the measuring device at the end of the drill bit.

**Note:** Correct placement of the drill bit and measuring device are important for accurate locking screw length measurement.



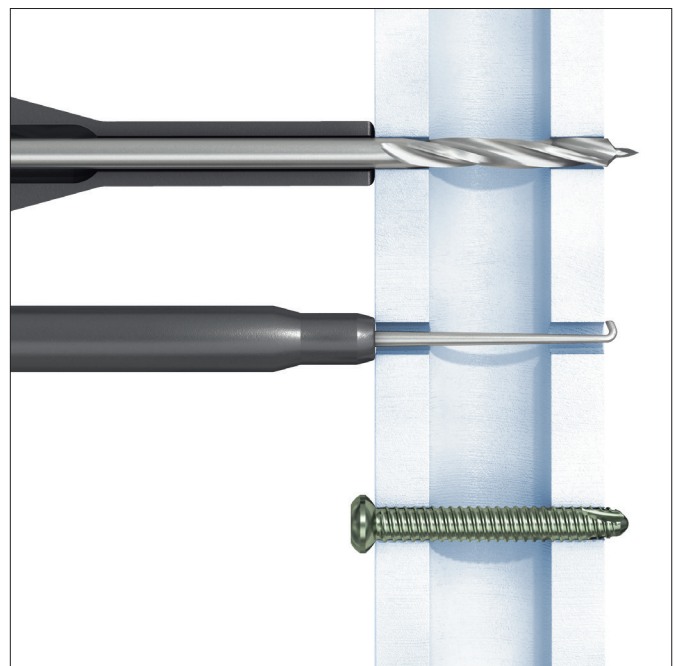
**Alternative instrument**

03.010.072      Depth Gauge, for Locking Screws  
to 100 mm

Measure the locking screw length using the depth gauge.  
Ensure the outer sleeve is in contact with the bone and the  
hook grasps the far cortex.

- Ensure the correct position of the depth gauge beyond the  
far cortex.

Read the locking screw length directly from the depth gauge  
at the back of the outer sleeve.



## 6

### Insert locking screw

#### Instruments

03.010.107	StarDrive Screwdriver, T25, self-retaining
03.010.112	Holding Sleeve, with Locking Device

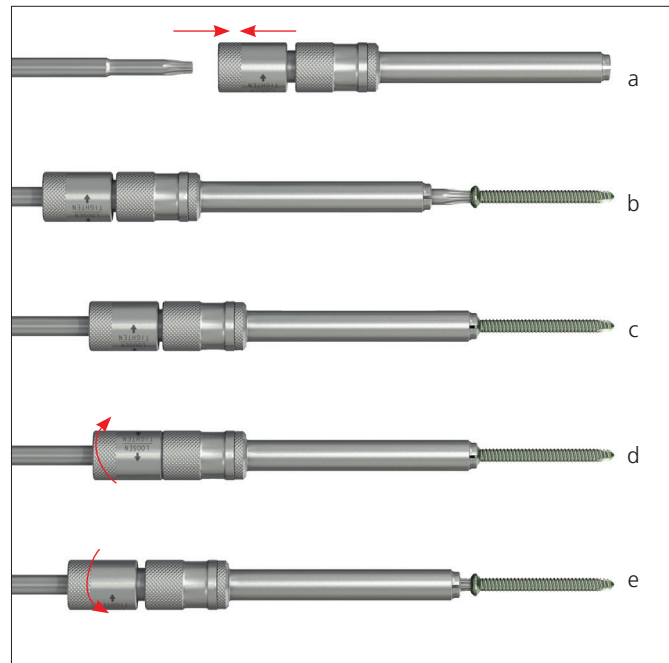
Insert the appropriate length locking screw using the screwdriver, and the holding sleeve if needed.

- ⓘ Verify locking screw length under image intensification. If needed, a second locking screw may be inserted using the same technique.

Repeat Steps 2 to 6 for the second proximal locking screw.

#### To use the holding sleeve:

- a Insert the holding sleeve onto the shaft of the screwdriver.
- b Place the tip of the screwdriver in the recess of the locking screw.
- c Push the holding sleeve in the direction of the locking screw; the sleeve now holds the locking screw.
- d Lock the holding sleeve by tightening it counterclockwise.
- e After insertion of the locking screw, release the holding sleeve by loosening it clockwise and pulling it back.





# ANTEGRADE APPROACH— OPENING THE PROXIMAL FEMUR

## 1

### Position patient

Place the patient in a supine position or lateral decubitus position (not shown) on a fracture or radiolucent table. It is recommended to slightly heighten and adduct the fractured leg, to facilitate the approach to the nail insertion site.

- Position the image intensifier to allow visualization of the proximal and distal femur in both the AP and lateral views. The contralateral leg can be flexed at the hip and knee for optimum image intensifier positioning.



## 2

### Reduce fracture

#### Instrument

394.35*	Large Distractor
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- Perform closed reduction manually by axial traction, under image intensification. The use of the large distractor may be appropriate in certain circumstances.



\*Also available.

### 3

#### Confirm nail length

##### Instruments

03.010.020	Radiographic Ruler, for Titanium Cannulated Femoral Nails
03.010.023	Radiographic Canal Width Estimator

The required nail length must be determined after reduction of the fracture.

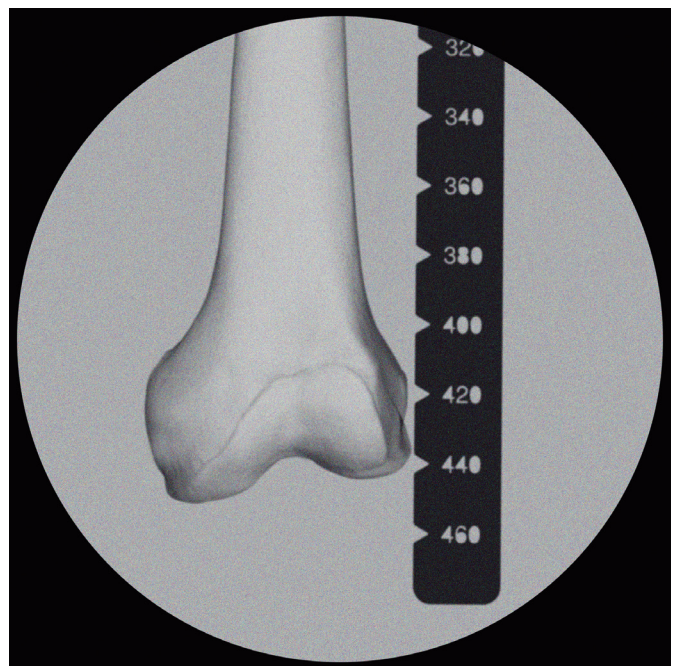
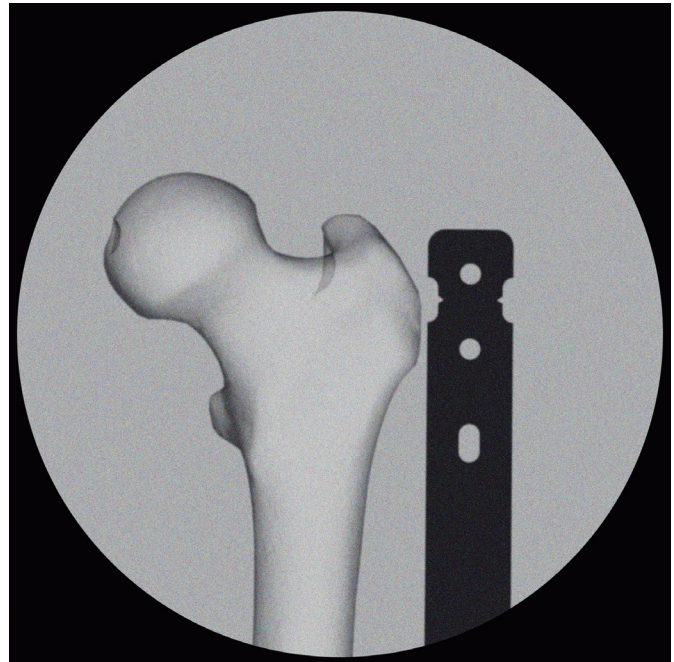
- Position the image intensifier for an AP view of the proximal femur. Using long forceps, hold the ruler parallel to the femur on the lateral side, and at the level of the femur. Position the ruler with the end at or just below the level of the tip of the greater trochanter. Mark the skin on the lateral side.
- Move the image intensifier toward the distal femur. Align the proximal end of the ruler with the skin marking and take an AP image of the distal femur. Verify fracture reduction. Read the required nail length directly from the ruler as it appears on the x-ray.

**Precaution: It is recommended to treat all fractures with the longest nail possible, taking into account patient anatomy or previous implant. Dynamization must be taken into account when determining nail length. The dynamic locking option allows 5 mm of travel; therefore, a shorter nail would be chosen.**

##### Alternative techniques

Determine nail length using the above procedure on the uninjured leg before draping (nonsterile).

Insert a reaming rod into the medullary canal of the injured leg and use an identical length reaming rod to determine the length.



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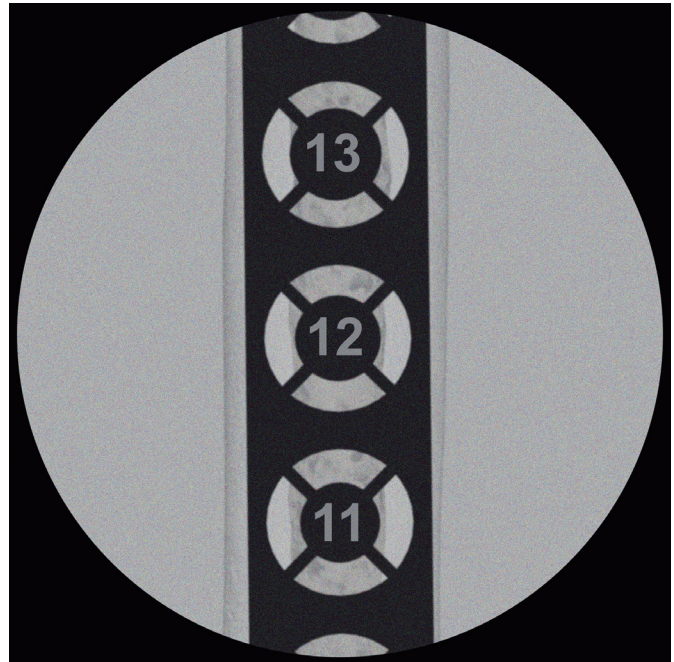
#### 4

##### Confirm nail diameter

- Position the image intensifier for an AP or lateral view of the femur at the level of the isthmus. Hold the radiographic ruler over the femur so that the diameter gauge is centered over the narrowest part of the medullary canal. Read the diameter measurement on the circular indicator that fills the canal.

**Note: The ruler is not at the same level as the femur. This affects the accuracy of the measurement, providing only an estimate of the canal diameter.**

If the reamed technique is used, the diameter of the largest medullary reamer applied must be 0.5 mm to 1.5 mm larger than the nail diameter.



---

#### 5

##### Approach

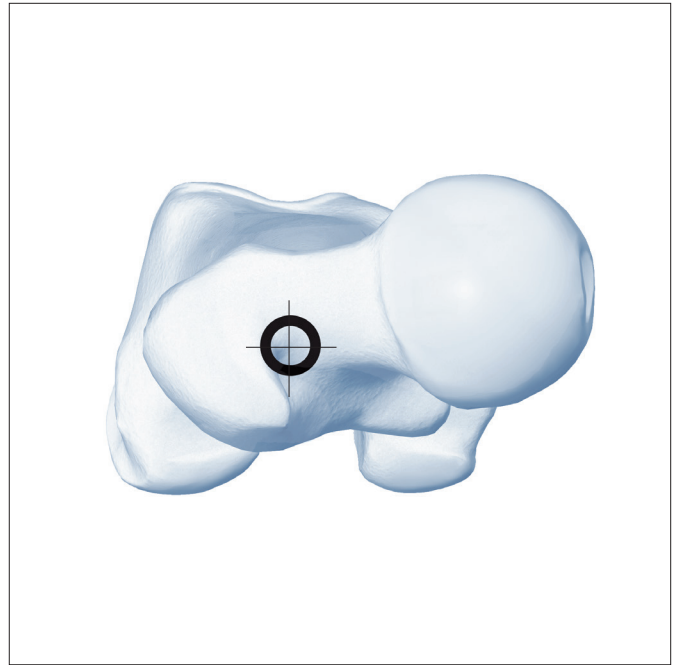
Make a longitudinal incision proximal to the tip of the greater trochanter, through the gluteus medius.

**6**

**Determine entry point**

The entry point for the Retrograde/Antegrade Femoral Nail–EX is in line with the medullary canal in the AP and lateral views. The point is posterior in the proximal femur, in the piriformis fossa, but varies with patient anatomy.

The entry point determines the optimal anatomic position of the nail in the medullary canal. Special care should be taken to ensure an accurate entry point.



**7**

**Insert guide wire**

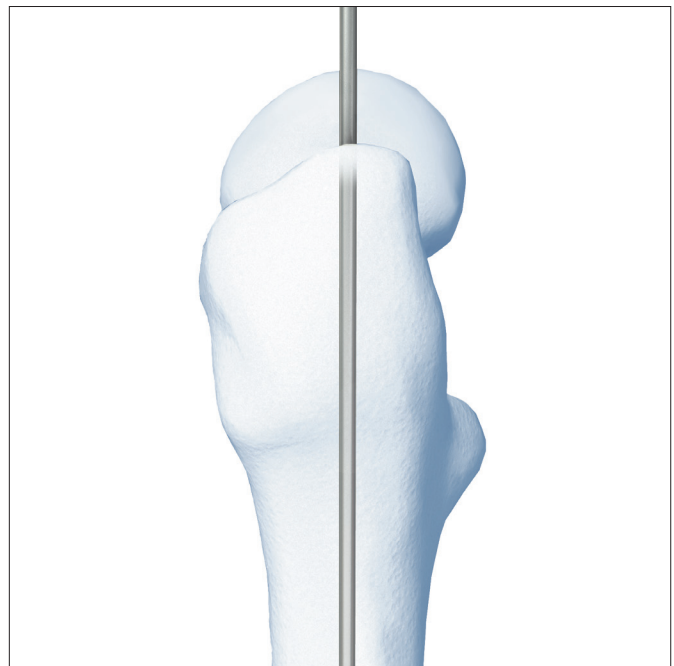
**Instruments**

03.010.030	13.0 mm Protection Sleeve (for antegrade insertion)
03.010.031	13.0 mm/3.2 mm Wire Guide, with trocar tip (for antegrade insertion)
03.010.115	3.2 mm Guide Wire, 290 mm

Thread the wire guide into the protection sleeve. Insert the assembly through the incision to the bone. Hold the protection sleeve firmly and insert the guide wire through the trocar and into the piriformis fossa in line with the anatomic axis of the femur.

- ① Verify guide wire position under image intensification with AP and lateral views.

Remove the wire guide.



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## 8

### Open medullary canal

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#### Instrument

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03.010.034      13.0 mm Flexible Cannulated Drill Bit,  
large quick coupling, 465 mm

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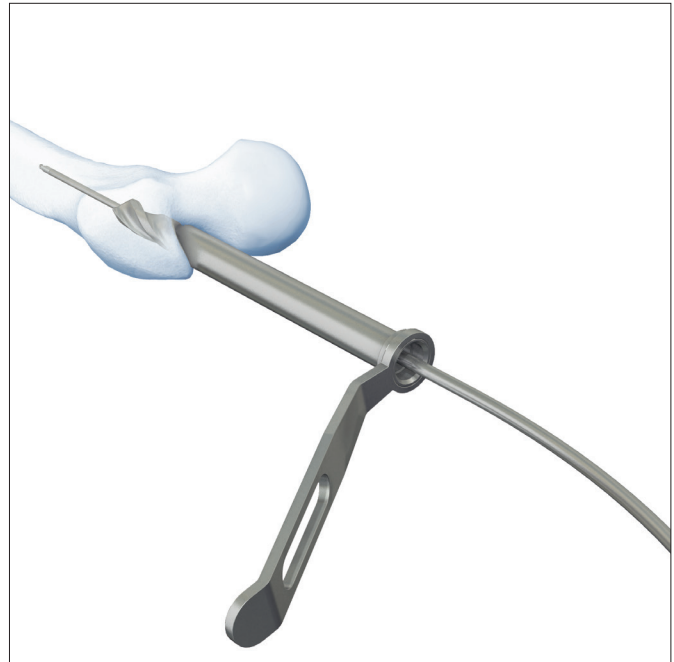
Pass the drill bit over the guide wire and through the protection sleeve to the bone. Drill the medullary canal to a depth of approximately 10 cm, to the level of the lesser trochanter.

#### Precautions:

- **The use of the drill bit for opening the medullary canal is suitable for 9.0 mm to 12.0 mm nails. For the larger, 13.0 mm to 15.0 mm nails, the use of a reaming system is recommended.**
- **Take care not to plunge the drill bit into the fracture site, as this may displace the fracture.**

Remove the drill bit and protection sleeve.

Dispose of the guide wire. Do not reuse.



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**Alternative instrument**

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03.010.041      14.0 mm Cannulated Awl

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Alternatively, the awl may be used to open the medullary canal.

Remove the protection sleeve.

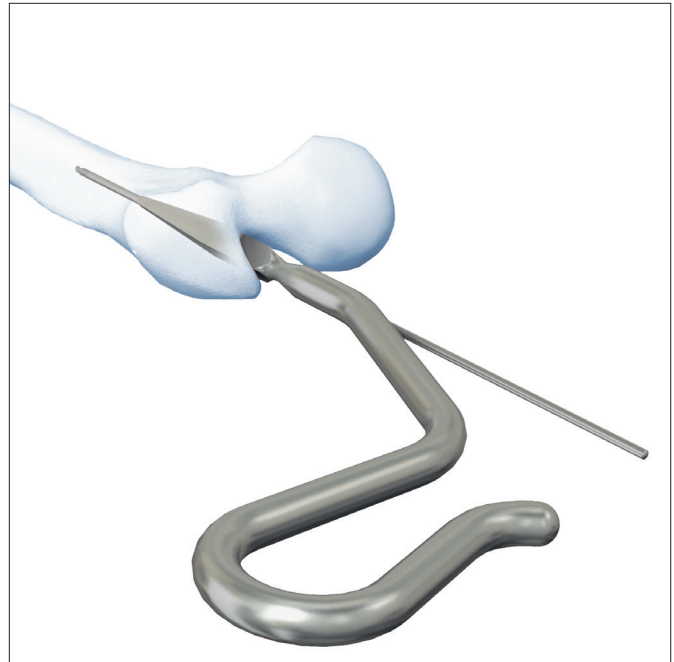
Pass the awl over the guide wire and open the medullary canal.

**Precautions:**

- **The use of the awl for opening the medullary canal is suitable for 9.0 mm to 13.0 mm nails. For the larger, 14.0 mm and 15.0 mm nails, the use of a reaming system is recommended.**
- **Take care not to plunge the awl into the fracture site, as this may displace the fracture.**

Remove the awl.

Dispose of the guide wire. Do not reuse.



---

**9**

**Reaming the medullary canal (optional)**

See reaming information on page 15.

# ANTEGRADE APPROACH— INSERT NAIL

## 1

### Assemble insertion instruments

#### Instruments

03.010.044 Cannulated Connecting Screw, for Standard Insertion Handle

03.010.045 Standard Insertion Handle

03.010.093 Reaming Rod Push Rod

Slide the connecting screw onto the Reaming Rod Push Rod until it is secured. Insert it into the insertion handle. Match the tang of the handle to the notch of the nail.

The anterior bow of the nail must be aligned with the anterior bow of the femur. Orient the insertion handle anteriorly, match the notch on the insertion handle to the nail, and tighten the connecting screw.





---

**Alternative instrument**

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03.010.092      Ball Hex Screwdriver, 8 mm

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Use the ball hex screwdriver to assemble the insertion instruments to the nail.



## 2

### Insert nail

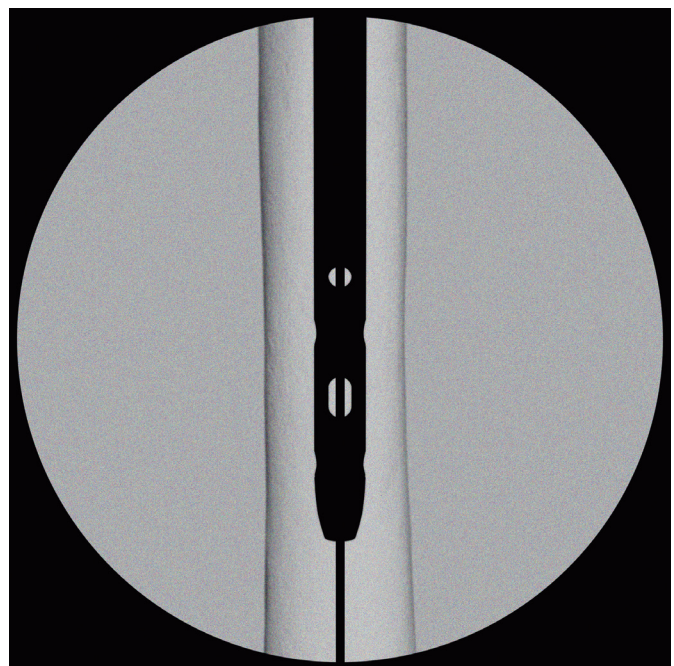
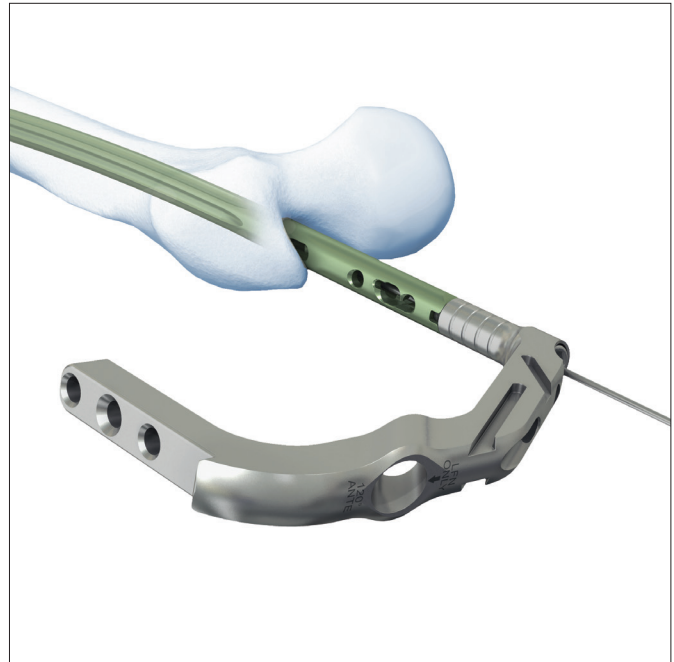
Insert the nail over the reaming rod, if used, into the medullary canal as far as possible by hand. Small twisting motions can help advance the nail.

- 1 Monitor nail passage across the fracture, controlling in two planes to avoid malalignment. Use the insertion assembly to manipulate the nail across the fracture. Verify fracture reduction.

Insert the nail until the proximal end is at or just below the greater trochanter. Insertion depth is indicated by the grooves on the insertion handle.

- 2 Check the final position of the nail in AP and lateral views.

**Note:** For proximal locking, mount the aiming arm after the nail has been completely inserted; otherwise the aiming arm may loosen during nail insertion.



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**Alternative instruments**

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03.010.047	Driving Cap
03.010.056	Slide/Fixed Hammer, 700 grams
321.17	4.5 mm Pin Wrench
321.20	11 mm Ratchet Wrench
357.22	Hammer Guide, for Slide Hammer
357.398	Cannulated Shaft with 8 mm hex

---

If necessary, insert the nail with light hammer blows. Attach the driving cap to the insertion handle in the first (medial) slot and tighten it to the insertion handle, using the pin or ratchet wrench. Use the slide/fixed hammer in the fixed mode.

If necessary, the hammer guide can be threaded onto the driving cap and the hammer can be used as a slide hammer. Loosen the nut from the threads located below the hammer head and secure it onto the threads located above the handle.

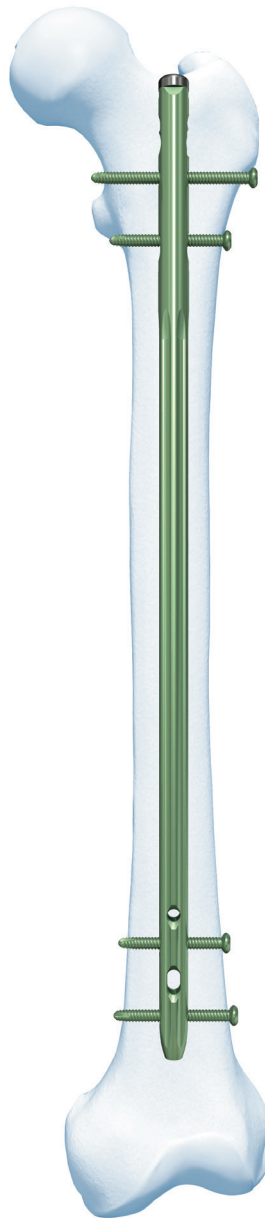
**Notes:**

- **If insertion is difficult, choose a nail with a smaller diameter or enlarge the entry canal by reaming the medullary canal to a larger diameter.**
- **Do not strike the insertion handle directly.**



# ANTEGRADE APPROACH— STANDARD LOCKING

**Antegrade insertion**



Standard locking

---

## 1

### Choose locking screws and instruments

Choose the locking screws and instruments appropriate for the nail diameter (see table on page 23).

---

## 2

### Connect aiming arm

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#### Instrument

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03.010.049	Aiming Arm, for Antegrade Standard Locking
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Connect the aiming arm to the insertion handle.

**Note:** Confirm that the nail is securely connected to the insertion handle, especially after hammering, using either the 8 mm ball hex screwdriver or the cannulated shaft with 8 mm hex.

**Precaution:** Do not exert forces on the aiming arm, protection sleeve, drill sleeves and drill bits in order to guarantee a good drilling precision through the proximal locking holes and to avoid breakage of the drill bits.



---

## 3

### Static and dynamic locking

For the proximal locking screws, follow the procedure described in section "Retrograde Approach—Standard Locking," Steps 3 to 5 (pages 24–26).

Use the LM hole and LM slot for proximal locking. The dynamic locking option corresponds to the upper position of the LM slot, to allow dynamization of the bone fragments.

For immediate dynamization, insert one proximal locking screw through the distal hole in the aiming arm.

For later, controlled dynamization, insert both proximal locking screws. When dynamization is desired, remove the most proximal locking screw.

## 4

### Insert end cap

#### Instruments

03.010.110	Cannulated StarDrive Screwdriver, T40, self-retaining
03.010.111*	Cannulated StarDrive Screwdriver, T40, with lever handle, self-retaining

Remove the nail insertion instruments.

The gray, cannulated end caps are available in 0 mm–20 mm lengths, in 5 mm increments.

Engage a gray end cap with the screwdriver by exerting axial pressure. To prevent cross-threading, align the end cap with the nail axis and turn the end cap counterclockwise, until the thread of the end cap aligns with that of the nail. Thread the end cap into the nail and tighten firmly.

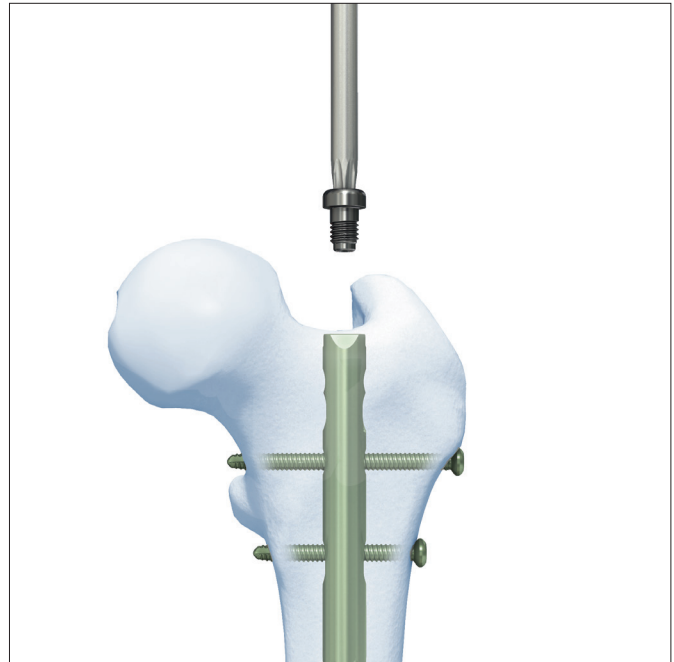
**Precaution:** The use of an end cap is recommended. The end cap protects the nail connection threads from bone ingrowth to facilitate removal, and extends the nail height if the nail is overinserted.

#### Optional instrument

03.010.115	3.2 mm Guide Wire, 290 mm
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Insert the guide wire into the proximal end of the nail and slide the end cap and the screwdriver over the guide wire.

Follow the procedure described above.



\*Also available.

# ANTEGRADE APPROACH— FREEHAND LOCKING

## 1

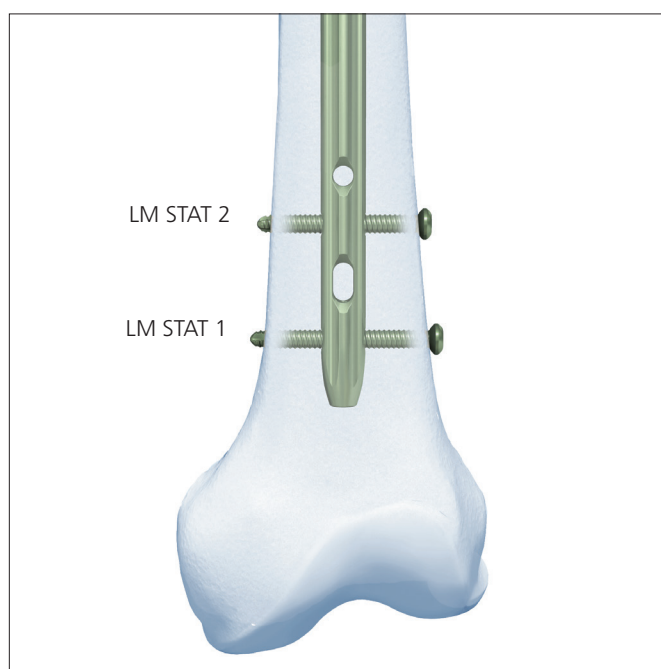
### Choose locking screws and instruments

Choose the locking screws and instruments appropriate to the nail diameter (see table on page 33).

## 2

### Freehand distal locking

Use the two LM holes for distal locking. Follow the procedure described in section “Retrograde Approach—Freehand Locking,” Steps 2 to 6 (pages 34–38).



# IMPLANT REMOVAL (OPTIONAL)

## 1

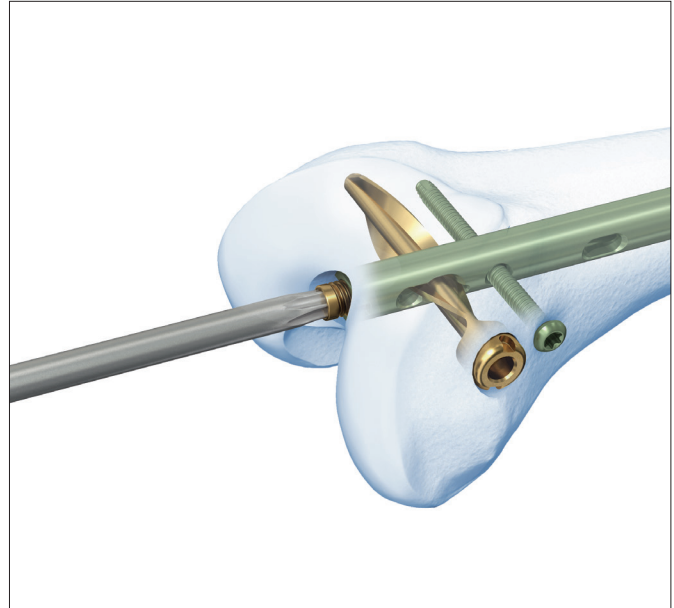
### Remove end cap

#### Instruments

03.010.110	Cannulated StarDrive Screwdriver, T40, self-retaining
03.010.111*	Cannulated StarDrive Screwdriver, T40, with lever handle, self-retaining

Clear the StarDrive Recess of the end cap of any ingrown tissue.

Remove the end cap with the StarDrive Screwdriver.



## 2

### Remove spiral blade (for retrograde nail with spiral blade)

#### Instruments

03.010.056	Slide/Fixed Hammer, 700 grams
321.17	4.5 mm Pin Wrench
357.22	Hammer Guide, for Slide Hammer
357.36	Extraction Screw (for spiral blades)

Clear the recess of the spiral blade of any ingrown tissue.

Thread the extraction screw into the hub of the spiral blade.

Thread the hammer guide into the extraction screw.

Use controlled blows of the slide/fixe hammer in “sliding” mode to extract the spiral blade. Leave a loose grip on the extraction assembly, as it and the spiral blade rotate during extraction.



\*Also available.



### 3

#### Remove screws

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#### Instruments

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03.010.107 StarDrive Screwdriver, T25, self-retaining

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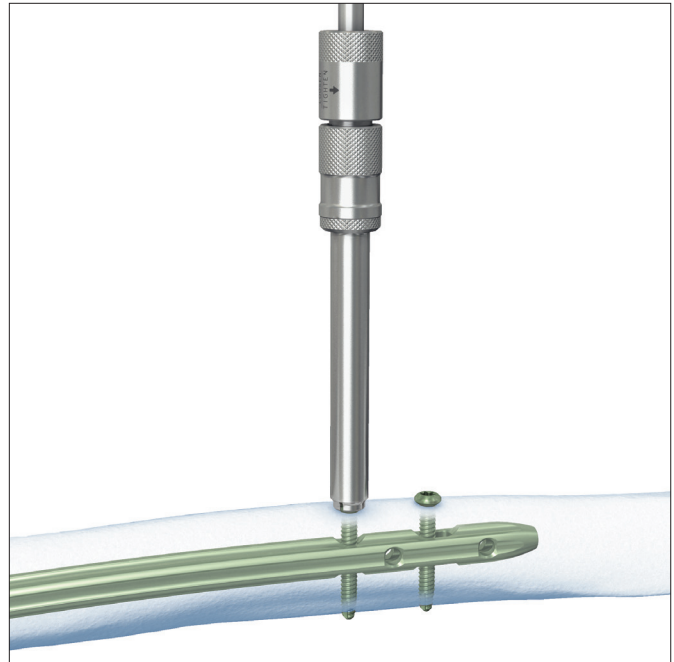
03.010.112 Holding Sleeve, with Locking Device

---

Clear the StarDrive Recess of the locking screws of any ingrown tissue.

For retrograde nails, remove all locking screws except one distal locking screw. For antegrade nails, remove all locking screws except one proximal locking screw.

Refer to page 38, for holding sleeve operation.



### 4

#### Attach extraction screw and hammer guide

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#### Instrument

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357.133 Extraction Screw, for Titanium Femoral and Tibial Nails

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Thread the extraction screw into the nail and tighten it to prevent rotation or displacement of the nail.

Attach the hammer guide to the extraction screw.

Remove the remaining locking screw.



---

**5**

**Remove nail**

---

**Instrument**

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03.010.056 Slide/Fixed Hammer, 700 grams

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Extract the nail by applying gentle blows with the slide/ fixed hammer.



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## Alternative Technique – Extraction Hook

### For removal of broken nail

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#### Instruments

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355.399 <sup>◇</sup>	Extraction Hook, for Titanium Cannulated Nails
393.10	Universal Chuck with T-Handle
or	
393.105	Small Universal Chuck with T-Handle

---

Begin with Steps 1-4 of Implant Removal, then remove the extraction screw from the nail.

#### Option 1

### 1

#### Assemble extraction hook and universal chuck

Insert the extraction hook into the universal chuck with T-handle. The hook should be parallel with the T-handle. This facilitates visualization of the hook position in the bone.

### 2

#### Insert extraction hook through nail

Pass the extraction hook through the cannula of the nail, including the distant fragment.

**Note:** Under image intensification, verify that the hook has passed through and engaged the distant end of the nail.

### 3

#### Extract nail

Extract both nail fragments.

**Note:** Keep the patient's limb restrained to increase the efficiency of the extraction force.



<sup>◇</sup> Available nonsterile or sterile-packed. Add "S" to product number to indicate sterile product.

## Option 2

### 1

#### Remove near nail fragment

Attach the appropriate extraction bolt or connecting screw to the nail. Remove the near nail fragment using the extraction bolt or connecting screw.

**Note:** The extraction hook can be used as an alternative to extraction instrumentation.

### 2

#### Ream canal

Ream the medullary canal 1 mm larger than the nail diameter to clear a path for the distant nail fragment.

### 3

#### Align extraction hook

Insert the extraction hook and explanted near nail fragment into the medullary canal. The near nail fragment aligns the extraction hook with the cannulation of the distant nail fragment.

### 4

#### Engage distant fragment

Pass the extraction hook through the cannula of the distant nail fragment.

**Note:** Under image intensification, verify that the hook has passed through and engaged the distant end of the nail.

### 5

#### Extract nail

Extract both nail fragments.

**Note:** Keep the patient's limb restrained to increase the efficiency of the extraction force.



◊Available nonsterile or sterile-packed. Add "S" to product number to indicate sterile product.

# IMPLANT SPECIFICATIONS

## TITANIUM CANNULATED RETROGRADE FEMORAL NAILS–EX

### **Titanium Cannulated Retrograde/ Antegrade Femoral Nails–EX**

- Universal design for the left or right femur

#### **Material**

- Titanium-6% aluminum-7% niobium alloy

#### **Diameters**

9 mm–15 mm (1 mm increments)

- 9 mm–11 mm are 12 mm in diameter at instrumented end
- 12 mm–15 mm have an instrumented end diameter consistent with the shaft

#### **Colors**

- 9 mm–13 mm (green) use 5.0 mm titanium locking screws (green)
- 14 mm–15 mm (aqua) use 6.0 mm titanium locking screws (aqua)

#### **Lengths**

Retrograde Femoral Nails–EX

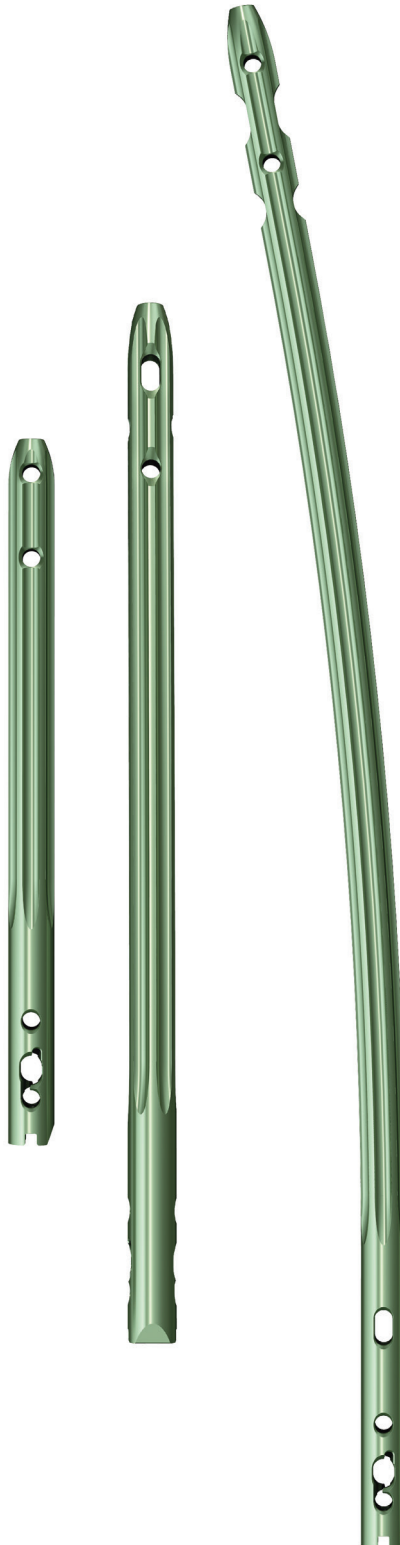
- 160 mm–280 mm (20 mm increments)

Retrograde/Antegrade Femoral Nails–EX

- 300 mm–480 mm (20 mm increments)

#### **Cross Section**

- 9 mm–10 mm nails are round
- 11 mm–15 mm nails are fluted



# IMPLANTS

## Titanium Cannulated Retrograde Femoral Nails-EX, sterile\*

Length (mm)	9 mm dia. green	10 mm dia. green	11 mm dia. green
160	04.013.312S	04.013.412S	04.013.512S
180	04.013.316S	04.013.416S	04.013.516S
200	04.013.320S	04.013.420S	04.013.520S
220	04.013.324S	04.013.424S	04.013.524S
240	04.013.328S	04.013.428S	04.013.528S
260	04.013.332S	04.013.432S	04.013.532S
280	04.013.336S	04.013.436S	04.013.536S

Length (mm)	12 mm dia. green	13 mm dia. green
160	04.013.612S	04.013.712S
180	04.013.616S	04.013.716S
200	04.013.620S	04.013.720S
220	04.013.624S	04.013.724S
240	04.013.628S	04.013.728S
260	04.013.632S	04.013.732S
280	04.013.636S	04.013.736S

Length (mm)	14 mm dia. aqua	15 mm dia. aqua
160	04.013.812S	04.013.912S
180	04.013.816S	04.013.916S
200	04.013.820S	04.013.920S
220	04.013.824S	04.013.924S
240	04.013.828S	04.013.928S
260	04.013.832S	04.013.932S
280	04.013.836S	04.013.936S

- 9 and 10 mm diameter nails are round
- 11 to 15 mm diameter nails are fluted
- 160 to 200 mm nails are straight
- 220 to 280 mm nails are bent (antecurvature = 1500 mm)



Nail length	A	B
160 mm	18 mm	42 mm
180 mm	14 mm	38 mm
200 mm	10 mm	34 mm

\*Titanium-6% Aluminum-7% Niobium alloy.

**Titanium Cannulated Retrograde/Antegrade Femoral Nails-EX, sterile\***

Length (mm)	9 mm dia. green	10 mm dia. green	11 mm dia. green
300	04.013.340S	04.013.440S	04.013.540S
320	04.013.344S	04.013.444S	04.013.544S
340	04.013.348S	04.013.448S	04.013.548S
360	04.013.352S	04.013.452S	04.013.552S
380	04.013.356S	04.013.456S	04.013.556S
400	04.013.360S	04.013.460S	04.013.560S
420	04.013.364S	04.013.464S	04.013.564S
440	04.013.368S	04.013.468S	04.013.568S
460	04.013.372S	04.013.472S	04.013.572S
480	04.013.376S	04.013.476S	04.013.576S

Length (mm)	12 mm dia. green	13 mm dia. green
300	04.013.640S	04.013.740S
320	04.013.644S	04.013.744S
340	04.013.648S	04.013.748S
360	04.013.652S	04.013.752S
380	04.013.656S	04.013.756S
400	04.013.660S	04.013.760S
420	04.013.664S	04.013.764S
440	04.013.668S	04.013.768S
460	04.013.672S	04.013.772S
480	04.013.676S	04.013.776S



\*Titanium-6% Aluminum-7% Niobium alloy.

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**Titanium Cannulated Retrograde/Antegrade Femoral Nails-EX, sterile\* continued**

Length (mm)	14 mm dia. aqua	15 mm dia. aqua
300	04.013.840S	04.013.940S
320	04.013.844S	04.013.944S
340	04.013.848S	04.013.948S
360	04.013.852S	04.013.952S
380	04.013.856S	04.013.956S
400	04.013.860S	04.013.960S
420	04.013.864S	04.013.964S
440	04.013.868S	04.013.968S
460	04.013.872S	04.013.972S
480	04.013.876S	04.013.976S

- 9 and 10 mm diameter nails are round
- 11 to 15 mm diameter nails are fluted

\*Titanium-6% Aluminum-7% Niobium alloy.



**Titanium Spiral Blades, for Retrograde Femoral Nails–EX (gold)◇**



- Titanium alloy\*
- Lengths: 45 mm–100 mm (5 mm increments)
- Cannulated for insertion over a 3.2 mm guide wire
- 12.5 mm blade diameter
- Front-cutting edge

	Length (mm)		Length (mm)
04.013.041	45	04.013.047	75
04.013.042	50	04.013.048	80
04.013.043	55	04.013.049	85
04.013.044	60	04.013.050	90
04.013.045	65	04.013.051	95
04.013.046	70	04.013.052	100

**Titanium End Cap, for Retrograde Femoral Nails–EX Spiral Blade Locking (gold)◇**



- Titanium alloy\*
- Securely locks spiral blade
- Sits flush with end of nail
- Protects nail threads from tissue ingrowth
- T40 StarDrive Recess

04.013.000 End Cap, 0 mm extension

◇Available nonsterile or sterile-packed.  
 Add "S" to product number to indicate sterile product.  
 \*Titanium-6% Aluminum-7% Niobium alloy.

**5.0 mm Titanium Locking Screws  $\diamond$ , with T25 StarDrive Recess, for IM Nails (green)**



- Titanium alloy\*
- Lengths: 26 mm–80 mm (2 mm increments)  
85 mm–100 mm (5 mm increments)
- 4.3 mm core diameter
- Fully threaded
- Self-tapping, blunt tip
- T25 StarDrive Recess for improved torque transmission and self-retention on screwdriver

	Length (mm)		Length (mm)
04.005.516	26	04.005.548	58
04.005.518	28	04.005.550	60
04.005.520	30	04.005.552	62
04.005.522	32	04.005.554	64
04.005.524	34	04.005.556	66
04.005.526	36	04.005.558	68
04.005.528	38	04.005.560	70
04.005.530	40	04.005.562	72
04.005.532	42	04.005.564	74
04.005.534	44	04.005.566	76
04.005.536	46	04.005.568	78
04.005.538	48	04.005.570	80
04.005.540	50	04.005.575	85
04.005.542	52	04.005.580	90
04.005.544	54	04.005.585	95
04.005.546	56	04.005.590	100

$\diamond$ Available nonsterile or sterile-packed.

Add "S" to product number to indicate sterile product.

\*Titanium-6% Aluminum-7% Niobium alloy.

**6.0 mm Titanium Locking Screws <sup>◇</sup>, with T25 StarDrive Recess, for IM Nails (aqua)**



- Titanium alloy\*
- Lengths: 26 mm–60 mm (2 mm increments)  
64 mm–80 mm (4 mm increments)  
85 mm–125 mm (5 mm increments)
- 4.8 mm core diameter
- Fully threaded
- Self-tapping, blunt tip
- T25 StarDrive Recess for improved torque transmission and self-retention on screwdriver

	Length (mm)		Length (mm)
04.005.616	26	04.005.648	58
04.005.618	28	04.005.650	60
04.005.620	30	04.005.654	64
04.005.622	32	04.005.658	68
04.005.624	34	04.005.662	72
04.005.626	36	04.005.666	76
04.005.628	38	04.005.670	80
04.005.630	40	04.005.675	85
04.005.632	42	04.005.680	90
04.005.634	44	04.005.685	95
04.005.636	46	04.005.690	100
04.005.638	48	04.005.691	105
04.005.640	50	04.005.692	110
04.005.642	52	04.005.693	115
04.005.644	54	04.005.694	120
04.005.646	56	04.005.695	125

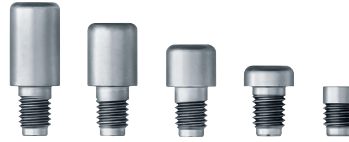
<sup>◇</sup>Available nonsterile or sterile-packed.

Add "S" to product number to indicate sterile product.

\*Titanium-6% Aluminum-7% Niobium alloy.

**Titanium End Caps<sup>◇</sup>, with T40 StarDrive Recess, for IM Nails (gray)**

- Titanium alloy\*
- End cap protects the nail connection threads from bone ingrowth and facilitates nail removal
- Self-retaining T40 StarDrive Recess facilitates secure end cap pick-up and insertion



**0 mm (retrograde or antegrade)**

- Securely locks most distal locking screw in retrograde approach
- Sits flush with end of nail

**5 mm, 10 mm, 15 mm, and 20 mm extensions (antegrade)**

- Extend nail height if nail is overinserted

	Extension (mm)
04.003.000	0
04.003.001	5
04.003.002	10
04.003.003	15
04.003.004	20

<sup>◇</sup>Available nonsterile or sterile-packed.

Add "S" to product number to indicate sterile product.

\*Titanium-6% Aluminum-7% Niobium alloy.

# INSTRUMENTS

03.010.020 Radiographic Ruler, for Titanium  
Cannulated Femoral Nails



03.010.023 Radiographic Canal Width Estimator,  
for IM Nails



03.010.024 Holding Device, for Guide Wires and  
Reaming Rods



03.010.030 13.0 mm Protection Sleeve



03.010.031 13.0 mm/3.2 mm Wire Guide,  
with trocar tip



03.010.034<sup>◇</sup> 13.0 mm Flexible Cannulated Drill Bit,  
large quick coupling, 465 mm



◇ Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

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03.010.041 14.0 mm Cannulated Awl



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03.010.044 Cannulated Connecting Screw, for Standard Insertion Handle



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03.010.045 Standard Insertion Handle



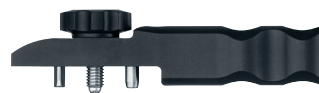
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03.010.047 Driving Cap with Handle Adapter



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03.010.049 Aiming Arm, for Antegrade Standard Locking

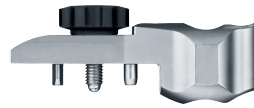


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03.010.050 Aiming Arm, for Retrograde Standard Locking



03.010.051 Aiming Arm, for Retrograde Spiral Blade Locking



03.010.056 Slide/Fixed Hammer, 700 grams



03.010.061<sup>◇</sup> 4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration



03.010.062<sup>◇</sup> 5.0 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration



03.010.063 12.0 mm/8.0 mm Protection Sleeve, 188 mm



03.010.065 8.0 mm/4.2 mm Drill Sleeve, 200 mm



03.010.066 8.0 mm/5.0 mm Drill Sleeve, 200 mm



<sup>◇</sup>Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

Instruments

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03.010.070 4.2 mm Trocar, 210 mm



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03.010.071 5.0 mm Trocar, 210 mm



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03.010.072 Depth Gauge, for Locking Screws to 100 mm for IM Nails



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03.010.081 15.0 mm/13.0 mm Protection Sleeve, for Spiral Blade Aiming Arm



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03.010.082 13.0 mm/3.2 mm Wire Guide, for Spiral Blade Aiming Arm



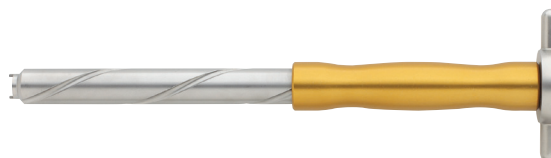
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03.010.083 Spiral Blade Measuring Device, for Retrograde Femoral Nails-EX



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03.010.084 Spiral Blade Inserter, for Retrograde Femoral Nails-EX





Instruments

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03.010.092 Ball Hex Screwdriver, 8 mm



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03.010.093 Reaming Rod Push Rod, with Ball Handle



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03.010.104<sup>◇</sup> 4.2 mm Three-Fluted Drill bit, quick coupling, needle point, 145 mm



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03.010.105<sup>◇</sup> 5.0 mm Three-Fluted Drill bit, quick coupling, needle point, 145 mm



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03.010.106 Direct Measuring Device, for Locking Screws to 100 mm, for IM Nails



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03.010.107 StarDrive Screwdriver, T25, self-retaining



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03.010.110 Cannulated StarDrive Screwdriver, T40, self-retaining



<sup>◇</sup>Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

Instruments

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03.010.112 Holding Sleeve, with Locking Device



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03.010.115 3.2 mm Guide Wire, 290 mm



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321.17 4.5 mm Pin Wrench, 120 mm



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321.20 Ratchet Wrench, 11 mm width across flats



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351.05 Tissue Protector



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351.27<sup>◇</sup> 13.0 mm Cannulated Drill Bit, 300 mm



<sup>◇</sup>Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

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357.127 13.0 mm Protection Sleeve



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357.128 13.0 mm/3.2 mm Trocar



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357.133 Extraction Screw, for Titanium Femoral and Tibial Nails



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357.22 Hammer Guide, for Slide Hammer



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357.34 Connecting Screw, for Inserter for Titanium Spiral Blades



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357.36 Extraction Screw



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357.398 Cannulated Shaft with 8 mm hex, 125 mm



# TITANIUM CANNULATED RETROGRADE/ANTEGRADE FEMORAL NAIL—EX INSTRUMENT SET (01.013.303)

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## Graphic Case

69.013.300 Retrograde/Antegrade Femoral Nail—EX  
Instrument Set Graphic Case

## Instruments

03.010.020 Radiographic Ruler, for Titanium Cannulated Femoral Nails

03.010.023 Radiographic Canal Width Estimator, for IM Nails

03.010.024 Holding Device, for Guide Wires and Reaming Rods

03.010.030 13.0 mm Protection Sleeve

03.010.031 13.0 mm/3.2 mm Wire Guide, with trocar tip

03.010.034<sup>◇</sup> 13.0 mm Flexible Cannulated Drill Bit, large quick coupling, 465 mm

03.010.041 14.0 mm Cannulated Awl

03.010.044 Cannulated Connecting Screw, for Standard Insertion Handle, 2 ea.

03.010.045 Standard Insertion Handle

03.010.047 Driving Cap with Handle Adapter

03.010.049 Aiming Arm, for Antegrade Standard Locking

03.010.050 Aiming Arm, for Retrograde Standard Locking

03.010.051 Aiming Arm, for Retrograde Spiral Blade Locking

03.010.056 Slide/Fixed Hammer, 700 grams

03.010.061<sup>◇</sup> 4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration, 2 ea.

03.010.062<sup>◇</sup> 5.0 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration, 2 ea.

03.010.063 12.0 mm/8.0 mm Protection Sleeve, 188 mm

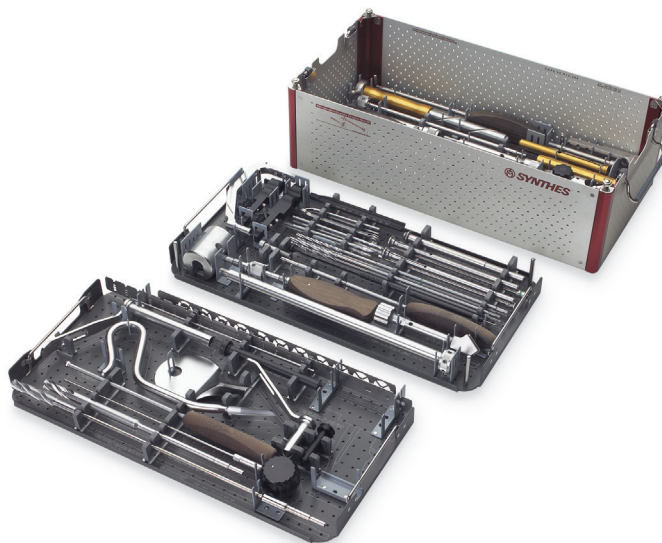
03.010.065 8.0 mm/4.2 mm Drill Sleeve, 200 mm

03.010.066 8.0 mm/5.0 mm Drill Sleeve, 200 mm

03.010.070 4.2 mm Trocar, 210 mm

03.010.071 5.0 mm Trocar, 210 mm

03.010.072 Depth Gauge, for Locking Screws to 100 mm, for IM Nails



Note: For additional information, please refer to the package insert or [www.e-ifu.com](http://www.e-ifu.com).

For detailed cleaning and sterilization instructions, please refer to [www.depuyorthopedics.com/hcp/cleaning-sterilization](http://www.depuyorthopedics.com/hcp/cleaning-sterilization) or sterilization instructions, if provided in the instructions for use.

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**Instruments**

03.010.081	15.0 mm/13.0 mm Protection Sleeve, for Spiral Blade Aiming Arm
03.010.082	13.0 mm/3.2 mm Wire Guide, for Spiral Blade Aiming Arm
03.010.083	Spiral Blade Measuring Device, for Retrograde Femoral Nails—EX
03.010.084	Spiral Blade Inserter, for Retrograde Femoral Nails—EX
03.010.092	Ball Hex Screwdriver, 8 mm
03.010.093	Reaming Rod Push Rod, with Ball Handle
03.010.104 <sup>◇</sup>	4.2 mm Three-Fluted Drill bit, quick coupling, needle point, 145 mm, 2 ea.
03.010.105 <sup>◇</sup>	5.0 mm Three-Fluted Drill bit, quick coupling, needle point, 145 mm, 2 ea.
03.010.106	Direct Measuring Device, for Locking Screws to 100 mm, for IM Nails
03.010.107	StarDrive Screwdriver, T25, self-retaining
03.010.110	Cannulated StarDrive Screwdriver, T40, self-retaining
03.010.112	Holding Sleeve, with Locking Device
03.010.115	3.2 mm Guide Wire, 290 mm, 3 ea.
321.17	4.5 mm Pin Wrench, 120 mm, 2 ea.
321.20	Ratchet Wrench, 11 mm width across flats
351.05	Tissue Protector
351.27 <sup>◇</sup>	13.0 mm Cannulated Drill Bit, 300 mm
357.127	13.0 mm Protection Sleeve
357.128	13.0 mm/3.2 mm Trocar
357.133	Extraction Screw, for Titanium Femoral and Tibial Nails
357.22	Hammer Guide, for Slide Hammer
357.34	Connecting Screw, for Inserter for Titanium Spiral Blades
357.36	Extraction Screw
357.398	Cannulated Shaft with 8 mm hex, 125 mm

<sup>◇</sup>Available nonsterile or sterile-packed.

Add "S" to product number to indicate sterile product.

# RETROGRADE/ANTEGRADE FEMORAL NAIL—EX TITANIUM IMPLANT SET (01.013.304)

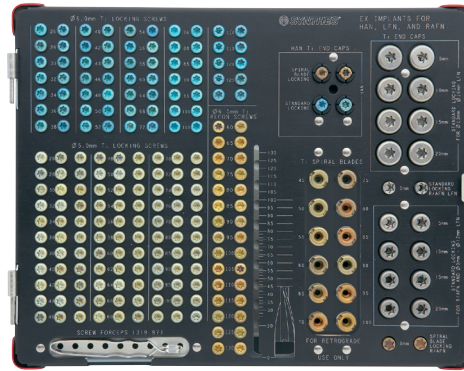
## Rack

690.502 Locking Screw/Spiral Blade Rack for Femoral Nail—EX Implants

## Implants

5.0 mm Titanium Locking Screws<sup>◇</sup>, with T25 StarDrive Recess, for IM Nails, 2 ea.

	Length (mm)		Length (mm)
04.005.516	26	04.005.548	58
04.005.518	28	04.005.550	60
04.005.520	30	04.005.552	62
04.005.522	32	04.005.554	64
04.005.524	34	04.005.556	66
04.005.526	36	04.005.558	68
04.005.528	38	04.005.560	70
04.005.530	40	04.005.562	72
04.005.532	42	04.005.564	74
04.005.534	44	04.005.566	76
04.005.536	46	04.005.568	78
04.005.538	48	04.005.570	80
04.005.540	50	04.005.575	85
04.005.542	52	04.005.580	90
04.005.544	54	04.005.585	95
04.005.546	56	04.005.590	100



<sup>◇</sup>Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

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**Implants continued**

6.0 mm Titanium Locking Screws<sup>◇</sup>, with T25 StarDrive Recess,  
for IM Nails, 2 ea.

	Length (mm)		Length (mm)
04.005.616	26	04.005.644	54
04.005.618	28	04.005.646	56
04.005.620	30	04.005.648	58
04.005.622	32	04.005.650	60
04.005.624	34	04.005.654	64
04.005.626	36	04.005.658	68
04.005.628	38	04.005.662	72
04.005.630	40	04.005.666	76
04.005.632	42	04.005.670	80
04.005.634	44	04.005.675	85
04.005.636	46	04.005.680	90
04.005.638	48	04.005.685	95
04.005.640	50	04.005.690	100
04.005.642	52		

<sup>◇</sup>Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.

---

**Implants continued**

Titanium Spiral Blades, for Retrograde Femoral Nails—EX  
(gold)<sup>◇</sup>

	Length (mm)		Length (mm)
04.013.041	45	04.013.047	75
04.013.042	50	04.013.048	80
04.013.043	55	04.013.049	85
04.013.044	60	04.013.050	90
04.013.045	65	04.013.051	95
04.013.046	70	04.013.052	100

04.013.000<sup>◇</sup> Titanium End Cap, with T40 StarDrive Recess,  
for Retrograde Femoral Nails—EX Spiral Blade  
Locking, 0 mm extension (gold), 2 ea.

Titanium End Caps<sup>◇</sup>, with T40 StarDrive Recess, for Femoral  
Nails—EX (gray), 2 ea.

	Extension (mm)
04.003.000	0
04.003.001	5
04.003.002	10
04.003.003	15
04.003.004	20

<sup>◇</sup> Available nonsterile or sterile-packed.  
Add "S" to product number to indicate sterile product.



# ALSO AVAILABLE

## Sets

105.309	Reamer/Irrigator/Aspirator Instrument Set
150.060	Flexible Reamer Set for IM Nails

## Instruments

03.010.042	Cannulated Connecting Screw, for Percutaneous Insertion Handle
03.010.046	Percutaneous Insertion Handle
03.010.101 <sup>◇</sup>	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.102 <sup>◇</sup>	5.0 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.111	Cannulated StarDrive Screwdriver, T40, with lever handle, self-retaining
03.010.119	4.6 mm Cleaning Brush
03.010.120	4.6 mm Cleaning Stylet
03.010.121	Large Hexagonal Screwdriver, 3.5 mm width across flats
03.010.151	Star/Hex Drive Screwdriver shaft, T25/3.5 mm Hex, self-retaining, 165 mm
03.010.152	Star/Hex Drive Screwdriver shaft, T25/3.5 mm Hex, self-retaining, 280 mm
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling, 165 mm
319.97	Screw Forceps
351.706S	2.5 mm Reaming Rod with ball tip, 950 mm, sterile
351.707S	2.5 mm Reaming Rod with ball tip and extension, 950 mm, sterile
351.708S	2.5 mm Reaming Rod with ball tip, 1150 mm, sterile
357.408	Cleaning Stylet
357.409	Cleaning Brush
360.251	7.5 mm Intramedullary Reduction Tool, 460 mm
393.105	Small Universal Chuck with T-Handle
394.35	Large Distractor, complete
399.43	Hammer, 700 grams

## Power Equipment

511.30	Radiolucent Drive Mark II
511.73	Jacobs Chuck with Key (Large)
511.75	Quick Coupling, for drill bits
511.761	Large Quick Coupling
511.785	Reduction Drive Unit
511.791	Quick Coupling, for Kirschner wires
530.100	Power Drive
530.200	Battery, for Power Drive
530.280	Battery Casing, for Power Drive

<sup>◇</sup>Available nonsterile or sterile-packed.

Add "S" to product number to indicate sterile product.

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Please also refer to the package insert(s) or other labeling associated with the devices identified in this surgical technique for additional information.

CAUTION: Federal Law restricts these devices to sale by or on the order of a physician.

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**Synthes USA Products, LLC**  
1302 Wrights Lane East  
West Chester, PA 19380

**Synthes USA, LLC**  
1101 Synthes Avenue  
Monument, CO 80132

**Synthes GmbH**  
Luzernstrasse 21  
4528 Zuchwil, Switzerland

To order (USA): 800-523-0322

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