Discontinued December 2017; AVAILABLE FOR IMPLANT REMOVAL PURPOSES ONLY—DSUS/TRM/0916/1033(1)
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**MR Information**
The Titanium 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 Femoral Nail System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.
Implant Specifications

Titanium Femoral Nails (green)

9 mm – 12 mm solid nails
10 mm – 15 mm cannulated nails

Material:
Titanium - 6% aluminum - 7% niobium alloy implant material

Lengths:
300 mm – 480 mm, in 20 mm increments

Diameters:
9 mm and 10 mm diameters: round cross section
11 mm – 15 mm diameters: fluted cross section

Dynamic slot accepts 4.9 mm locking bolt, 5.0 mm locking screw, Spiral Blade, or 5.0 mm shaft screw. Permits up to 8 mm controlled, axial dynamization with transverse locking bolt or locking screw.

12 mm diameter proximal end accepts locking sleeves for 13 mm – 15 mm nails.
Standard Locking Implants (green)

For 9 mm–12 mm solid nails and 10 mm–12 mm cannulated nails

12 mm Titanium End Caps
Protect proximal nail threads from tissue ingrowth
- 0 mm extension
- 10 and 20 mm extensions: extend proximal nail end to level of greater trochanter

For 13 mm–15 mm cannulated nails

Standard Locking Sleeve
For use with 13 mm–15 mm diameter nails
- 15 mm diameter sleeve matches proximal profile of 13 mm–15 mm nails to provide smooth transition on nail
- Flats key onto proximal nail end in one of two positions for right or left femur

15 mm Titanium End Caps, for standard locking sleeve
Protect proximal nail threads from tissue ingrowth
Secure locking sleeve to nail
- 0 mm extension
- 10 and 20 mm extensions extend proximal nail end to level of greater trochanter

4.9 mm Titanium Locking Bolts and 5.0 mm Titanium Locking Screws
- Lengths: 26–100 mm, in 2–5 mm increments
- 4.3 mm core diameter
- Self-cutting trocar tip
- 3.5 mm hex drive
Implant Specifications (continued)

130° Locking Implants (pink)
For 9 mm–12 mm solid nails and 10 mm–12 mm cannulated nails

130° Locking Sleeve
- 15 mm diameter sleeve adapts dynamic slot to a 130° antegrade locking hole
- Flats key onto proximal nail end in one of two positions for right or left femur

For 13 mm–15 mm cannulated nails
130° Locking Sleeve
for use with 13 mm–15 mm diameter nails
- 15 mm diameter sleeve adapts dynamic slot to a 130° antegrade locking hole
- 15 mm diameter sleeve matches proximal profile of 13 mm–15 mm nails to provide smooth transition on nail
- Flats key onto proximal nail end in one of two positions for right or left femur

15 mm Titanium End Caps for 130° locking sleeves
Protect proximal nail threads from tissue ingrowth
Secure locking sleeve to nail
- 0 mm extension
- 10 and 20 mm extensions: extend proximal nail end to level of greater trochanter
Spiral Blade Locking Implants (blue)

For 9 mm–12 mm solid nails and 10 mm–12 mm cannulated nails

- 100°, 110°, 120° angles adapt nail slot for Spiral Blade
- 15 mm diameter
- Flats key onto proximal nail end in one of two positions for right or left femur
- Etching identifies the lateral side

Locking Sleeves for Spiral Blade

- 100°, 110°, 120° angles adapt nail slot for Spiral Blade
- 15 mm diameter
- Flats key onto proximal nail end in one of two positions for right or left femur
- Etching identifies the lateral side

For 13 mm–15 mm cannulated nails

- 15 mm diameter Locking Sleeves match proximal profile of 13 mm–15 mm nails to provide smooth transition on nail

Spiral Blades

- Lengths: 70–120 mm, in 5 mm increments
- Cannulated for insertion over 3.2 mm guide wire
- Front-cutting end
- Spiral rotates counterclockwise 90° between nail and front tip
- Width: 12.5 mm

15 mm Titanium End Caps, for Spiral Blade locking sleeves

Protect proximal nail threads from tissue ingrowth

Secure Spiral Blade locking sleeve to nail

- 0 mm extension
- 10 and 20 mm extensions: extend proximal nail end to level of greater trochanter

*Ultra High Molecular Weight Polyethylene implant material.
Implant Specifications (continued)

Miss-A-Nail Locking Implants (gold)

7.3 mm Titanium Cannulated Screws
• 16 mm cancellous thread length for interfragmentary compression
• Lengths: 70–125 mm, in 5 mm increments
• Accept 2.8 mm guide wire
• Self-drilling/self-tapping
• Reverse-cutting flute for removal

5.0 mm Titanium Shaft Screws
• 16 mm cancellous thread length for interfragmentary compression
• Lengths: 70–125 mm, in 5 mm increments
• 5.0 mm diameter for insertion through nail slot, as a third point of femoral neck fracture fixation
• Self-tapping
• Front-cutting flutes permit insertion of 5.0 mm shaft screw into 3.2 mm drilled hole

13.0 mm Titanium Washers (optional)
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| **130° Locking** |
|-------------------------------------------------|--------------|
| **15 mm End Caps** | **130° Locking Sleeve**  |
| 457.210–.212 | 456.013  |

| **Spiral Blade Locking** |
|-------------------------------------------------|--------------|
| **15 mm End Caps** | **Locking Sleeves for Spiral Blade**  |
| 457.010–.012 | 456.010–.012  |

| **Spiral Blades** | **456.70–.120**  |

| **MISS-A-NAIL** |
|-------------------------------------------------|--------------|
| **12 mm End Caps** | **7.3 mm Cannulated Screws**  |
| 459.012–.014 | 408.870–.925  |

| | **Not Recommended**  |
Indications

Indications for the Titanium Femoral Nail System include:

- Femoral shaft fractures
- Subtrochanteric fractures
- Ipsilateral femoral neck/shaft fractures
- Impending pathologic fractures
- Nonunions

Femoral shaft fractures

For the femoral shaft fracture, two standard locking configurations are possible:

- Static transverse locking
- Dynamic transverse locking
CASE 1

CASE 2
Femoral shaft or stable* subtrochanteric fractures

For the femoral shaft or the stable subtrochanteric fracture, 130° antegrade locking is possible.

CASE 3

* Lesser trochanter and medial buttress intact/attached to the proximal fragment
**Subtrochanteric fractures**

For the subtrochanteric fracture with a detached lesser trochanter, the Spiral Blade provides secure fixation of the proximal fragment. The Spiral Blade is not indicated for intertrochanteric fractures.

**CASE 4**
Indications (continued)

Ipsilateral femoral neck/shaft fractures

For the ipsilateral femoral neck/shaft fracture, the Miss-A-Nail instruments permit insertion of titanium cannulated screws into the femoral head, anterior to the nail path, for fixation of the neck fracture prior to intramedullary fixation of the shaft fracture. The Miss-A-Nail instruments also permit screw insertion into the femoral head after nail insertion, for the occult neck fracture.

CASE 5
Preoperative Implant Selection

Use the AO Preoperative Planner rulers to determine the following measurements:

- Nail length
- Nail diameter
- Spiral Blade angle (if indicated)

For Spiral Blade locking procedures

Determine Spiral Blade angle

Select Spiral Blade angle based on anatomy and fracture location.

Ideally, the blade tip should lie just inferior to the intersection of the compression and tension trabeculae in the AP view of the femoral head, and the midsection of the blade should lie in the inferior aspect of the femoral neck. Because the trabecular intersection is the densest area of bone in the femoral head, this blade placement maximizes purchase and cutout resistance.

The Spiral Blade should be in the proximal fragment and should not cross the fracture. For high subtrochanteric fractures, a lower angled Spiral Blade is often needed.

For all locking procedures

Note that all ruler images are enlarged 15% to account for average radiograph magnification; however, deviations in magnification levels are common.

When selecting nail diameter, consider anatomic isthmus diameter, fracture pattern, and postoperative protocol/expectations.

Plan for Spiral Blade angle

Example showing ruler placed over the preoperative x-ray. The 100° angle will place the Spiral Blade inferior to the trabecular intersection and fully in the proximal fragment.
Instruments for Opening the Femur

Small Battery Drive with 14.4 V Battery Pack Set [105.954], specifically:

- Battery Casing for 14.4 V Battery 532.032
- Small Battery Drive 532.010
- 14.4 V Battery 532.033
- Large Quick Coupling 532.015
- Quick Coupling for K-Wires 532.022
- 3.2 mm Calibrated Guide Wire 292.69
- 13.0 mm Cannulated Drill Bit 351.27
- Large Reverse Awl 351.11
- Tissue Protector 351.05
- Universal Chuck 393.10
- Radiographic Ruler 357.59

Additional Instruments

- 2.5 mm Reaming Rod with ball tip 950 mm, sterile 351.7065 (for cannulated nails)
- Broach 351.89 (for specialty locking and 13–15 mm nails)
Opening the Femur

1  Position the patient
Position the patient in the lateral decubitus or supine position, on a fracture or radiolucent operating table. Use of the Large Distractor is optional.
Position the C-arm so true AP and lateral views are possible.
Reduce the fracture.

2  Confirm nail length
Position the image intensifier for an AP view of the proximal femur. With a long forceps, hold the ruler alongside the lateral aspect of the thigh parallel to and at the same level as the femur. Adjust the C-arm so the beam is centered between the femur and ruler; this will prevent magnification errors. Adjust the ruler until the top is level with the tip of the greater trochanter. Mark the skin at the top of the ruler.
Move the image intensifier to the distal femur, replace the proximal end of the ruler at the skin mark, and take an AP image of the distal femur. Verify fracture reduction. Read nail length directly from the ruler image, selecting the measurement at or just proximal to the physeal scar, or at the chosen insertion depth.

3  Identify nail entry point
The entry point for the nail is in line with the medullary canal in the AP and lateral views. This point is posterior in the proximal femur, in the piriformis fossa, but varies with patient anatomy.
Make a longitudinal incision proximal to the greater trochanter, through the gluteus medius and maximus interval. Insert the 3.2 mm guide wire through the incision to the piriformis fossa. Under an AP image intensification view, center the pin in line with the medullary canal.
Perform the same procedure under a lateral view.
**Opening the Femur** (continued)

4 **Open the canal**

With a power drill or hand chuck, insert the 3.2 mm guide wire into the entry point. Pass the guide wire into the medullary canal to a depth of 100 mm, confirming direction and depth with the image intensifier.

Using the tissue protector, drill over the guide wire with the 13 mm cannulated drill bit to a minimum depth of 100 mm, approximately the level of the lesser trochanter. This opening will accommodate the 9 mm–12 mm nails, which are 12 mm in diameter for a length of 90 mm from the proximal end. Remove the drill bit.

**Note:** The surgeon may also use the awl to identify the nail entry point and open the canal.

For specialty locking and for 13 mm–15 mm diameter nails, use the broach (from the Specialty Locking Set) to enlarge the femoral opening to accommodate a 15 mm sleeve. Fully insert the broach into the femoral opening using a twisting hand motion. Remove the 3.2 mm guide wire.

**Do not use the 15 mm/13 mm Protection Sleeve with the Cannulated Drill Bit. This sleeve prevents adequate drill bit penetration into the insertion site and is used only for Spiral Blade technique.**

*AP view  Lateral view*
**Reaming guidelines**
*(optional technique)*

Under image intensification, reduce the fracture and insert the appropriate reaming rod into the canal as far as the distal metaphysis.

Ream to desired diameter in 0.5 mm increments. Advance the reamer with a steady, moderate pressure. Do not force the reamer. Partially retract the reamer often to clear debris from the medullary canal.

For: 

- 9 mm or 10 mm nails: 0.5 mm > nail diameter
- 11 mm or 12 mm nails: 1.0 mm > nail diameter
- 13 mm–15 mm nails: 1.5 mm–2.0 mm > nail diameter

After reaming, withdraw the reamer shaft from the canal until the reamer head is visible. To prevent loss of reduction, grasp the reaming rod at the canal entry point and hold the reaming rod in place using the Holding Forceps [351.782].

Leave the 2.5 mm reaming rod in position for insertion of the cannulated nail.
18  DePuy Synthes Titanium Femoral Nail System Surgical Technique
Standard Locking

The Titanium Femoral Nails allow two standard locking configurations (static transverse and dynamic transverse locking) for fixation of the femoral shaft fracture.

Steps of the procedure:

- Fracture reduction
- Insertion of the nail
- Insertion of proximal and distal locking bolts or locking screws
- Insertion of end cap

Follow standard technique for opening the femur, pages 14–16.
Implants and Instruments for Standard Locking

12 mm Titanium End Cap (green) 459.01x
15 mm Titanium End Cap for Standard Locking Sleeve (green) 474.92x
Titanium Femoral Nails 46x.xx, 474.xxx
Standard Locking Sleeve for 13–15 mm nails (green) 474.900
4.9 mm Titanium Locking Bolt 459.xx
5.0 mm Titanium Locking Screw 458.xx

Hexagonal Screwdriver 314.75

Battery Casing for 14.4 V Battery 532.032
Small Battery Drive 532.010
11 mm Ratchet Wrench 321.20
11 mm Hexagonal Socket 321.21
Cannulated Shaft, 8 mm Hex 357.516

14 mm Titanium End Cap 459.01x
Cannulated End Cap for Standard Locking Sleeve (green) 474.92x
4.9 mm Titanium Locking Bolt 459.xx

4.0 mm Three-Fluted Calibrated Drill Bit 356.98
Quick Coupling for Drill Bits 532.013
700 gram Hammer 399.43
8 mm Ball Hexagonal Screwdriver 357.515
Driving Cap 357.18

Depth Gauge for Locking Bolts 357.79

8.0 mm/4.0 mm Drill Sleeve 357.71
11.0 mm/8.0 mm Protection Sleeve 357.76
4.0 mm Trocar 357.75
Standard Locking

1. Assemble the insertion instruments

   Insert the appropriate connecting screw into the insertion handle. Couple the handle to the nail so the handle orients laterally (convex side of the nail bow faces anteriorly).

   **For solid nails:**
   Use Connecting Screw [357.54]. Use the ratchet wrench to secure the connecting screw to the nail.

   **For cannulated nails:**
   Use Cannulated Connecting Screw [357.512]. Use the Ball Hexagonal Screwdriver to secure the connecting screw.

   **Note:** Do not attach the Standard Aiming Arm to the handle until the nail is fully inserted. It can loosen during nail insertion.

When using a 13 mm – 15 mm nail, place the Standard Locking Sleeve over the proximal nail end before attaching instruments.

For solid nails

   Insert connecting screw

   Tighten connecting screw

For cannulated nails

   Insert cannulated connecting screw

   Tighten cannulated connecting screw
**Standard Locking** (continued)

**Instrument Assembly**

Thread the driving cap onto the insertion handle. Slide the hammer onto the guide and pivot the handle to lock it in place. Thread this assembly into the proximal end of the driving cap, and finger-tighten the assembly.

The surgeon may also use the 700 gram hammer instead of the slide hammer assembly. The proximal end of the driving cap is the direct striking surface for the hammer.
2 **Insert the nail**

Manually insert the nail into the femoral opening using a twisting hand motion, with the insertion handle oriented laterally. Verify fracture reduction, and insert the nail as far as possible by hand. Monitor nail passage across the fracture under image intensification and use the insertion assembly to manipulate the nail across the fracture.

For cannulated nails:  
Insert the nail over the 2.5 mm Reaming Rod. The rod will pass through the opening in the side of the insertion handle.

3 **Seat the nail**

Using light blows of the hammer, seat the nail into the distal metaphysis, leaving the proximal nail end at or just below the level of the tip of the greater trochanter. When nail overinsertion is required, the surgeon may exchange the nail or extend nail length with a green 12 mm end cap (see “Place the green end cap,” pages 26–27).

If the nail has been inserted over a 2.5 mm Reaming Rod, remove the reaming rod.

*Note: During insertion of a cannulated nail, the Cannulated Shaft may be used to retighten the connecting screw, as needed.*
Lock proximally

For static locking, insert a 4.9 mm locking bolt or 5.0 mm locking screw through the inferior, proximal hole in the nail. For added rotational control, insert a second bolt or screw through the dynamic slot. For subsequent, controlled axial dynamization of the fracture, remove the static locking bolt or locking screw at a later date.

For immediate dynamization, insert one proximal locking bolt or locking screw through the proximal slot in the nail.

Attach the Standard Aiming Arm to the insertion handle. Insert the triple trocar assembly* into the handle and through a stab incision to bone. Remove the trocar.

Drill through both cortices with the 4.0 mm calibrated drill bit, stopping the drill immediately after penetrating the far cortex. Confirm drill bit position radiographically. Be sure the drill sleeve is pressed firmly to the cortex, and read direct locking bolt or locking screw length from the calibrated drill bit at the back of the drill sleeve.

*11.0 mm /8.0 mm protection sleeve, 8.0 mm /4.0 mm drill sleeve, and 4.0 mm trocar
**Note:**

There is no need to calculate bolt or screw length; the calibrated drill bit provides a direct measurement. However, since drill bit position directly represents locking bolt or locking screw position in bone, the locking bolt or locking screw will be too long if the drill bit is overinserted, or if the drill sleeve is not pressed down to the lateral cortex.

To minimize measuring errors, use the ‘pause and consider’ method:

Temporarily stop the drill when the bit hits the far cortex. Press the drill sleeve to the lateral cortex, continue drilling until the bit just penetrates the far cortex, and read the direct locking bolt or locking screw length at the back of the drill sleeve.

To use the depth gauge, remove the drill sleeve, measure through the protection sleeve using standard depth gauge technique, and add 2–4 mm to the reading to ensure thread engagement of the far cortex.

Insert the locking bolt or locking screw through the protection sleeve using the screwdriver.

Repeat the procedure for a second proximal locking bolt or locking screw.
5 **Lock distally**

For distal locking techniques, see pages 64–65.

6 **Place the green end cap**

With the insertion handle in place, take an AP image intensification view of the proximal femur. Note the position of the proximal nail end in relation to the tip of the greater trochanter. The nail end should be apparent due to the difference in nail and insertion handle diameters.

If the nail end is level with the tip of the greater trochanter, select the green 12 mm end cap with 0 mm extension.

If the proximal nail end is distal to the tip of the greater trochanter, and the surgeon chooses to extend nail length, note the position of the insertion handle barrel in relation to the tip of the greater trochanter on the image.

- If the indented ring is at the tip of the greater trochanter, use the green 12 mm end cap with 10 mm extension.
- If the base of the flare is at the tip of the greater trochanter, use the green 12 mm end cap with 20 mm extension.

If the nail end isn’t visible, remove the aiming arm, place a 3.2 mm guide wire through the hole in the insertion handle, and note wire position radiographically. This is the level of the proximal nail end. The etched line on the insertion handle is also at the level of the proximal nail end.
Remove the insertion instruments. Using the hexagonal screwdriver or ratchet wrench with socket extension, align the end cap with the nail axis to prevent cross-threading. Thread the green end cap into the nail until it seats fully.

As the final threads of the end cap turn into the nail, the surgeon will feel increased resistance. Continue turning until the shoulder of the end cap contacts the proximal nail end. This will help prevent backout.

**Note:** For 13 mm–15 mm nails with Standard Locking Sleeve, use a green 15 mm Titanium End Cap [474.92x].

Use the hexagonal screwdriver to insert the green end cap.

Use the ratchet wrench to insert the green end cap.

End cap fully seated.
130° Antegrade Locking

The 130° locking sleeve allows fixation of the femoral shaft fracture or the stable subtrochanteric fracture (with lesser trochanter intact and attached to the proximal fragment).

Steps of the procedure:

• Fracture reduction
• Insertion of the nail and locking sleeve
• Insertion of the 130° locking bolt or locking screw
• Insertion of distal locking bolts or locking screws and end cap

Follow standard technique for opening the femur, pages 14–16.
**Implants and Instruments for 130° Antegrade Locking**

- **15 mm Titanium End Cap (pink)**
  - 457.21x

- **4.9 mm Titanium Locking Bolt**
  - 459.xx

- **5.0 mm Titanium Locking Screw**
  - 458.xx

- **700 gram Hammer**
  - 399.43

- **11 mm Ratchet Wrench**
  - 321.20

- **11 mm Hexagonal Socket**
  - 321.21

- **8 mm Ball Hexagonal Screwdriver**
  - 357.515

- **Cannulated Shaft, 8mm Hex**
  - 357.516

- **Titanium Locking Sleeve (pink)**
  - 456.013

- **130° Locking Sleeve for 13–15 mm nails (pink)**
  - 474.913

- **Hexagonal Screwdriver**
  - 314.75

- **4.0 mm Three-Fluted Calibrated Drill Bit**
  - 356.98

- **Quick Coupling for Drill Bits**
  - 532.013

- **Battery Casing for 14.4 V Battery**
  - 532.032

- **Small Battery Drive**
  - 532.010

- **Broach**
  - 351.89

- **Cannulated Connecting Screw**
  - 357.512

- **Insertion Handle**
  - 357.511

- **Connecting Screw**
  - 357.54

- **Depth Gauge for Locking Bolts**
  - 357.79

- **Driving Cap**
  - 357.18

- **Battery Casing for 14.4 V Battery**
  - 532.032

- **Quick Coupling for Drill Bits**
  - 532.013

- **Hammer Guide**
  - 357.22

- **Slide Hammer**
  - 357.25

- **8.0 mm/4.0 mm Drill Sleeve**
  - 357.71

- **11.0 mm/8.0 mm Protection Sleeve**
  - 357.76

- **4.0 mm Trocar**
  - 357.75
130° Antegrade Locking

1. Enlarge the femoral opening

Fully insert the broach into the femoral opening using a twisting hand motion, to accommodate the 15 mm diameter 130° locking sleeve.

2. Assemble the implants

Orient the pink 130° locking sleeve to the nail so the word “lateral” faces laterally (convex side of nail bow faces anteriorly). Seat the sleeve onto the proximal nail end.

Note: For 13 mm – 15 mm nails, use 130° Locking Sleeve [474.913].
3 Assemble the insertion instrumentation

Assemble the insertion instruments to the nail and locking sleeve, as described on page 22.

**Note:** The aiming arm is not needed for the 130° locking procedure.

4 Insert the nail

Manually insert the nail into the femoral opening using a twisting hand motion, with the insertion handle oriented laterally. Verify fracture reduction, and pass the nail as far as possible by hand. Monitor nail passage across the fracture under image intensification. Use the insertion assembly to manipulate the nail across the fracture.

**For cannulated nails:**

Insert the nail over the 2.5 mm Reaming Rod. The rod will pass through the opening in the side of the insertion handle.
5 Seat the nail

Using light blows of the hammer, seat the nail into the distal metaphysis, leaving the proximal nail end at or just below the level of the tip of the greater trochanter.

If the nail has been inserted over a 2.5 mm Reaming Rod, remove the reaming rod.

Note: During insertion of a cannulated nail, the Cannulated Shaft may be used to retighten the connecting screw, as needed.

6 Verify nail insertion depth

Insert the 11.0 mm/8.0 mm protection sleeve into the 130° hole in the black section of the insertion handle. The sleeve will act as a pointer. Under AP image intensification, further insert or withdraw the nail until a line drawn through the sleeve corresponds to the desired locking bolt or locking screw position.
130° Antegrade Locking (continued)

7 Insert the 4.9 mm Locking Bolt or 5.0 mm Locking Screw

Extend the insertion site incision, or make a separate stab incision under the protection sleeve. Insert the 4.0 mm drill sleeve and trocar into the protection sleeve to bone. Remove the trocar.

Drill through both cortices with the 4.0 mm calibrated drill bit, stopping the drill immediately after penetrating the far cortex. Confirm drill bit position radiographically. Be sure the drill sleeve is pressed firmly to the cortex, and read direct locking bolt or locking screw length from the calibrated drill bit at the back of the drill sleeve.

To use the depth gauge, remove the drill sleeve, measure through the protection sleeve using standard depth gauge technique, and add 2 – 4 mm to the reading to ensure thread engagement of the far cortex.

Insert the locking bolt or locking screw through the protection sleeve using the screwdriver.
**Note:**
There is no need to calculate bolt or screw length; the calibrated drill bit provides a direct measurement. However, since drill bit position directly represents locking bolt or locking screw position in bone, the locking bolt or locking screw will be too long if the drill bit is overinserted, or if the drill sleeve is not pressed down to the lateral cortex.

To minimize measuring errors, use the ‘pause and consider’ method: Temporarily stop the drill when the bit hits the far cortex. Press the drill sleeve to the lateral cortex, continue drilling until the bit penetrates the far cortex, and read the direct locking bolt or locking screw length at the back of the drill sleeve.

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**8 Lock distally**
For distal locking techniques, see pages 64 and 65.
With the insertion handle in place, take an AP image intensification view of the proximal femur. Note the position of the proximal nail end in relation to the tip of the greater trochanter. The nail end should be apparent due to a difference in nail and insertion handle diameters.

If the nail end is level with the tip of the greater trochanter, select the pink 15 mm end cap with 0 mm extension.

If the proximal nail end is distal to the tip of the greater trochanter, note the position of the insertion handle barrel in relation to the tip of the greater trochanter on the image.

- If the indented ring is at the tip of the greater trochanter, use the pink 15 mm end cap with 10 mm extension.
- If the base of the flare is at the tip of the greater trochanter, use the pink 15 mm end cap with 20 mm extension.

If the nail end isn’t visible, place a 3.2 mm guide wire through the hole in the insertion handle, and note wire position on the image intensifier. This is the level of the proximal nail end. The etched line on the insertion handle is also at the level of the proximal nail end.

Note position of proximal nail end

Example showing indication for 10 mm extension end cap.
Remove the insertion instruments. Using the hexagonal screwdriver or ratchet wrench with socket extension, align the end cap with the nail axis to prevent cross-threading. Thread the green end cap into the nail until it seats fully.

As the final threads of the end cap turn into the nail, the surgeon will feel increased resistance. Continue turning until the shoulder of the end cap contacts the proximal nail end. This will help prevent backout.
Spiral Blade Locking

The Spiral Blade allows fixation of the subtrochanteric fracture, with or without a detached lesser trochanter, for secure fixation of the proximal fragment.

Steps of the procedure:

• Fracture reduction
• Insertion of the nail with locking sleeve
• Spiral Blade insertion into the femoral head
• Insertion of locking bolt(s) or locking screw(s) and end cap

Follow standard technique for opening the femur, as described on pages 14–16.
Implants and Instruments for Spiral Blade Locking

- 15 mm Titanium End Cap (blue) 457.01x
- Titanium Locking Sleeve (blue) 456.01x
- Titanium Spiral Blade 456.xxx
- Spiral Blade Locking Sleeve for 13–15 mm nails (blue) 474.91x
- Quick Coupling for Drill Bits 532.013
- Large Quick Coupling 532.015
- 4.0 mm Three-Fluted Calibrated Drill Bit 356.98
- 3.2 mm Calibrated Guide Wire 292.69
- 13.0 mm Cannulated Drill Bit 351.27
- 700 gram Hammer 399.43
- Connecting Screw 357.54
- Cannulated Connecting Screw 357.512
- Cannulated, 8 mm Hex 357.516
- Insertion Handle 357.511
- Specialty Aiming Arm 357.80
- 8.0 mm/3.2 mm Wire Sleeve 357.82
- 3.2 mm Trocar 357.96
- Battery Casing for 14.4 V Battery 532.032
- Small Battery Drive 532.010
- 13.0mm/3.2 mm Trocar 351.23
- 15.5 mm/13 mm Protection Sleeve 351.28
- Broach 351.89
- 11 mm Ratchet Wrench 321.20
- 8 mm Ball Hexagonal Screwdriver 357.515
- Quick Coupling for K-Wires 532.022
- Quick Coupling for Spiral Blade Locking 537.34
- Cannulated Shaft, 8 mm Hex 357.516
- Depth Gauge for Locking Bolts 357.79
- 4.9 mm Titanium Locking Bolt 459.xx
- 5.0 mm Titanium Locking Screw 458.xx
- Hexagonal Screwdriver 314.75
- Connecting Screw for Spiral Blade 357.34
- Spiral Blade Inserter 357.31
- Driving Cap 357.18
- Slide Hammer 357.25
- Hammer Guide 357.22
- Quick Coupling for K-Wires 532.013
- Hexagonal Screwdriver 314.75
- Connecting Screw for Spiral Blade 357.34
- Spiral Blade Inserter 357.31
- 8.0 mm/3.2 mm Wire Sleeve 357.82
- 3.2 mm Trocar 357.96
- Battery Casing for 14.4 V Battery 532.032
- Small Battery Drive 532.010
- 13.0mm/3.2 mm Trocar 351.23
- 15.5 mm/13 mm Protection Sleeve 351.28
- Broach 351.89
- 11 mm Ratchet Wrench 321.20
- 8 mm Ball Hexagonal Screwdriver 357.515
- Quick Coupling for K-Wires 532.022
- Quick Coupling for Spiral Blade Locking 537.34
- Cannulated Shaft, 8 mm Hex 357.516
- Insertion Handle 357.511
- Specialty Aiming Arm 357.80
- 8.0 mm/3.2 mm Wire Sleeve 357.82
- 3.2 mm Trocar 357.96
Spiral Blade Locking

1. **Enlarge the femoral opening**

   Fully insert the broach into the femoral opening using a twisting hand motion. The opening must accommodate the blue 15 mm Locking Sleeve for Spiral Blade.

   If needed, adjust the insertion site location at this time. Ideally, the end of the Spiral Blade will rest in the center of the femoral head in the lateral view.

2. **Assemble the implants**

   Select the correct angle Spiral Blade locking sleeve, as determined preoperatively (see page 13). Orient the blue locking sleeve to the nail so the word “lateral” faces laterally (convex side of the nail bow faces anteriorly). Seat the sleeve onto the proximal nail end.

---

**KEY**

- = Axis of Spiral Blade insertion
- = Femoral anteversion

---

*Fully insert the broach*

*The Spiral Blade should pass through the center of the femoral neck in the lateral view*
Spiral Blade Locking (continued)

3  Assemble the insertion instrumentation
Assemble the insertion instruments to the nail and locking sleeve, as shown on page 21.

Do not attach the Specialty Aiming Arm to the handle until the nail is fully inserted. It can loosen during nail insertion.

4  Insert the nail
Prior to nail insertion, estimate the insertion path of the Spiral Blade by considering both femoral anteversion and nail insertion site. The Spiral Blade should pass through the center of the femoral neck; significant misdirection could cause the blade to cut out of the neck. Manually insert the nail into the femoral opening, and rotate the insertion handle until the nail slot is in line with this blade insertion path in the lateral view.
Verify fracture reduction, and pass the nail as far as possible by hand with the insertion handle in this position.

**For cannulated nails:**

Insert the nail over the 2.5 mm Reaming Rod. The rod will pass through the opening in the side of the insertion handle.

*Note:* It is important that femoral neck anteversion is kept in mind during insertion of the nail into the distal fragment. If this is not done, secondary rotational correction, due to the curvature of the nail, may lead to malalignment in the frontal (and also in the sagittal) plane.

Monitor nail passage across the fracture under image intensification, and further insert the nail until the proximal end is at the level of the greater trochanter, using the slide hammer assembly.

If the nail has been inserted over a 2.5 mm Reaming Rod, remove the reaming rod.

*Note:* During insertion of a cannulated nail, the Cannulated Shaft may be used to retighten the connecting screw, as needed.
Spiral Blade Locking (continued)

5 Verify nail insertion depth and rotation

*Note: Nail insertion depth dictates Spiral Blade position in the coronal plane.*

Attach the Specialty Aiming Arm to the Insertion Handle. Insert the 8.0 mm/3.2 mm wire sleeve into the aiming arm, at the preoperatively chosen Spiral Blade angle.

6 Insert the Spiral Blade guide wire

Make a short incision under the wire sleeve. Insert the 3.2 mm trocar into the wire sleeve to bone. Remove the trocar, and insert the 3.2 mm guide wire into the sleeve. Confirm direction and position with AP and/or lateral image.

The sleeve will act as a pointer. Under AP image intensification, further insert or withdraw the nail until a line drawn through the sleeve and into the femoral head corresponds to the desired Spiral Blade position.

Take a lateral image intensification view of the proximal femur to verify nail rotation and ensure that the Spiral Blade slot is aimed toward the center of the femoral head.
Advance the guide wire into the femoral head until the tip is 5–10 mm short of subchondral bone.

Monitor wire placement with image intensification in the AP and lateral views. (The black section of the insertion handle is partially radiolucent.) If wire position is incorrect, remove the wire, adjust the insertion assembly and replace the wire.

Press the wire sleeve against the lateral cortex, and read direct Spiral Blade length at the back of the sleeve. Select a blade length equal to or shorter than this reading, and remove the sleeve and aiming arm.
7 Insert the Spiral Blade

Insert the Spiral Blade connecting screw into the Spiral Blade inserter. Thread the connecting screw into the Spiral Blade and tighten the assembly with the spanner wrench.

**Spiral Blade insertion assembly:**
The T-handle of the inserter is in the same plane as the Spiral Blade tip. The surgeon always has an external indicator of Spiral Blade tip position, facilitating easy insertion of the blade through the nail slot.

Insert the black cannulated trocar into the 13 mm protection sleeve, and pass this assembly over the guide wire to spread the tissue. Press the protection sleeve firmly to bone, and remove the trocar.

Couple the 13 mm cannulated drill bit to a power drill.

Pass the drill bit over the guide wire and open the lateral cortex. The shoulder of the drill bit will contact the protection sleeve, preventing overpenetration of the bit.
Under image intensification, ensure that the bit has fully penetrated the lateral cortex. If a complete circle of cortex is not removed, remove the protection sleeve and continue drilling. Closely monitor drilling depth under image intensification until the cortical circle is removed.

Align the T-handle with the femoral axis. Push the Spiral Blade over the guide wire, through the cortical opening and into the nail slot. The surgeon will feel the blade engage the nail slot.

**Note:** If the Spiral Blade doesn’t enter the nail slot, ensure that:

- The Spiral Blade entry hole is deep enough (complete cortical circle removed);
- Guide wire angle = Spiral Blade locking sleeve angle (i.e., the 3.2 mm guide wire has been placed through the correct-angle bushing in the aiming arm);
- Spiral Blade locking sleeve is correctly oriented on the nail (check locking sleeve under AP image intensification to ensure inferior side of slot is positioned laterally);
- T-handle of Spiral Blade inserter is in line with femoral axis (Spiral Blade is aligned with nail slot).
Grip the blue handle of the inserter with one hand, and tap on the end of the connecting screw with the 700 gram hammer to insert the Spiral Blade. The blade should advance with each hammer blow. Monitor blade insertion radiographically.

The blade is fully inserted when its hub is flush with the lateral cortex. Disconnect the insertion assembly and remove the guide wire. Use bone wax to protect the threads of the Spiral Blade, if desired.
8  **Lock distally**
For distal locking techniques, see pages 64–65.

9  **Place the blue end cap (required)**

The 15 mm collar of the blue end cap statically locks the blue sleeve to the nail. Upon final seating of the end cap, the UHMWPE* tip deforms around the blade edge, further securing the Spiral Blade during the nonweightbearing period.

With the insertion handle in place, take an AP image intensification view of the proximal femur. Note the position of the proximal nail end in relation to the tip of the greater trochanter. The nail end should be visible due to the difference in nail and insertion handle diameters.

If the nail end is not visible, remove the aiming arm, place a 3.2 mm guide wire through the hole in the insertion handle, and note wire position on the image intensifier. This is the level of the proximal nail end. The etched line on the insertion handle is also at the level of the proximal nail end.

If the nail end is level with the tip of the greater trochanter, select the blue end cap with 0 mm extension.

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* Ultra High Molecular Weight Polyethylene implant material
Spiral Blade Locking (continued)

9. Place the blue end cap (continued)

If the proximal nail end is distal to the tip of the greater trochanter, note the position of the insertion handle barrel in relation to the tip of the greater trochanter on the image.

- If the indented ring is at the tip of the greater trochanter, use the blue 15 mm end cap with 10 mm extension.

- If the base of the flare is at the tip of the greater trochanter, use the blue 15 mm end cap with 20 mm extension.

*Example showing indication for 10 mm extension end cap.*
Remove the insertion instruments. Using the hexagonal screwdriver or ratchet wrench with socket extension, align the end cap with the nail axis to prevent cross-threading. Thread the blue end cap into the nail until it seats fully.

As the final threads of the end cap turn into the nail, the surgeon will feel increased resistance. Continue turning until the shoulder of the end cap contacts the proximal nail end. This will help prevent backout.
Miss-A-Nail Locking

The Miss-A-Nail device allows screw fixation of the neck fracture prior to nail fixation of the shaft fracture.

Steps of the procedure:

- Fracture reduction
- Insertion of Miss-A-Nail instrument assembly through the standard nail insertion site
- Cannulated screw fixation of the femoral neck fracture
- Insertion of the nail, locking bolts or locking screws and end cap

*Follow standard technique for opening the femur, pages 14–16.*
Implants and Instruments for Miss-A-Nail Locking

- 13.0 mm Titanium Washer (optional) 419.99
- 7.3 mm Titanium Cannulated Screws* 408.xxx
- 5.0 mm Titanium Shaft Screw 457.xxx
- 3.2 mm Calibrated Guide Wires 292.69
- Quick Coupling for K-Wires 532.022
- 11 mm Ratchet Wrench 321.20
- 11 mm Hexagonal Socket 321.21
- Battery Casing for 14.4 V Battery 532.032
- Small Battery Drive 532.010
- Cannulated Hexagonal Screwdriver 314.05
- Cannulated Hexagonal Screwdriver 314.75
- Cannulated Screw Measuring Device 319.70
- Hexagonal Screwdriver 314.75
- Large Quick Coupling 532.015
- Driving Cap 357.18
- 2.8 mm Threaded Guide Wire 292.68
- 8.0 mm/3.2 mm Wire Sleeve 357.82
- 8.5 mm/2.8 mm Wire Sleeve (optional) 312.05
- 5.0 mm Cannulated Drill Bit (optional) 310.63
- 12.5 mm/8.5 mm Protection Sleeve (optional) 312.05
- 5.0 mm Cannulated Drill Bit (optional) 310.63
- 3.2 mm Trocars 357.96
- 5.6 mm/2.8 mm Wire Sleeves 357.90
- 2.8 mm Trocars 357.91

*6.5 mm Titanium Cannulated Screws [408.4xx] may also be used.
Miss-A-Nail Locking

1. Reduce the neck fracture
   If the femoral neck fracture is displaced, perform meticulous reduction and temporarily stabilize the fracture. Open reduction may be necessary. When using K-wires, place them anterior and/or posterior to the anticipated path of the nail.

2. Identify dummy nail entry point
   Since the correct, standard nail entry point is often posterior to the femoral neck axis, it will usually allow room for the Miss-A-Nail-placed anterior cannulated screws.
   However, consider each case individually and move the point slightly posteriorly if needed to accommodate the screws.

3. Open the canal
   Follow standard procedure (pages 14–16) to open the canal.
   Use gentle technique to prevent displacement or distraction of the femoral neck fracture.

   **Note:** Use of 13 mm–15 mm nails is not recommended with Miss-A-Nail Locking. The larger opening into the canal which is required to accommodate the proximal end of the nail may compromise stability in the neck and trochanteric regions.
Miss-A-Nail Locking (continued)

4 Assemble the Miss-A-Nail instruments
Insert the connecting screw into the insertion handle. Couple the handle to the short dummy nail.
*Use the ratchet wrench to secure the connecting screw to the dummy nail.*

5 Insert the dummy nail
Manually insert the dummy nail into the femoral opening. Do not use the hammer or hammer guide assembly. If the surgeon feels resistance, remove the dummy nail, redrill the entry site, and manually reinsert the dummy nail.

Attach the Specialty Aiming Arm to the insertion handle.
6 Select screw angle

Under AP image intensification, lay a guide wire on the anterior thigh along the femoral neck axis. Adjust the angle of the guide wire until it is perpendicular to the fracture. This will allow the surgeon to place the screws perpendicular to the fracture for optimal fracture compression. Hold the wire in this position.

With the aiming arm oriented laterally, gently move the instrument assembly up or down along the insertion site until the guide wire corresponds to one of the four Miss-A-Nail angles etched on the aiming arm.

Securely thread the Miss-A-Nail jig into the aiming arm at this angle. Insert the 2.8 mm wire sleeve into the superior bushing of the jig and use it as a pointer to verify the angle and dummy nail insertion depth under image intensification.

**Note:** If the drill sleeve does not reach the bone, turn the Miss-A-Nail jig 180° in order to reduce the distance to the bone.
Miss-A-Nail Locking (continued)

7 Adjust for anteversion

Readjust the image intensifier for a lateral view of the proximal femur. (The black portion of the aiming arm is partially radiolucent.) Rotate the insertion handle around the dummy nail until the wire sleeve is directed safely through the center of the femoral neck and into the femoral head.

8 Insert the stabilization wire

Holding the correct axial and rotational position of the insertion assembly, insert the blue 3.2 mm wire sleeve through the aiming arm at the same angle as the Miss-A-Nail jig. Make a stab incision under the wire sleeve, and insert a 3.2 mm calibrated guide wire through the slot of the dummy nail and into the femoral head. This will temporarily hold the instrument assembly in position and further stabilize the neck fracture.
9 **Adjust screw position**

Insert the second 2.8 mm wire sleeve into the inferior bushing of the Miss-A-Nail jig.

Reposition the image intensifier for an AP image of the proximal femur. Independently adjust the two bushings of the Miss-A-Nail jig to maximize distance between the screws while remaining within the femoral neck. **Secure the bushings to the jig using the ratchet wrench with socket.**

**Notes:**

- If the patient is small-statured, the surgeon may choose to place only one screw through the jig and subsequently place a second screw through the nail.

- If there is no room anterior to the nail, the surgeon may place one or two screws posterior to the dummy nail by attaching the Miss-A-Nail jig to the posterior side of the aiming arm.

Adjust each sleeve bushing independently to obtain maximum screw spread within the anatomic range of the femoral neck.
**Miss-A-Nail Locking** (continued)

10 **Insert the screws**

Make a stab incision under one wire sleeve. Insert the 2.8 mm trocar into the sleeve to bone and remove the trocar.

Insert the 2.8 mm guide wire through the sleeve and into the femoral head. Allow the wire to “pull” itself into bone. *Excessive axial force can cause wire misdirection.*

Insert the second guide wire using the same technique. Remove all instrumentation and the stabilization wire, leaving only the guide wires in place.

Slide the cannulated screw sleeve assembly* over one guide wire.

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*The 8.5 mm/2.8 mm wire sleeve and 12.0 mm/8.5 mm protection sleeve*
Remove the wire sleeve, slide the black measuring device over the wire, and measure for direct screw length. (This device measures to the tip of the guide wire.)

Remove the measuring device. Insert the self-drilling/self-tapping screw into the femoral head through the protection sleeve using the cannulated screwdriver.

Note: In very dense bone, the surgeon may predrill and tap the near cortex through the protection sleeve with the 5.0 mm cannulated drill bit and cannulated tap.

Note: If the surgeon prefers 6.5 mm Titanium Cancellous Bone Screws, use the 3.2 mm wire sleeve(s) with 3.2 mm trocar through the Miss-A-Nail jig. Insert the 3.2 mm calibrated guide wire through the sleeve and into the femoral head until it is just short of subchondral bone. Press the sleeve to the lateral cortex and read screw length from the guide wire at the back of the sleeve. This measurement will place the screw 5 mm from the guide wire tip. Remove the wire and tap as needed with the tap for 6.5 mm screws. Select a screw equal to or shorter than the reading and insert the cancellous screw with the standard screwdriver.
**Miss-A-Nail Locking** (continued)

Insert the second screw using the same technique.

11 **Insert the nail**
Proceed with standard nail insertion technique (pages 21–25).

12 **Insert the 5.0 mm shaft screw**

The surgeon may insert a 5.0 mm shaft screw through the dynamic slot for a third point of femoral neck fracture fixation.

To insert the shaft screw, attach the Specialty Aiming Arm to the insertion handle. Insert the 3.2 mm drill sleeve into the aiming arm bushing at the same angle as the Miss-A-Nail-placed screws.

**Note:** When using the 130° angle, use the gold Protection Sleeve 11.0/8.0 (357.840) with the gold drill sleeve 8.0/3.2.

Insert the 3.2 mm calibrated guide wire through the sleeve and into the femoral head until it is just short of subchondral bone. Press the sleeve to the lateral cortex, and read screw length from the guide wire at the back of the sleeve. This measurement will place the screw 5 mm from the guide wire tip.

Remove the guide wire, select a screw equal to or shorter than the reading, and insert the shaft screw with the standard screwdriver.

**Insert the second screw**

**Drill for shaft screw**

**Insert the shaft screw**
13  **Lock proximally**
Statically lock the shaft fracture by inserting a locking bolt or locking screw through the inferior, proximal hole. Follow standard proximal locking technique (see pages 24–25).

14  **Lock distally**
For distal locking techniques, see pages 64–65.

15  **Place the green end cap**
To insert an end cap, follow the procedure on pages 26–27.

**Drill for the locking bolt or locking screw**

**Insert the locking bolt or locking screw**

**End cap fully seated**
**Distal Locking** (all procedures)

**Reconfirm reduction**
Confirm reduction/alignment of the distal fragment.

**To use the Radiolucent Drive:**
Align the image intensifier with the most distal hole in the nail until a perfect circle is visible in the center of the screen. Place a scalpel blade on the skin to determine the incision point, and make a stab incision.

*Oblique (incorrect)*

*Round (correct)*

*Determine incision point*
Under image intensification, insert the tip of the 4.0 mm brad-point drill bit into the incision and place the bit oblique to the x-ray beam until the tip is centered in the locking hole.

![Center drill bit in locking hole](image)

Tilt the drive until the drill bit is in line with the beam and appears as a radiopaque solid circle in the center of the outer ring. The drill bit will nearly fill in the locking hole image. Hold the drill in this position and drill through both cortices.

Measure for the locking bolt or locking screw using the depth gauge, adding 2–4 mm to the reading to ensure thread engagement of the far cortex.

Insert the bolt or screw using the screwdriver and holding sleeve.

For Standard Technique:

Use the 4.0 mm drill bit to perform freehand distal locking technique.
Implant Removal

1 Remove the end cap
Clear bone from the end cap. Use the ratchet wrench with socket extension or large hexagonal screwdriver to remove the end cap.

2 Remove the locking bolt(s) or locking screw(s)
Using the screwdriver with holding sleeve, remove the locking bolt or locking screw.

Note: Before removing the last locking bolt or locking screw, thread the extraction screw into the proximal nail end. This will prevent the nail from rotating in the medullary canal.
3  Remove the Spiral Blade

Manually thread and finger-tighten the extraction screw into the hub of the Spiral Blade.

Thread the hammer guide assembly into the extraction screw.

Extract the Spiral Blade. Maintain a loose grip on the extraction assembly, as it and the blade rotate clockwise upon extraction.

4  Remove the nail (and locking sleeve)

Assemble the hammer and hammer guide, and thread the assembly into the extraction screw.

Thread the extraction screw into the proximal nail end, through the incision made for end cap removal. Finger-tighten the assembly.

Remove the locking bolt and extract the nail.

Insert extraction screw

Extract the Spiral Blade

Thread extraction assembly into nail end, then remove locking bolt or locking screw

Extract the nail
Titanium Femoral Nail
Standard Insertion and Locking Sets
with Locking Bolts [105.655]
with Locking Screws [105.657]

Note: For sterile implants, add “S” to set number.

For detailed cleaning and sterilization instructions, please refer to www.synthes.com/cleaning-sterilization or sterilization instructions, if provided.
**Instruments**

292.69 3.2 mm Calibrated Guide Wire, 300 mm, 5 ea.
314.11 Holding Sleeve for Hexagonal Screwdriver [314.75]
314.75 Hexagonal Screwdriver
315.40 4.0 mm Three-Fluted Drill Bit, 2 ea.
321.20 Ratchet Wrench, 11 mm
321.21 Hexagonal Socket, 11 mm
321.25 Spanner Wrench
338.49 Large Quick Coupling
351.05 Tissue Protector
351.11 Large Reverse Awl
351.27 13.0 mm Cannulated Drill Bit, 300 mm
356.98 4.0 mm Three-Fluted Calibrated Drill Bit, 2 ea.
357.18 Driving Cap
357.22 Hammer Guide

357.25 Slide Hammer
357.36 Extraction Screw
357.511 Insertion Handle
357.512 Cannulated Connecting Screw
357.515 Ball Hexagonal Screwdriver, 8 mm
357.516 Cannulated Shaft, 8 mm Hex
357.54 Connecting Screw
357.59 Radiographic Ruler
357.70 Standard Aiming Arm
357.71 8.0 mm/4.0 mm Drill Sleeve
357.75 4.0 mm Trocar
357.76 11.0 mm/8.0 mm Protection Sleeve
357.79 Depth Gauge for Locking Bolts
393.10 Universal Chuck with T-Handle
399.43 Hammer, 700 grams
Titanium Femoral Nail
Standard Insertion and Locking Sets
[105.655] and [105.657]  (continued)

Implants for Standard Locking

4.9 mm Titanium Locking Bolts◊ in [105.655]

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5.0 mm Titanium Locking Screws◊ in [105.657] for IM Nails

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Also Available

Instruments

- **314.17** Large Hexagonal Screwdriver with universal joint
- **321.15** Socket Wrench with universal joint, 11 mm width across flats
- **351.7065** 2.5 mm Reaming Rod with ball tip, 950 mm, sterile

**12 mm Titanium End Caps◊**
for 9–12 mm nails

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**Standard Titanium Locking Sleeve◊**
for 13–15 mm nails

**15 mm Titanium End Caps◊**
for 13–15 mm nails

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◊Implants available nonsterile or sterile-packed.
Add “S” to catalog number to order sterile product.
Titanium Femoral Nails
Available individually only

Titanium Solid Femoral Nails (9 mm–12 mm diameters)

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Titanium Cannulated Femoral Nails (10 mm–15 mm diameters)

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<th>10 mm DIAMETER</th>
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<tr>
<td>474.031 300 mm</td>
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<td>474.132 320 mm</td>
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<td>474.048 480 mm</td>
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<th>13 mm DIAMETER</th>
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<td>474.331 300 mm</td>
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<td>474.334 340 mm</td>
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<td>474.348 480 mm</td>
<td>474.448 480 mm</td>
<td>474.548 480 mm</td>
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</tbody>
</table>
Titanium Femoral Nail
Specialty Locking Set [105.68]

304.520  Titanium Femoral Nail
Specialty Locking Set
Graphic Case

Implant tray with lid for independent autoclaving and storage
of back-up inventory. May also be purchased separately.

Note: For sterile implants, add “S” to set number.
**Instruments**

### SPIRAL BLADE

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>351.23</td>
<td>13.0 mm/3.2 mm Trocar</td>
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<tr>
<td>351.28</td>
<td>15.5 mm/13 mm Protection Sleeve</td>
</tr>
<tr>
<td>351.89</td>
<td>Broach (also used for 130° locking)</td>
</tr>
<tr>
<td>357.31</td>
<td>Inserter for Spiral Blade</td>
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<tr>
<td>357.34</td>
<td>Connecting Screw for Spiral Blade</td>
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<tr>
<td>357.80</td>
<td>Specialty Aiming Arm (also used for 130° and Miss-A-Nail locking)</td>
</tr>
<tr>
<td>357.82</td>
<td>8.0 mm/3.2 mm Wire Sleeve (also used for Miss-A-Nail locking)</td>
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<tr>
<td>357.96</td>
<td>3.2 mm Trocar, for use with Wire Sleeve [357.82]</td>
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</table>

### MISS-A-NAIL

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tr>
<td>292.68</td>
<td>2.8 mm Threaded Guide Wire, 300 mm, 5 ea.</td>
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<tr>
<td>310.63</td>
<td>5.0 mm Cannulated Drill Bit, 300 mm/255 mm, 2 ea.</td>
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<tr>
<td>312.05</td>
<td>12.0 mm/8.5 mm Protection Sleeve</td>
</tr>
<tr>
<td>312.08</td>
<td>8.5 mm/2.8 mm Wire Sleeve</td>
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<tr>
<td>314.05</td>
<td>Cannulated Hexagonal Screwdriver</td>
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<tr>
<td>319.70</td>
<td>Cannulated Screw Measuring Device</td>
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<tr>
<td>357.90</td>
<td>5.6 mm/2.8 mm Wire Sleeve, 2 ea.</td>
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<tr>
<td>357.91</td>
<td>2.8 mm Trocar, 160 mm, 2 ea.</td>
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<tr>
<td>357.92</td>
<td>Miss-A-Nail Aiming Jig</td>
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<tr>
<td>357.97</td>
<td>Dummy Nail</td>
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</tbody>
</table>
Titanium Femoral Nail  
Specialty Locking Set [105.68] (continued)

Implants

130° ANTEGRADE

130° Titanium Locking Sleeve◊
456.013 2 ea.

15 mm Titanium End Caps◊
for 130° Locking Sleeve

EXTENSION
457.210 0 mm, 2 ea.
457.211 10 mm, 2 ea.
457.212 20 mm, 2 ea.

SPIRAL BLADE

Titanium Spiral Blades◊
456.70 70 mm
456.75 75 mm
456.80 80 mm
456.85 85 mm
456.90 90 mm
456.95 95 mm
456.100 100 mm
456.105 105 mm
456.110 110 mm
456.115 115 mm
456.120 120 mm

Titanium Locking Sleeves◊
for Spiral Blade
456.010 100°, 2 ea.
456.011 110°, 2 ea.
456.012 120°, 2 ea.

15 mm Titanium End Caps◊
for Spiral Blade

EXTENSION
457.010 0 mm, 2 ea.
457.011 10 mm, 2 ea.
457.012 20 mm, 2 ea.

Also Available

Titanium Locking Sleeves for 13 mm–15 mm nails◊
474.910 100° for Spiral Blade
474.911 110° for Spiral Blade
474.912 120° for Spiral Blade
474.913 for 130° Antegrade Locking

◊Implants available nonsterile or sterile-packed. Add “S” to catalog number to order sterile product.
7.3 mm Titanium Cannulated Screws, 16 mm thread length

<table>
<thead>
<tr>
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<tbody>
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<td>408.870</td>
<td>70 mm, 2 ea.</td>
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<td>408.875</td>
<td>75 mm, 2 ea.</td>
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<td>408.880</td>
<td>80 mm, 2 ea.</td>
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<td>408.885</td>
<td>85 mm, 2 ea.</td>
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<td>408.890</td>
<td>90 mm, 2 ea.</td>
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<td>408.895</td>
<td>95 mm, 2 ea.</td>
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<tr>
<td>408.900</td>
<td>100 mm, 2 ea.</td>
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<td>408.905</td>
<td>105 mm, 2 ea.</td>
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<td>408.910</td>
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<td>408.920</td>
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<tr>
<td>408.925</td>
<td>125 mm, 2 ea.</td>
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<tr>
<td>419.99</td>
<td>13.0 mm Titanium Washer, 6 ea.</td>
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Also Available

5.0 mm Titanium Shaft Screws

<table>
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<th>LENGTH</th>
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<tbody>
<tr>
<td>457.070</td>
<td>70 mm, 2 ea.</td>
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<tr>
<td>457.075</td>
<td>75 mm, 2 ea</td>
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<td>457.080</td>
<td>80 mm, 2 ea</td>
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<tr>
<td>457.085</td>
<td>85 mm, 2 ea</td>
</tr>
<tr>
<td>457.090</td>
<td>90 mm, 2 ea</td>
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<tr>
<td>457.095</td>
<td>95 mm, 2 ea</td>
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<tr>
<td>457.100</td>
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<tr>
<td>457.115</td>
<td>115 mm, 2 ea</td>
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<tr>
<td>457.120</td>
<td>120 mm, 2 ea</td>
</tr>
<tr>
<td>457.125</td>
<td>125 mm, 2 ea</td>
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</table>

MISS-A-NAIL

7.3 mm Titanium Cannulated Screws are not available sterile.
INSTRUMENTS

351.05 Tissue Protector
351.15 Flexible Shaft Handle, quick coupling, cannulated
351.17 Depth Gauge
351.19 Depth Gauge Extension Tube
351.782 Holding Forceps
351.783 Removal Tool
351.92 6.0 mm Hand Reamer, 450 mm
351.93 7.0 mm Hand Reamer, 450 mm
351.94 8.0 mm Hand Reamer, 450 mm
352.040 5.0 mm Flexible Shaft, 2 ea.
352.041 3.6 mm Cleaning Brush
352.050 7.0 mm Reduction Head, straight
352.055 7.0 mm Reduction Head, angled
355.006 Medullary Tube
393.10 Universal Chuck with T-Handle

Also Available

105.954 H/M/T Small Battery Drive Set
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
355.399 Extraction Hook for Titanium Cannulated Nails

MISS-A-NAIL

Also available for Miss-A-Nail locking with
6.5 mm Titanium Cancellous Screws
357.94 5.6 mm/3.2 mm Wire Sleeve, 150 mm, for use with Miss-A-Nail Jig

Also available for Miss-A-Nail locking with
7.3 mm Titanium Cannulated Screws
311.689 Cannulated Tap for 6.5 mm and 7.3 mm Cannulated Screws
314.04 Solid Hexagonal Screwdriver Shaft for removal of 7.3 mm Cannulated Screws
314.23 Cannulated Hexagonal Screwdriver Shaft
319.46 2.8 mm Cleaning Stylet
408.830- 7.3 mm Titanium Cannulated Screws, 16 mm thread, 30–65 mm, 130 mm

Flexible Reamer Set for IM Nails [150.060]

INSTRUMENTS

351.05 Tissue Protector
351.15 Flexible Shaft Handle, quick coupling, cannulated
351.717 Depth Gauge
351.719 Depth Gauge Extension Tube
351.782 Holding Forceps
351.783 Removal Tool
351.92 6.0 mm Hand Reamer, 450 mm
351.93 7.0 mm Hand Reamer, 450 mm
351.94 8.0 mm Hand Reamer, 450 mm
352.040 5.0 mm Flexible Shaft, 2 ea.
352.041 3.6 mm Cleaning Brush
352.050 7.0 mm Reduction Head, straight
352.055 7.0 mm Reduction Head, angled
355.006 Medullary Tube
393.10 Universal Chuck with T-Handle

MEDULLARY REAMER HEADS

352.085 8.5 mm 352.140 14.0 mm
352.090 9.0 mm 352.145 14.5 mm
352.095 9.5 mm 352.150 15.0 mm
352.100 10.0 mm 352.155 15.5 mm
352.105 10.5 mm 352.160 16.0 mm
352.110 11.0 mm 352.165 16.5 mm
352.115 11.5 mm 352.170 17.0 mm
352.120 12.0 mm 352.175 17.5 mm
352.125 12.5 mm 352.180 18.0 mm
352.130 13.0 mm 352.185 18.5 mm
352.135 13.5 mm 352.190 19.0 mm

◊ Items available nonsterile or sterile-packed. Add “S” to catalog number to order sterile product.
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