

Humeral Nails With Multiple Locking Options  
for Simple and Complex Fractures

# MultiLoc® Humeral Nails

Surgical Technique



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<b>MR Information</b> The MultiLoc Humeral 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 MultiLoc Humeral Nail System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.		

**MultiLoc® Humeral Nails.** Humeral nails with multiple locking options for simple and complex fractures.



### Features and Benefits

DePuy Synthes MultiLoc® Humeral Nails provide a comprehensive system for the treatment of humeral fractures. The system consists of short and long nails with multiple screw options to address simple and complex fractures of the proximal humerus as well as humeral shaft.

### Innovative design

The system includes several innovative features designed specifically for the clinical needs of humeral nailing

- Straight nail with central insertion point
- Unique screw-in-screw option, for improved stability where needed\*
- Polyethylene inlay for secure screw fixation of proximal screws
- Ascending screw option to provide support to the calcar
- Multiplanar distal locking for less implant toggling
- Fully targeted distal locking for the short nail

### Comprehensive options

Short Nail: Right and left nails in 8.0 mm and 9.5 mm diameters, 160 mm length

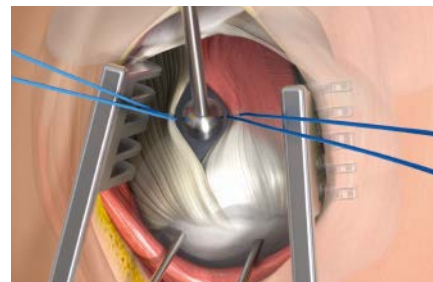
Long Nail: Right and left nails in 7.0 mm and 8.5 mm diameters, 180 mm – 315 mm length

\*See Bench Test on page 5.

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### **Straight Nail With Central Insertion Point**

- Designed to avoid potential insertion through the fracture site, increasing biomechanical stability
- Designed to avoid the sulcus between greater tuberosity and humeral head where the supraspinatus tendon inserts



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### **MultiLoc™ Screws**

- Unique screw-in-screw option, for improved stability where needed\*
- Blunt screw tips to reduce risks associated with secondary screw perforation
- Four suture holes per screw, for attachment of rotator cuff tendons



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### **Proximal Fixation**

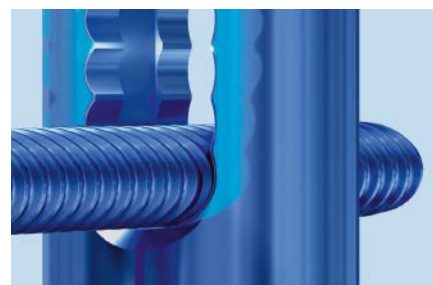
- The ascending calcar screw and the 3.5 mm screw-in-screw options designed to increase resistance to head migration, varus deformation and greater tuberosity rotation



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### **Bicortical Compression: Long Nail**

- Designed to increase fracture stability in transverse and short oblique fractures



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### **Distal Locking: Long Nail**

- Designed to be in the safe zone between the median and the radial nerve
- Two distal locking options in the anatomic AP direction, designed to facilitate free hand locking



\*See Bench Test on page 5.

## Screw Configurations

### MultiLoc Proximal Humeral Nail (short)

#### Proximal locking: Levels A to D

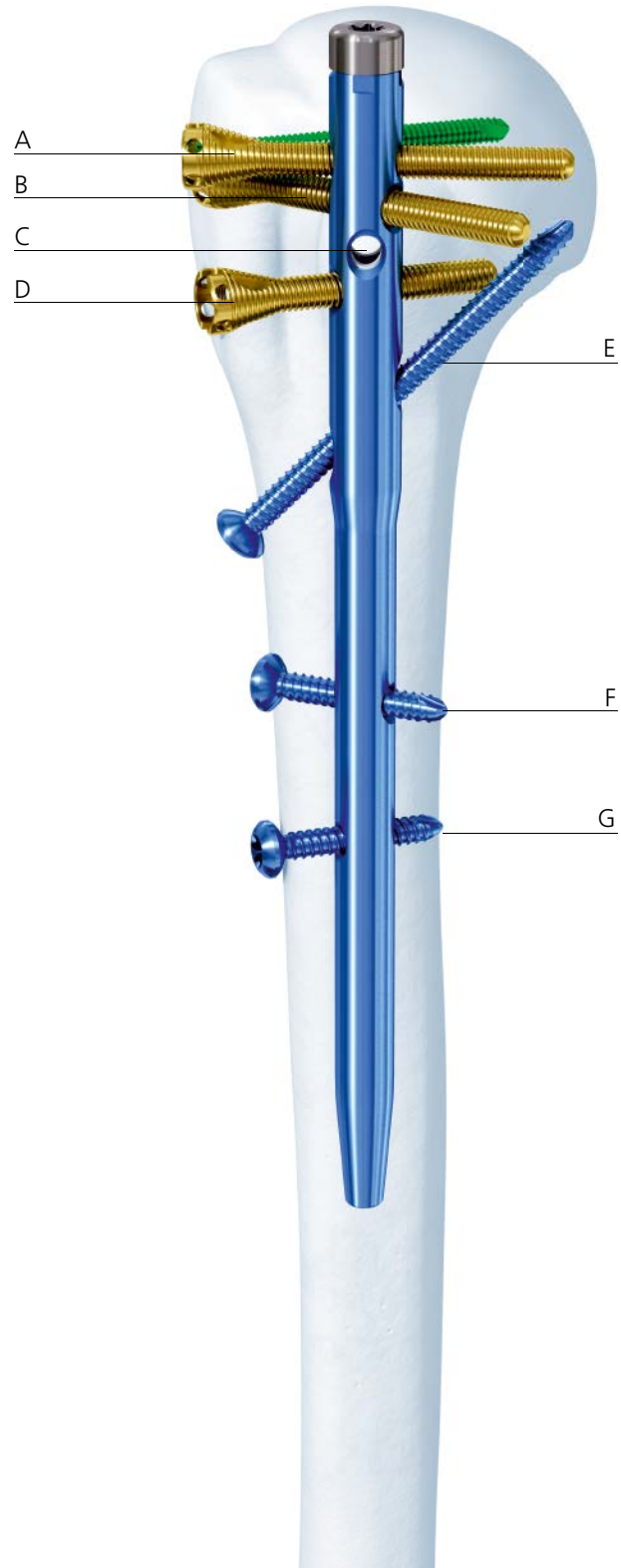
4.5 mm Titanium MultiLoc Screws (gold)

3.5 mm Titanium Locking screws (green; optional)

The lateral screws (levels A, B and D) provide multiple points of fixation in the head through the greater tuberosity. They ensure basic stability of the construct.

Additional screw-in-screws (levels A, B and D) may be inserted through the screw heads of the lateral screws to increase stability especially in osteopenic bone. These locking screws are aimed posteriorly where increased bone density may be present.\*

The anterior screw (level C) may be used with a lesser tuberosity fragment if the fragment is large enough to accommodate the screwhead. Do not insert a 3.5 mm locking screw in this hole.



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**Ascending screw: Level E**

4.0 mm Titanium Locking Screws (blue)

4.0 mm Titanium ASLS Screws (brown; optional)

The ascending screw supports the medial calcar region which can be helpful in medially comminuted fractures.

**Distal locking: Levels F and G**

4.0 mm Titanium Locking Screws (blue)

4.0 mm Titanium ASLS Screws (brown; optional)

The two distal locking screws are located in different planes to reduce implant toggling in the humeral canal, compared to monoplanar locking.

**\*Bench Test**

Comparative testing was conducted by DePuy Synthes with the MultiLoc Humeral Nail construct implanted in polyurethane foam block material of multiple densities. Static bend testing was conducted to compare the stability of the nail construct with and without the secondary 3.5 mm locking screws assembled with the proximal lateromedial (LM) screws. The static bending force was applied to the test constructs in an eccentric, mediolateral direction. Testing was conducted with the test sample constructs implanted in foam block material with densities of 5.5 pcf (pounds per cubic foot), 7.5 pcf, and 10 pcf. Failure was defined as varus collapse of 10 mm or cutout of the proximal screws. Results showed as much as a 45% increase in construct stability when the secondary 3.5 mm locking screws were assembled with the proximal LM screws and the construct was subjected to the

static mediolateral bending force. Test results showed that in 10 pcf foam material, the MultiLoc Humeral Nail construct failed at 315 N (mean) with secondary locking screws assembled with LM screws vs. 230 N (mean) without secondary locking screws. In 7.5 pcf foam material, the construct failure occurred at 141 N (mean) with secondary 3.5 mm locking screws vs. 123 N (mean) without secondary 3.5 mm locking screws. In 5.5 pcf foam material, the construct failed at 137 N (mean) with secondary 3.5 mm locking screws vs. 94 N (mean) without secondary 3.5 mm locking screws.

(Bench test results do not necessarily reflect clinical performance).

# Screw Configurations

## MultiLoc Proximal Humeral Nail (long)

### Proximal locking: Levels A to D

4.5 mm Titanium MultiLoc Screws (gold)

3.5 mm Titanium Locking screws (green; optional)

The lateral screws (levels A, B and D) provide multiple points of fixation in the head through the greater tuberosity. They ensure basic stability of the construct.

Additional screw-in-screws (levels A, B and D) may be inserted through the screw heads of the lateral screws to increase stability especially in osteopenic bone. These locking screws are aimed posteriorly where increased bone density may be present.\*

The anterior screw (level C) may be used with a lesser tuberosity fragment if the fragment is large enough to accommodate the screwhead. Do not insert a 3.5 mm locking screw in this hole.

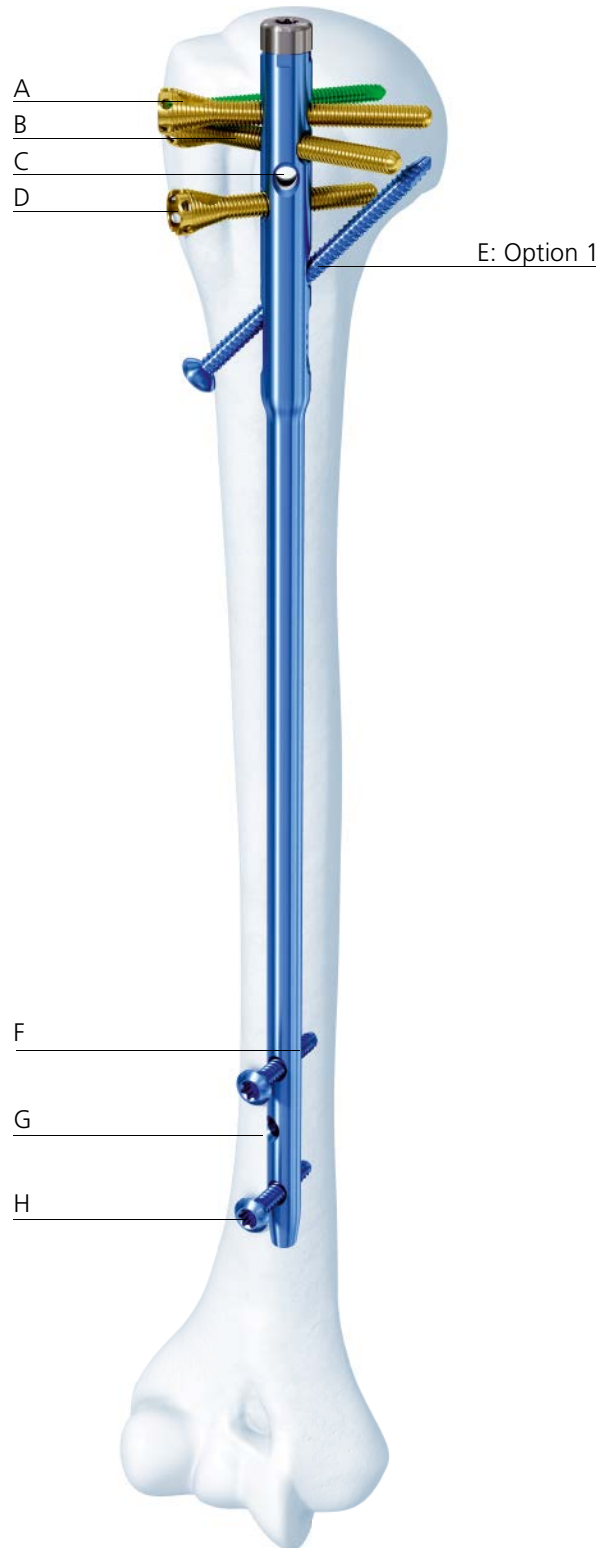
### Option 1:

#### Ascending screw: Level E

4.0 mm Titanium Locking Screws (blue)

4.0 mm Titanium ASLS Screws (brown; optional)

The ascending screw supports the medial calcar region which can be helpful in medially comminuted fractures.



\*See Bench Test on page 5.

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**Option 2:**

**Compression screw: Level E**

4.0 mm Titanium Locking Screws (blue)

The compression screw may be used for the compression of transverse or short oblique fractures.

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**Precautions:**

- The ascending screw should not be used in combination with the compression feature.
- ASLS screws cannot be used when applying compression.

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**Note:** Ascending screw and compression screw cannot be used at the same time.

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**Distal locking: Levels F, G and H**

4.0 mm Titanium Locking Screws (blue)

4.0 mm Titanium ASLS Screws (brown; optional)

The three distal locking screws are located in two different planes to reduce implant toggling and increase stability of the osteosynthesis. The locking planes are situated in anatomical AP (Levels F and H) and lateral oblique directions, at 25 degrees to each other (level G).





# AO Principles

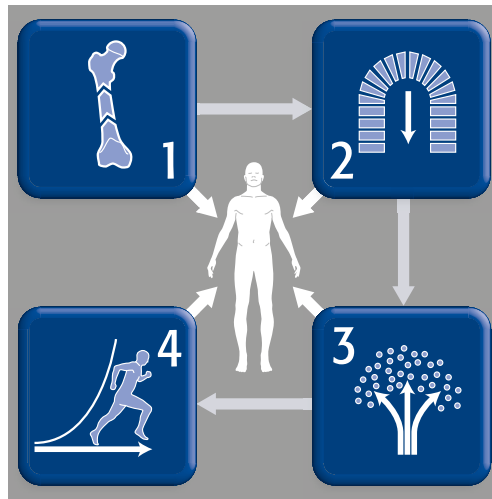
In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.<sup>1,2</sup>

## 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.

1. Müller ME, Allgöwer M, Schneider R, Willenegger H. *Manual of Internal Fixation*. 3rd ed. Berlin, Heidelberg, New York: Springer-Verlag; 1991.  
2. Rüedi TP, RE Buckley, CG Moran. *AO Principles of Fracture Management*. 2nd ed. Stuttgart New York: Thieme; 2007.

# Indications

## MultiLoc Proximal Humeral Nail (short)

The MultiLoc Proximal Humeral Nail is indicated for fractures of the proximal humerus, including:

- 2-part surgical neck fractures
- 3-part fractures
- 4-part fractures

## MultiLoc Humeral Nail (long)

The MultiLoc Humeral Nail is indicated for:

- Fractures of the proximal humerus including:
  - 2-part surgical neck fractures
  - 3-part fractures
  - 4-part fractures
- Fractures of the proximal humerus with diaphyseal extension
- Diaphyseal fractures of the humeral shaft
- Impending pathological fractures



## Precautions

- Use of these devices is not recommended when there is systemic infection, infection localized to the site of the proposed implantation or when the patient has demonstrated allergy or foreign body sensitivity to any of the implant materials
- Physician should consider patient bone quality to ensure it provides adequate fixation to promote healing
- Conditions that place excessive stresses on bone and implant such as severe obesity or degenerative diseases, should be considered. The decision whether to use these devices in patients with such conditions must be made by the physician taking into account the risks versus the benefits to the patients.
- Compromised vascularity at the site of proposed implantation may prevent adequate healing and thus preclude the use of this or any orthopaedic implant

## Clinical Cases

### Case 1: 2-part surgical neck fracture

78-year-old female. Simple fall.

Treatment with:

- 8.0 mm MultiLoc Nail
- 3 MultiLoc Screws (levels A, B, and D)
- Standard distal locking



Preoperative, AP view



Postoperative, AP view



Preoperative, scapular Y-view



Postoperative lateral view

\*Note: Results from case studies are not predictive of results in other cases. Results in other cases may vary.

**Case 2: 3-part fracture**

53-year-old female. Simple fall, after 6 weeks of conservative treatment with severe pain and impossible active rehabilitation. Treatment with:

- 9.5 mm MultiLoc Nail
- 3 MultiLoc Screws (levels A, B, and D)
- 3.5 mm locking screw (screw-in-screw) (level A)
- Ascending screw with ASLS
- Distal locking with ASLS



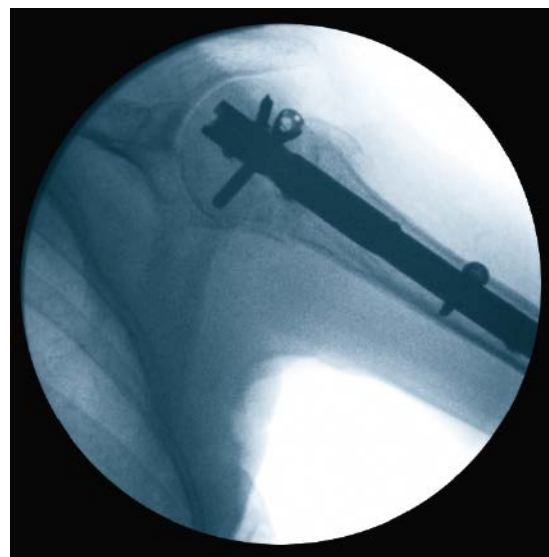
Preoperative, AP view



Postoperative, AP view



Preoperative, scapular Y-view



Postoperative lateral view

\*Note: Results from case studies are not predictive of results in other cases. Results in other cases may vary.

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**Case 3: Osteoporotic 4-part fracture**

80-year-old female. Simple fall.

Treatment with:

- 8.0 mm MultiLoc Nail
- 3 MultiLoc Screws (levels A, B, and D)
- 3.5 mm locking screw (screw-in-screw) (level A)
- Suture fixation of lesser tuberosity fragment
- Standard distal locking



Preoperative, AP view



Preoperative, scapular Y-view



Preoperative, 3-D CT reconstruction



\*Note: Results from case studies are not predictive of results in other cases. Results in other cases may vary.

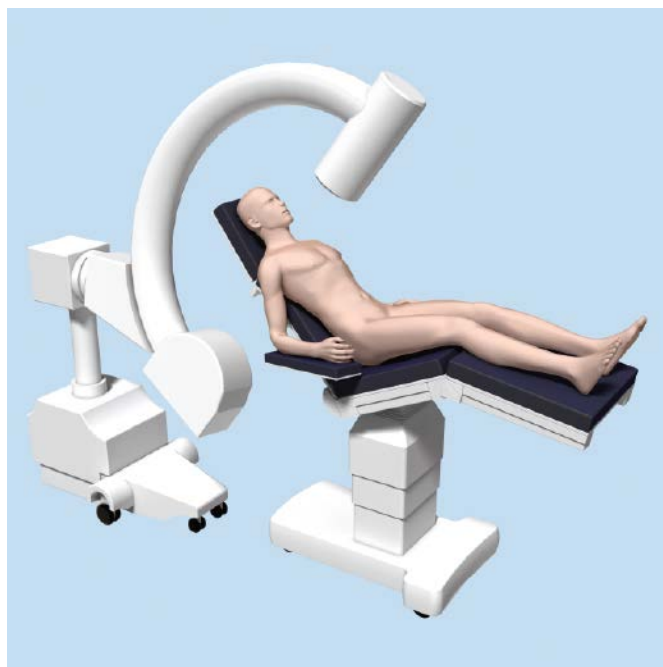
# Patient Positioning and Approach

## 1

### Position patient

Position the patient in a beach chair position on a radiolucent table. Support the shoulder with pads and place the fractured arm on an adjustable side table or arm rest. Ensure that the arm can be sufficiently reclined to expose the humeral head anterior to the acromion.

- Ensure that the C-arm placement allows visualization of the entire humerus in two planes, e.g., at the head of the patient or contralateral to the injured arm.



- A modified supine position on a completely radiolucent table can also be used. Position the C-arm to allow visualization of the entire humerus in the AP and lateral planes. Place the C-arm opposite the surgeon, perpendicular to the longitudinal axis of the humeral shaft in the AP view.
- Obtain a scapular "Y" lateral view by bringing the C-arm through a 90° arc and projecting the beam directly at the glenoid.





**Note:** Refer to page 22 for an alternative technique to determine nail length by measuring over a reaming rod.

## 2

### Determine nail length for MultiLoc Humeral Nail (long)

#### Instrument

03.019.001 Radiographic Ruler for  
MultiLoc Humeral Nailing System

- Position the image intensifier for an anteroposterior view of the proximal humerus. When measuring the fractured humerus, apply gentle traction to restore length.

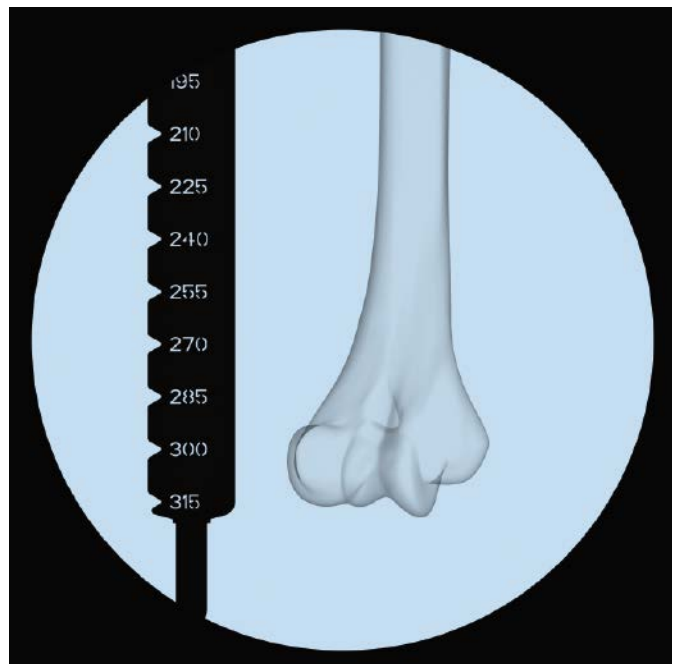
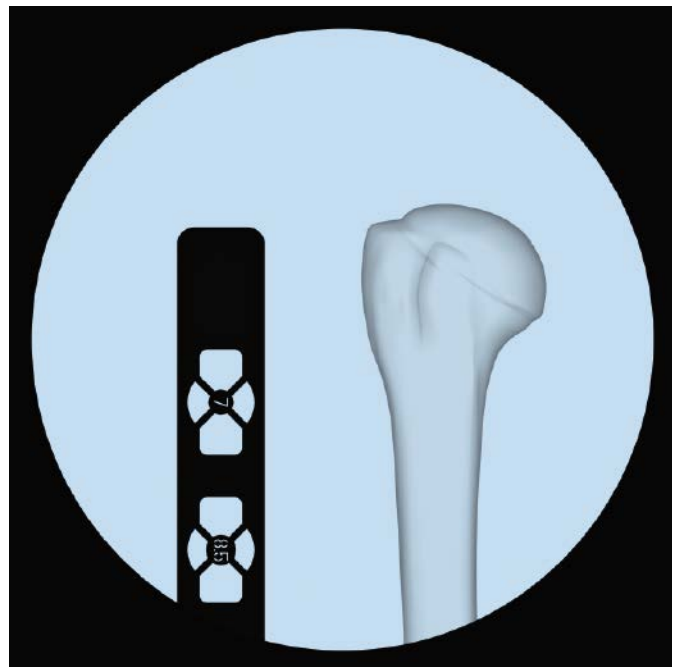
With long clamp, hold the radiographic ruler along the humerus with the top at the desired entry point. Mark the skin at the top of the ruler.

- Move the image intensifier to the distal humerus. Take an anteroposterior image of the distal humerus. Verify fracture reduction.

Orient the top of the ruler to the skin mark. Read the nail length directly from the ruler image, selecting the measurement that is at least 2.5 cm proximal to the cranial boundary of the olecranon fossa.

#### Notes:

- The length can be determined correctly on the fractured arm only after the fracture has been correctly reduced.
- Potential compression must be taken into account when determining the nail length and a shorter nail may be chosen. The locking screw in the compression slot can move by up to 8 mm distally.

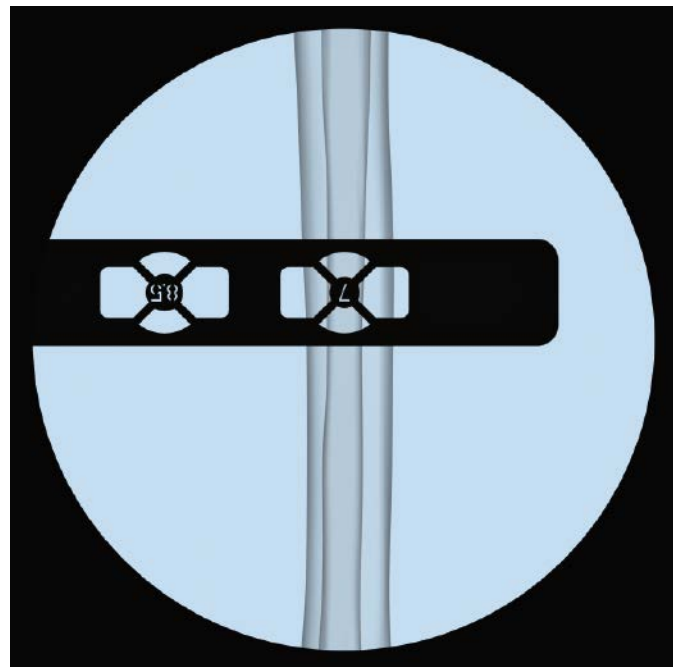


### 3

#### Determine nail diameter for MultiLoc Humeral Nail (long)

- Position the image intensifier and hold the radiographic ruler over the humerus with the diameter gauge centered over the narrowest part of the medullary canal (isthmus) that will contain the nail. Read the diameter measurement on the circular indicator that fills the canal.

**Note:** The ruler is not at the same depth as the humerus, which will affect the accuracy of the measurement.



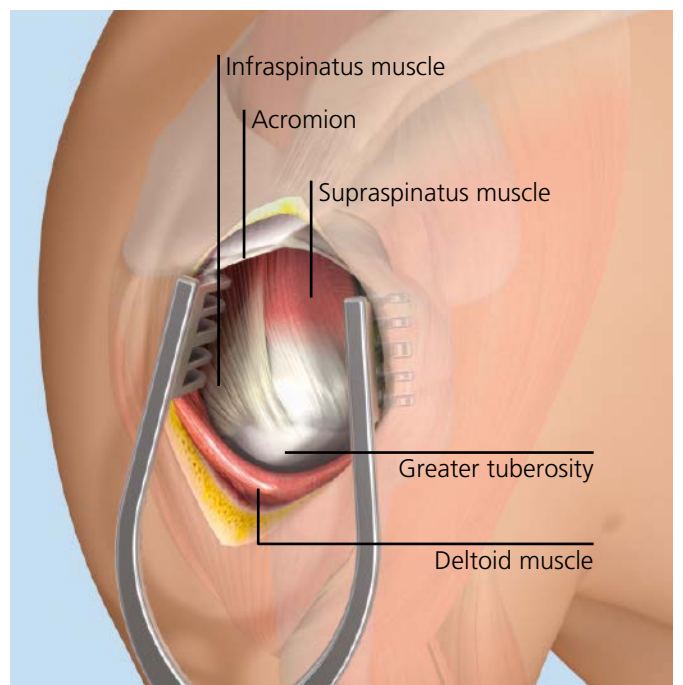
### 4

#### Approach

Perform an anterolateral approach. Begin the incision at the anterolateral tip of the acromion and carry it distally over the deltoid muscle. Split the deltoid muscle at the tendinous intersection between the anterior and the middle third along its fibers and retract it.

In complex fractures, a better view may be achieved by partially detaching the deltoid muscle from the anterior border of the acromion.

**Precaution:** Do not extend the approach too far distally, to prevent iatrogenic injury of the axillary nerve. The nerve may be identified by gentle palpation or careful dissection. A stay suture may be placed, to prevent further extension of the incision.





## 5

### Reduce fracture

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#### Instrument

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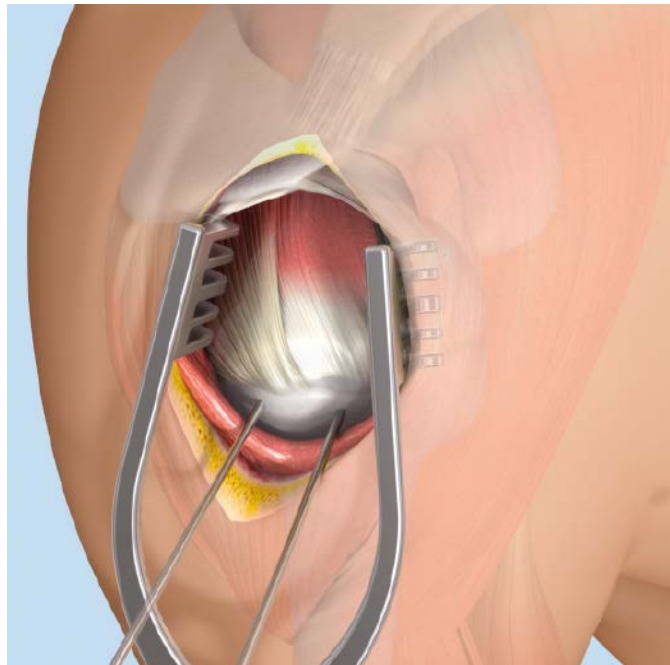
292.16	1.6 mm Kirschner Wire, trocar point, 150 mm
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Reduce the fracture via indirect reduction maneuvers, traction sutures, an elevator, or Schanz screws or Kirschner wires used as joysticks.

If necessary, use Kirschner wires to hold the fragments temporarily in place during insertion of the implant. Ensure that the Kirschner wires do not block insertion of the nail.

- Check reduction under image intensification.



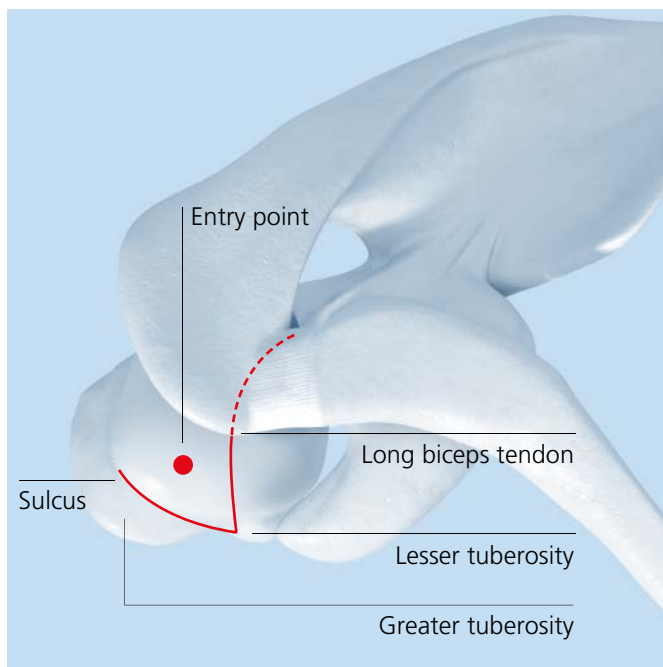
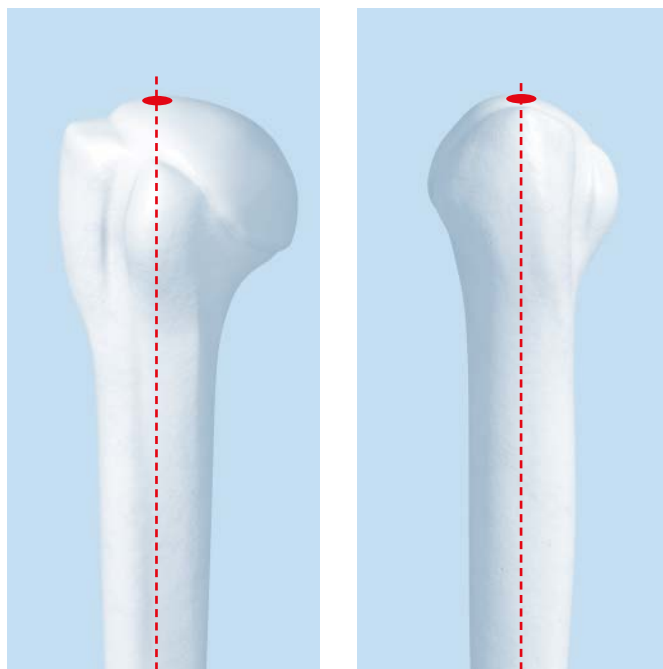
# Opening the Humerus

## 1

### Determine entry point

The ideal entry point is situated at the apex of the humeral head, in line with the medullary canal in both AP and lateral views. This point is located posterolateral to the biceps tendon and medial to the sulcus between the greater tuberosity and the humeral head.

**Note:** If the acromion inhibits access to the ideal entry point, extend the shoulder to move the apex of the humeral head in front of the acromion.



## 2

### Insert guide rod

#### Instruments

03.019.026	2.5 mm Guide Rod with Stop, trocar tip, 230 mm
393.105	Small Universal Chuck with T-Handle

Partially insert the guide rod at the appropriate insertion point, using the small universal chuck.

- Check the position of the guide rod in both AP and lateral views.

Make a longitudinal incision of 1 to 2 cm through the supraspinatus tendon along its fibers, at the position of the guide rod. Use holding sutures and retractors to obtain access to the operative field.

Advance the guide rod until its stop reaches the bone surface.

Remove the small universal chuck.

Continue with Step 3, Option A.

**Precaution:** Do not damage the hypervascular zone of the rotator cuff near its insertion on the humerus.

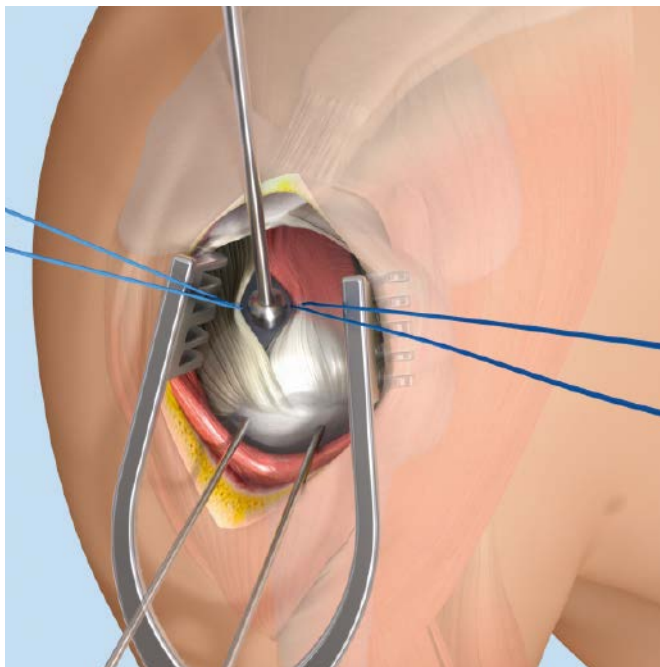
#### Alternative technique: Insert K-wire (for use with cannulated awl)

#### Instrument

292.26	2.5 mm Kirschner Wire, trocar point, 285 mm
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If the cannulated awl is preferred for opening the medullary canal, insert a 2.5 mm Kirschner wire instead of the guide rod.

Continue with Step 3, Option B.



### 3

#### Open medullary canal

##### Option A: With hollow drill bit

##### Instruments

03.019.003	10.0 mm Hollow Drill Bit, for MultiLoc Humeral Nailing System or
03.019.004	11.5 mm Hollow Drill Bit, for 9.5 mm MultiLoc Proximal Humeral Nail
03.019.027	Protection Sleeve, for 03.019.003 and 03.019.004

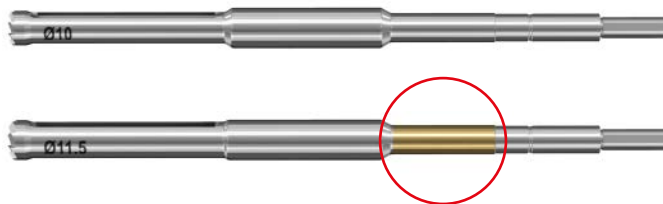
Pass the hollow drill bit through the protection sleeve and over the guide rod to the bone. Drill to the depth of the medullary canal.

Remove the hollow drill bit, protection sleeve, and guide rod.

**Note:** Use the 11.5 mm hollow drill bit marked with a gold band (03.019.004) for the 9.5 mm MultiLoc Proximal Humeral Nail. For all other nails, use the 10.0 mm hollow drill bit (03.019.003).



	Nail Diameter (mm)	Hollow Drill Bit (mm)
MultiLoc Proximal Humeral Nail	8.0	10.0
MultiLoc Proximal Humeral Nail	9.5	11.5 (gold)
MultiLoc Humeral Nail	7.0	10.0
MultiLoc Humeral Nail	8.5	10.0



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**Option B: With cannulated awl**

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**Instrument**

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03.010.039      10.0 mm Cannulated Awl

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Pass the cannulated awl over the Kirschner wire to the bone. Use a twisting motion to advance the awl to the depth of the medullary canal.

Remove the awl and the Kirschner wire.

---

**Precaution:** When using the cannulated awl, take care to not displace the fracture, especially in complex fracture cases.

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# Reduce Fracture and Ream

## MultiLoc Humeral Nail (long)

### 1

#### Reduce fracture

##### Instruments

03.019.011	Reduction Instrument for MultiLoc Humeral Nailing System, 330 mm length
351.709S	2.5 mm Reaming Rod with ball tip, 650 mm, sterile

Insert the reduction instrument into the medullary canal. Introduce the reaming rod into the reduction instrument. Turn the reduction instrument to facilitate the insertion of the reaming rod across the fracture site.

After reduction, push the reaming rod down the medullary canal. Remove the reduction instrument leaving the reaming rod in place.

##### Notes:

- The two arrows on the handle of the reduction instrument indicate the position of the distal opening.
- Avoid removing the reaming rod when pulling on the reduction instrument.
- As each manipulation in the fat-filled medullary canal causes intramedullary pressure increase, reduction with the reduction instrument also increases the pressure. Manipulations should therefore be minimized. As an alternative, reduction can also be carried out using the reaming rod only.



## 2

### Determine nail length

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#### Instruments

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03.019.001	Radiographic Ruler for MultiLoc Humeral Nailing System
351.719	Extension Tube for Depth Gauge

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Assemble the radiographic ruler with the extension tube. Place the assembly over the reaming rod and ensure that the tip of the assembly is located at the desired position of the proximal nail end.

Determine the length of the nail and choose the implant accordingly.

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#### Notes:

- Use the radiographic ruler only with the 2.5 mm reaming rod with ball tip, 650 mm length (351.709S).
  - The nail tip should be positioned at least 25 mm away from the cranial boundary of the olecranon fossa.
  - Potential compression must be taken into account when determining the nail length and a shorter nail may be chosen. The locking screw in the compression slot can move by up to 8 mm distally.
- 



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### 3

#### Reaming guidelines (optional)

- Using image intensification, ensure that fracture reduction has been maintained.

Ream to a diameter at least 1.0 mm greater than the nail diameter in accordance with the surgeon's preference. Ream in 0.5 mm increments and advance the reamer with steady, moderate pressure.

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**Precaution:** Do not force the reamer. Frequently retract the reamer partially to clear debris from the medullary canal. Remove the reaming assembly, leaving the reaming rod in place. All MultiLoc Humeral Nails (long) can be inserted over the reaming rod.

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**Note:** Flush the surgical site after reaming to remove remaining debris and minimize the risk of heterotopic ossification.

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**Precaution:** Reaming should be avoided in case of comminution in the area where the radial nerve contacts the bone in the radial sulcus.

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# Nail Insertion

## 1 Assemble insertion instruments

### Instruments

03.019.006	Insertion Handle for MultiLoc Proximal Humeral Nail
03.019.007	Connecting Screw, cannulated, for MultiLoc Humeral Nail
321.16	Combination Wrench, 11.0 mm width across flats

Orient the insertion handle laterally and match the geometry of the insertion handle to the nail. Pass the connecting screw through the insertion handle and into the nail. Secure the assembly with the combination wrench.

**Precaution:** The anatomic design of the MultiLoc Proximal Humeral Nail requires right and left versions. Nails are labeled “RIGHT” or “LEFT.” Using the incorrect version leads to instrumented drilling into the nail which may lead to subsequent premature implant failure.



## 2

### Insert nail

Insert and advance the nail into the medullary canal using twisting motions. Orient the insertion handle laterally.

- Monitor the nail passage across the fracture and control it in two planes to avoid misalignment.

In case of a metaphyseal fracture, advance the nail to the fracture site, reduce the fracture and continue into the diaphysis.

- Check the nail position in AP and lateral views.

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#### Precautions:

- The proximal end of the nail must be inserted below the humeral head surface to avoid impingement.
- Do not use a hammer, as this may increase the risk of iatrogenic fractures.

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#### Notes:

- If nail insertion is difficult, choose a smaller diameter nail or ream the intramedullary canal to a larger diameter.
  - Pressure against the elbow when advancing the nail prevents distraction and potential healing problems.
- 



# Nail Positioning

## 1

### Assemble lateral aiming arm

#### Instruments

03.019.008	Aiming Arm, lateral, for MultiLoc Proximal Humeral Nail (shown)
or	
03.019.012	Aiming Arm, lateral, for MultiLoc Humeral Nail
03.019.030	Aiming Arm Knob

Choose the appropriate aiming arm.

Insert the connecting screw into the aiming arm, ensuring that the aiming arm is oriented correctly. Attach the aiming arm to the insertion handle and tighten the connecting screw.

#### Notes:

- Ensure that the aiming arm shows “RIGHT” if used for the right humerus and “LEFT” if used for the left humerus.
- For MultiLoc Proximal Humeral Nail (short) use 03.019.008 marked “MULTILOC PHN.” For MultiLoc Humeral Nail (long) use 03.019.012 marked “MULTILOC HN.”



### Optional technique: Assemble anterior aiming arm for anterior screw (level C) or ascending screw (level E)

#### Instrument

03.019.009	Aiming Arm, anterior, for MultiLoc Proximal Humeral Nail
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If the anterior screw (lesser tuberosity) or the ascending screw will be used, connect the anterior aiming arm to the insertion handle and tighten the knob.



## 2

### Position nail: Insertion depth

#### Instrument

292.26	2.5 mm Kirschner Wire, trocar point, 285 mm
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The proximal nail end should be at least 2 to 3 mm below the cartilage to minimize the risk of impingement while maximizing stability. This determines the insertion depth of the implant.

- Check the proximal nail position clinically and under imaging.

**Note:** To better identify the proximal nail end, place a 2.5 mm Kirschner wire through the hole in the aiming arm marked "0".



#### Optional technique: Ascending screw (level E)

- If the ascending screw is used, place a 2.5 mm Kirschner wire through the hole in the anterior aiming arm marked "ASCEND." Adjust the position of the image intensifier or the patient's arm so that the circle of the anterior aiming arm aligns with the screw hole for the anterior screw in the nail. The Kirschner wire will indicate the position of the ascending screw.

Correct the insertion depth of the nail to have the ascending screw within the calcar region.

- Precaution:** The proximal nail end should be at least 2 to 3 mm below the cartilage to minimize the risk of impingement while maximizing stability. Check the proximal nail position clinically and under imaging.



### 3

#### Position nail: Adjust rotation

##### Instruments

03.019.013	13.0 mm/10.0 mm Protection Sleeve, for 4.5 mm Titanium MultiLoc Screws, 150 mm
03.019.014	10.0 mm/3.8 mm Drill Sleeve, for 03.019.013
03.019.015	3.8 mm Trocar, for 03.019.014
03.019.040	2.5 mm Kirschner Wire Sleeve
292.26	2.5 mm Kirschner Wire, trocar point, 285 mm

Insert a trocar assembly (protection sleeve, drill sleeve and trocar) through the most proximal hole of the lateral aiming arm (level A).

Insert a second trocar assembly through the anterior hole of the lateral aiming arm (level D).

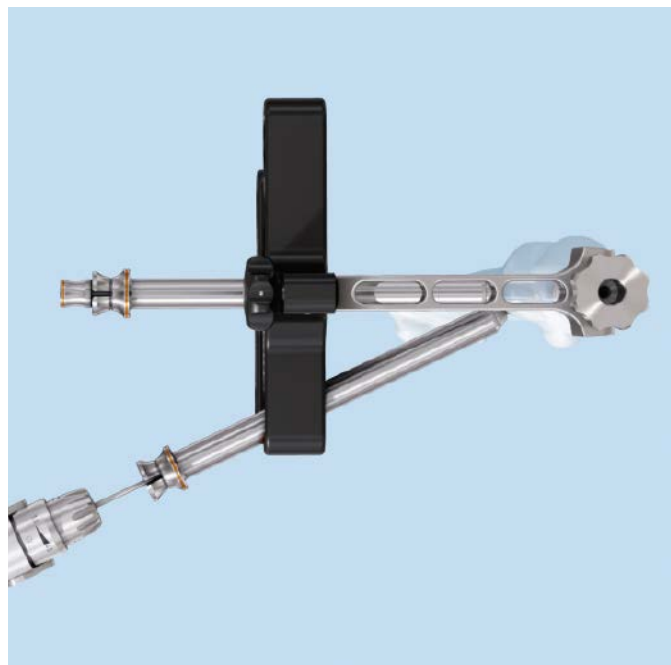
The screw on level D should be placed as anteriorly as possible without injuring the long biceps tendon. This determines the rotation of the implant.

**Precaution:** Do not place any screw in the bicipital groove.

Push one trocar down to the bone. Remove the trocar.

##### Notes:

- The holes for the MultiLoc Screws are marked with an orange circle.
- For temporary fixation, insert a 2.5 mm Kirschner wire through a K-wire sleeve.



---

**Optional technique: Anterior screw (level C)**

If the anterior screw (lesser tuberosity) is used, make a small incision with blunt dissection of the soft tissues. Then insert the second trocar assembly through the anterior aiming arm.

---

**Precaution:** Ensure that the tip of the trocar touches the tip of the lesser tuberosity. This helps to prevent irritation of the long biceps tendon or the ascending branch of the anterior circumflex artery through the anterior screw (lesser tuberosity). Slightly rotate the nail if needed.

---

**Note:** Ensure that the lesser tuberosity is large enough to accommodate a MultiLoc Screw. If not, consider other means of fixation, such as smaller independent screws or osteosuturing.

---



# Proximal Locking

## MultiLoc™ Screws

**Note:** When using the long nail, if bicortical compression is desired, it must be applied before proximal locking. Please refer to “Compression Locking” on page 50.

### 1

#### Drill and determine screw length

##### Instrument

03.019.016	3.8 mm Three-Fluted Drill Bit, quick coupling, calibrated, 270 mm
------------	---

- Insert the calibrated drill bit and drill carefully until the level of the subchondral bone is reached. Confirm drill bit position with the image intensifier.

Read the required length of the screw directly off the calibrated drill bit at the back of the drill sleeve. Press the drill sleeve firmly to the cortex to ensure accurate measurement.

Remove the drill bit and drill sleeve.

##### Precautions:

- Before inserting the MultiLoc Screw at level D, identify and protect the axillary nerve and its branches.
- Do not penetrate the articular surface.



### Alternative technique: Measure using depth probe

#### Instrument

03.019.029	Depth Probe for MultiLoc Humeral Nailing System
------------	---

Alternatively, the depth probe can be used for screw length determination.

Assemble the depth probe with its outer sleeve.

- Insert the depth probe through the protection sleeve and advance it until resistance of the subchondral space is felt. Monitor under imaging. Press the outer part of the depth probe firmly to the cortex to ensure accurate measurement. Read the screw length directly from the depth probe at the back of the outer sleeve.

**Note:** The orange marking on the depth probe will align with the outer opening of the protection sleeve.



## 2

### Countersink in hard bone (optional)

#### Instrument

03.019.018	6.5 mm Drill Bit, conical, with stop
------------	--------------------------------------

In hard bone, the conical drill bit may be used to countersink the head of the MultiLoc Screw in the lateral cortex.

**Precaution:** The conical drill bit should not be used in poor bone quality as it may increase the risk of iatrogenic fractures.





### 3

#### Insert MultiLoc Screw

##### Instrument

03.019.025      Screwdriver for 4.5 mm Titanium MultiLoc Screws, self-retaining, 330 mm

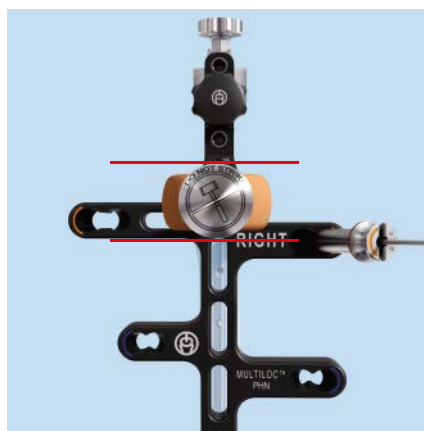
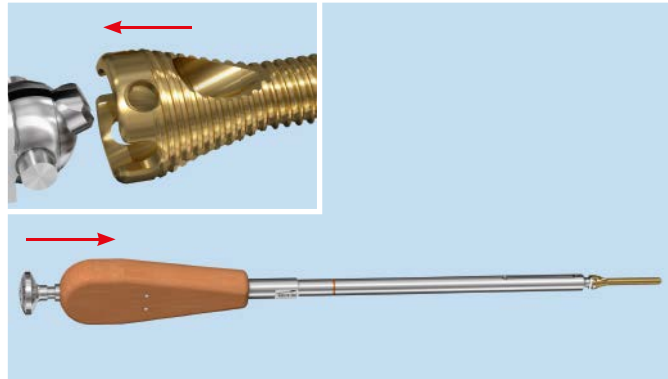
Assemble the screwdriver with inner shaft.

Pull back the knob of the screwdriver and attach the appropriate MultiLoc Screw. Push the knob forward to lock the screw into place. Insert the screw through the protection sleeve until it is countersunk.

- Ensure that the final position of the screwdriver handle is perpendicular to the nail with the arrow pointing posteriorly. Verify the position of the screw under imaging.

Pull back the knob to release the screwdriver.

**Note:** Properly countersink the most proximal screws to avoid risk of impingement. To allow suture fixation, do not overinsert the screw (see page 56). Use the orange marking on the shaft of the screwdriver as an indicator of screw insertion depth.



## 4

### Attach centering sleeve for 3.5 mm locking screw (Screw-in screw) (optional)

#### Instruments

03.019.019	Centering Sleeve for 3.5 mm Titanium Locking Screws, and 4.5 mm Titanium MultiLoc Screws
03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, 330 mm

If a 3.5 mm locking screw is used in combination with a MultiLoc Screw, assemble a centering sleeve to the T25 StarDrive™ Screwdriver. Insert the assembly into the protection sleeve. Turn the screwdriver slightly, until the centering sleeve aligns with the screw recess. Push the screwdriver to lock the centering sleeve into the MultiLoc Screw.

Remove the screwdriver and protection sleeve.

#### Notes:

- Do not insert a 3.5 mm locking screw through the anterior screw (level C).
- The centering sleeve may also be inserted manually, see page 34.



## 5

### Insert remaining MultiLoc Screws

For the remaining screws, repeat Steps 1 through 4.

- ⓘ Carefully inspect the final position of all MultiLoc Screws under image intensification in different planes and ensure that they do not penetrate the articular surface.

Remove the anterior aiming arm, if used.

# 1

## Attach centering sleeves

### Instruments

03.019.019	Centering Sleeve for 3.5 mm Titanium Locking Screws, and 4.5 mm Titanium MultiLoc Screws
03.019.021	5.8 mm/2.8 mm Drill Sleeve, for 03.019.019

Remove the lateral aiming arm.

If not done so previously, attach a centering sleeve to the MultiLoc Screw. Gently tilt the centering sleeve anteriorly and lock the drill sleeve in the centering sleeve by clicking it into place.

Ensure the two handles of the drill sleeve are exactly perpendicular to the nail. Rotate the assembly, if necessary.



## 2

### Drill and determine screw length

---

#### Instrument

---

310.284	2.8 mm Drill Bit, quick coupling, 165 mm
---------	--

---

- ① Insert the drill bit and drill carefully, until the level of the subchondral bone is reached. Confirm drill bit position under imaging.

Read the required screw length directly off the calibrated drill bit at the back of the drill sleeve.

Remove the drill bit and drill sleeve.

---

**Precaution:** Do not penetrate the articular surface.

---

#### Notes:

- The drill bit can only be inserted if the drill sleeve is properly locked in the centering sleeve.
  - Do not change the position of the centering sleeve.
- 



### Alternative technique: Measure using depth probe

---

#### Instrument

---

03.019.029	Depth Probe for MultiLoc Humeral Nailing System
------------	---

---

Alternatively, the depth probe can be used for screw length determination.

Assemble the depth probe with its outer sleeve.

- ① Insert the depth probe through the drill sleeve and advance it until resistance of the subchondral space is felt. Monitor under imaging. Read the screw length on the fenestrated scale of the depth probe.

Remove the drill sleeve.

---

**Note:** Do not change the position of the centering sleeve.

---



### 3

#### Insert 3.5 mm locking screw

---

##### Instruments

---

03.019.005	Handle with Quick Coupling, 150 mm
314.116	StarDrive Screwdriver Shaft, T15, quick coupling
511.773	Torque Limiting Attachment, 1.5 Nm, quick coupling

---

Assemble the torque limiting attachment, handle and screwdriver shaft.

Select the appropriate length 3.5 mm locking screw and insert it through the centering sleeve. Tighten the screw until a click is heard.

Remove the centering sleeve.

---

##### Notes:

- Always use a torque limiting attachment when inserting the 3.5 mm locking screws.
  - The centering sleeve can only be removed when the 3.5 mm locking screw is fully seated.
- 



---

## 4

### Insert remaining 3.5 mm locking screws and assemble lateral aiming arm

---


#### Instruments

---

03.019.008	Aiming Arm, lateral, for MultiLoc Proximal Humeral Nail
03.019.030	Aiming Arm Knob

---

To insert the remaining 3.5 mm locking screws, repeat Steps 1 through 3.

-  Carefully inspect the final position of all 3.5 mm locking screws under imaging in different planes, and ensure that they do not penetrate the articular surface.

If the MultiLoc Proximal Humeral Nail (short) is used, reassemble the lateral aiming arm to the insertion handle and tighten the connecting screw.

---

**Note:** Ensure the aiming arm shows “RIGHT” when used for the right humerus and “LEFT” when used for the left humerus.

---

# Ascending Screw

## 1

### Insert trocar combination

#### Instruments

03.010.063	12.0 mm/8.0 mm Protection Sleeve, 188 mm
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm
03.010.069	3.2 mm Trocar

Insert the trocar combination (protection sleeve, drill sleeve and trocar) through the ascending screw hole in the aiming arm. Make a skin incision and dissect carefully to the bone to avoid injury to the surrounding neurovascular structures and soft tissue.

Advance the trocar assembly and push the trocar down to the bone. Remove the trocar.

**Precaution:** Before insertion of the ascending screw, identify and protect the axillary nerve. Only incise the skin and then perform blunt dissection, to avoid injuring the axillary nerve and its branches.

#### Notes:

- The ascending screw should not be used if the humerus is too small to place the screw within the humeral head.
- The hole in the aiming arm for ascending screw is marked with a blue circle.



## 2

### Drill and determine screw length

#### Instrument

03.010.060	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration
------------	---

- Insert the calibrated drill bit and drill carefully until the level of the subchondral bone is reached. Confirm drill bit position under image intensification.

Read the required length of the screw directly off the calibrated drill bit at the back of the drill sleeve. Press the drill sleeve firmly to the cortex to ensure accurate measurement.

Remove the drill bit and the drill sleeve.

**Precaution:** Do not penetrate the articular surface.

**Note:** The Angular Stable Locking System (ASLS) may be useful in cases where increased stability is needed, as in fractures closer to the metaphyseal area or in poor quality bone. For additional information, please refer to the *DePuy Synthes ASLS Technique Guide*.





### Alternative technique: Measure using depth gauge

#### Instrument

03.019.017 Depth Gauge for MultiLoc Humeral Nailing System

The depth gauge can be used for screw length determination.

Assemble the depth gauge with its outer sleeve.

- Insert the depth gauge through the protection sleeve and advance it until resistance of the subchondral space is felt. Monitor under image intensification. Press the outer part of the depth gauge firmly to the cortex to ensure accurate measurement. Read the screw length directly off the depth gauge.

**Note:** The blue mark on the depth gauge will align with the outer opening of the protection sleeve.



## 3

### Insert 4.0 mm locking screw

#### Instrument

03.019.020 StarDrive Screwdriver, T25, with coupling, for 03.019.019, 330 mm length

Insert the appropriate length 4.0 mm locking screw through the protection sleeve using the T25 StarDrive Screwdriver.



# Targeted Distal Locking

## MultiLoc Proximal Humeral Nail (short)

### 1

#### Insert trocar assembly

##### Instruments

03.010.063	12.0 mm/8.0 mm Protection Sleeve, 188 mm
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm
03.010.069	3.2 mm Trocar

Insert the trocar combination (protection sleeve, drill sleeve and trocar) through one of the distal holes in the aiming arm. Make a skin incision and dissect carefully to the bone to avoid injury to the surrounding neurovascular structures and soft tissue.

Advance the trocar assembly and push the trocar down to the bone. Remove the trocar.

##### Notes:

- The holes in the aiming arm for distal locking screws are marked with a blue circle.
- Two distinct skin incisions are recommended when inserting the two distal locking screws.



## 2

### Drill and determine screw length

---

#### Instrument

---

03.010.060	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration
------------	---

---

- Insert the calibrated drill bit and drill carefully until the tip of the drill bit just breaks through the medial cortex. Confirm drill bit position under image intensification.

Read the required length of the screw directly off the calibrated drill bit at the back of the drill sleeve. Press the drill sleeve firmly to the cortex to ensure accurate measurement.

Remove the drill bit and the drill sleeve.

---

**Note:** The Angular Stable Locking System (ASLS) may be useful in cases where increased stability is needed, as in fractures closer to the metaphyseal area or in poor quality bone. For additional information, please refer to the *ASLS Technique Guide*.

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---

**Alternative technique: Measure using depth gauge**

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**Instrument**

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03.019.017	Depth Gauge for MultiLoc Humeral Nailing System
------------	---

---

The depth gauge can be used for screw length determination.

Assemble the depth gauge with its outer sleeve.

Insert the depth gauge through the protection sleeve.  
Press the outer part of the depth gauge firmly to the cortex to ensure accurate measurement. Read the screw length directly off the depth gauge.

---

**Note:** The blue mark on the depth gauge will align with the outer opening of the protection sleeve.

---



### 3

#### Insert 4.0 mm locking screw

---

##### Instrument

---

03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, length 330 mm
------------	---

---

Insert the appropriate length 4.0 mm locking screw through the protection sleeve, using the T25 StarDrive Screwdriver.



---

### 4

#### Insert remaining 4.0 mm locking screws

To insert the second distal 4.0 mm locking screw, repeat Steps 1 through 3.

Remove the lateral aiming arm.

# Freehand Distal Locking

## MultiLoc Humeral Nail (long)

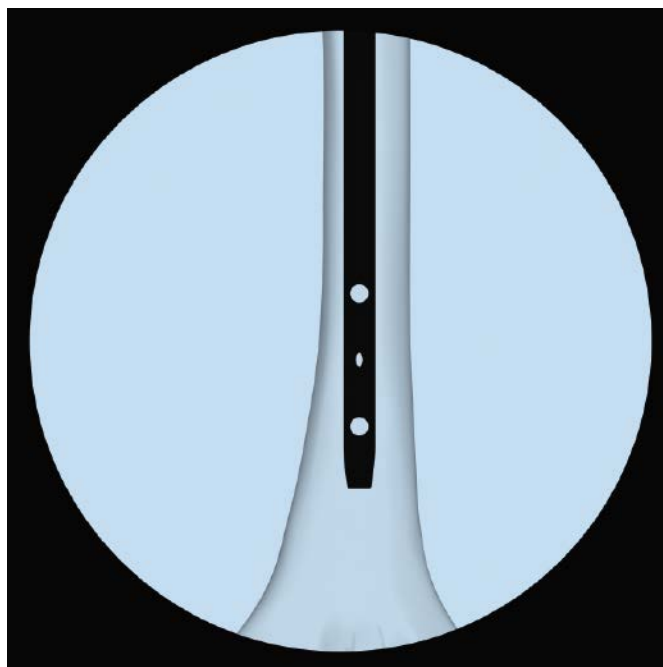
### 1

#### Adjust image

- Confirm fracture reduction with anteroposterior and lateral images.
- Align the image intensifier with the hole in the nail until a perfect circle is visible in the center of the screen.

**Precaution:** To visualize the round holes, always move the image intensifier without moving the arm since this can cause severe malrotation.

**Note:** It is recommended that the most proximal distal hole is locked first.

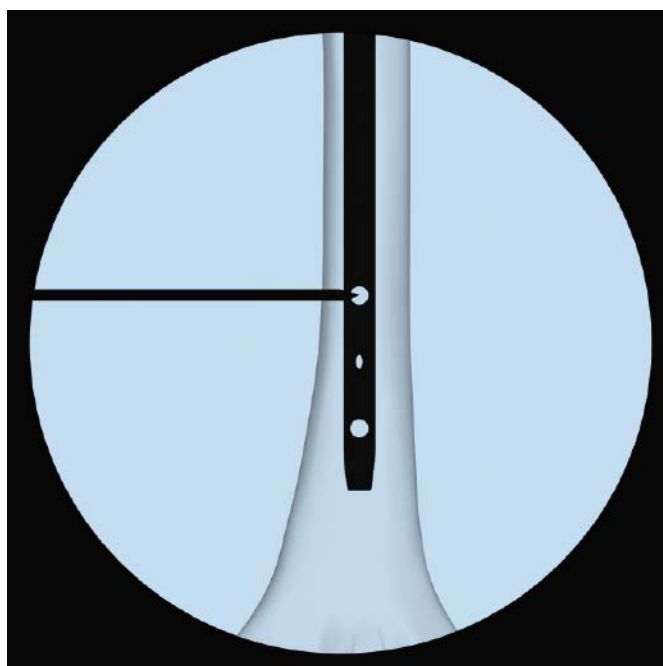


### 2

#### Perform incision

Identify the center of the hole with a Kirschner wire to mark the incision point and make a skin incision. Dissect the soft tissues to create a clear view of the bone. Use spreaders or retractors to avoid injury to neurovascular structures.

**Note:** Only incise the skin and then perform blunt dissection down to the bone to avoid injuring the median or radial nerve or the brachial artery.



### 3

#### Drill

##### Instruments

03.010.100	3.2 mm Three-fluted Drill Bit, for use with Radiolucent Drive
or	
03.010.103	3.2 mm Three-fluted Drill Bit, needle point

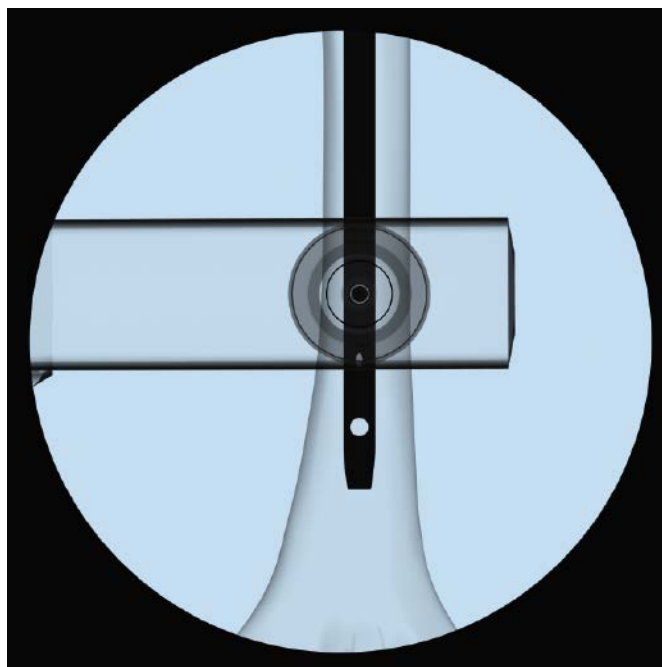
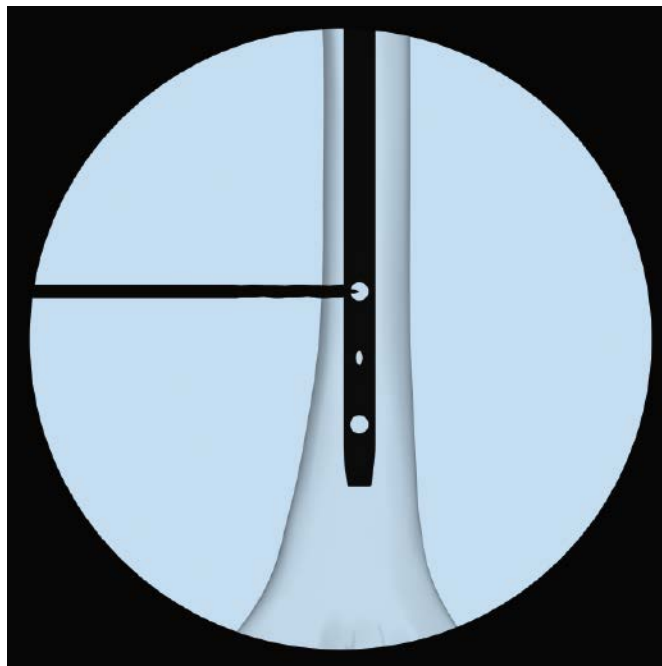
- Under image intensification, insert the tip of the drill bit through the incision and onto the bone. Keep the drill bit oblique to the x-ray beam until the tip is centered in the locking hole.

**Note:** Be sure to use a sharp drill bit to prevent slippage and ensure accuracy.

- Tilt the drill until the drill bit is in line with the beam and centered in the outer ring. The drill bit will nearly fill the locking hole image. Hold the drill firmly in this position and drill through both cortices. Monitor drill bit insertion with the image intensifier, as the position of the drill bit tip directly represents the screw position in the bone.

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

**Note:** The Angular Stable Locking System (ASLS) may be useful in cases where increased stability is needed, as in fractures closer to the metaphyseal area or in poor quality bone. For additional information, please refer to the *DePuy Synthes ASLS Technique Guide*.



## 4

### Determine screw length

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#### Instrument

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03.010.106	Direct Measuring Device for Locking Screws to 100 mm, for IM Nails
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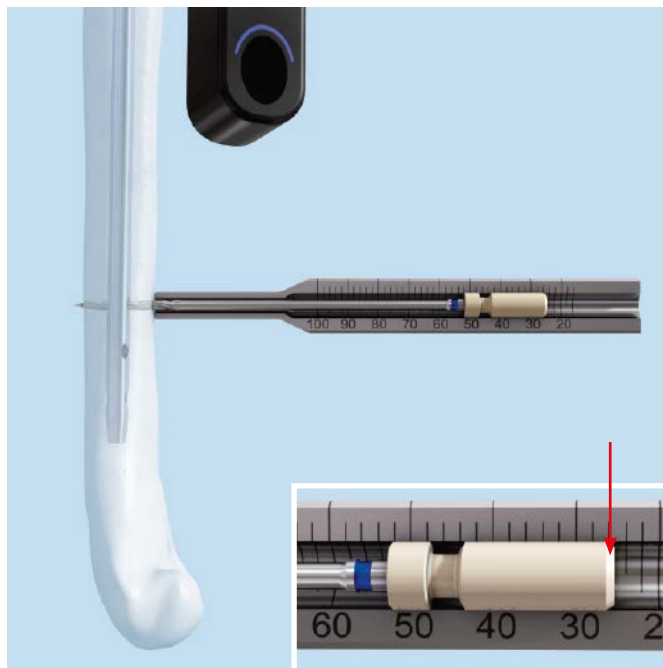
Leaving the drill bit in place, detach the drill. Place the direct measuring device against the drill bit, with the tip of the direct measuring device against the bone. Read the graduation against the end of the drill bit to determine the screw length.

Remove the drill bit.

---

**Note:** To avoid measurement errors, it is important that the tip of the direct measuring device is pressed against the bone.

---



### Alternative technique: Measure using depth gauge

---

#### Instrument

---

03.019.017	Depth Gauge for MultiLoc Humeral Nailing System
------------	---

---

The depth gauge can be used for screw length determination.

Assemble the depth gauge with its outer sleeve.

Insert the depth gauge and grasp the far cortex of the bone with the hook. Press the outer part of the depth gauge firmly to the cortex to ensure accurate measurement. Read the screw length directly off the depth gauge.





---

## 5

### Insert 4.0 mm locking screw

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#### Instrument

---

03.019.020	StarDrive Screwdriver, T25, with coupling, for 03.019.019, 330 mm length
------------	---

---

Insert the appropriate length 4.0 mm locking screw using the T25 StarDrive Screwdriver.



---

## 6

### Insert remaining 4.0 mm locking screws

To insert the remaining 4.0 mm locking screws, repeat Steps 1 through 5.

## Compression Locking (optional)

### MultiLoc Humeral Nail (long)

Compression locking of the MultiLoc Humeral Nail (long) can help close a transverse or short oblique fracture gap that is up to 8 mm wide. Bicortical compression may increase fracture stability in transverse and short oblique fractures.

The nail must be overinserted by at least the same amount of interfragmentary travel that is anticipated because, as compression is applied, the nail will back out at the insertion site.

#### Precautions:

- ASLS screws cannot be used in the compression slot.
- The axillary nerve should be explored and isolated prior to using the compression function.
- When radial nerve impingement is suspected or possible, the nerve should be explored and isolated prior to nailing or using the compression function.

**Note:** Distal locking must be performed prior to applying compression. For further details, please refer to “Freehand Distal Locking MultiLoc Humeral Nail (long)” on page 46.



## 1

### Lock nail distally

Overinsert the nail by at least the anticipated amount of interfragmentary travel. The maximum amount of travel produced by the compression device is 8 mm.

Lock the nail in the distal fragment as described in “Freehand Distal Locking MultiLoc Humeral Nail (long)” on page 46.



## 2

### Apply compression

#### Instruments

03.019.020	StarDrive Screwdriver, T25, with coupling, for 03.019.019, 330 mm length
or	
321.20	Ratchet Wrench, 11.0 mm across flats
03.019.038	Compression Screw for MultiLoc Humeral Nail

Insert a 4.0 mm locking screw through the hole in the aiming arm marked “COMP”, which targets the superior end of the nail slot, using standard insertion technique. See “Targeted Distal Locking MultiLoc Proximal Humeral Nail (short)” on page 42.

#### Precautions:

- Ensure that the nail is not left proud after compression because this may cause impingement.
- Before insertion of the 4.0 mm locking screw, identify and protect the axillary nerve. Only incise the skin and then perform blunt dissection, to avoid injuring the axillary nerve and its branches.

Insert the compression screw into the connecting screw. Advance the compression screw with the T25 StarDrive Screwdriver or the ratchet wrench. The tip of the compression screw will contact the 4.0 mm locking screw, pulling the nail up and moving the interlocked far fragment toward the near fragment to compress the fracture.



- 
- Continue to advance the compression screw, monitoring interfragmentary travel under image intensification, until the desired amount of compression is achieved.
  - Check the compression under image intensification since the base of the nail can move proximally and cause impingement.

Remove the compression screw.

Ensure that the nail is firmly attached to the insertion handle.  
Re-secure the assembly with the combination wrench if necessary.

---

**Notes:**

- Monitor both the fracture site and the 4.0 mm locking screw during the procedure. If the fragments do not compress and/or the 4.0 mm locking screw migrates or deforms excessively, discontinue the compression locking procedure.
  - Each revolution of the compression screw corresponds to an axial movement of 1 mm.
- 

---

### 3

#### **Lock nail proximally**

Insert the proximal locking screws as described in “Proximal Locking” on page 30.

# End Cap Insertion

The use of an end cap is recommended, to prevent bony ingrowth into the proximal end of the nail, or to increase stability if the nail has been overinserted.

## 1 Determine end cap length

### Instruments

03.019.023	End Cap Ruler for MultiLoc Humeral Nailing System
321.16	Combination Wrench, 11.0 mm width across flats

Slide the end cap ruler over the proximal groove of the insertion handle. Push the ruler down to the bone and read the end cap length directly off the ruler.

Remove the end cap ruler, the connecting screw and the insertion handle. If removal of the connecting screw is difficult, use the combination wrench.

**Note:** The proximal nail end and end cap should be 2 to 3 mm below the cartilage, to minimize the risk of impingement while providing maximum stability.



**Alternative technique: Measure using aiming arm and K-wire**

**Instruments**

03.019.008	Aiming Arm, lateral, for MultiLoc Proximal Humeral Nail
03.019.030	Aiming Arm Knob
292.26	2.5 mm Kirschner Wire, trocar point, 285 mm

1. Connect the lateral aiming arm to the insertion handle and tighten the knob. Insert a 2.5 mm Kirschner wire through the corresponding end cap hole in the proximal portion of the aiming arm. Estimate the extension length using an AP image of the proximal nail end.

Remove the Kirschner wire and the lateral aiming arm.

2. **Notes:**
  - The grooves on the insertion handle help to identify the insertion depth under imaging.
  - The proximal nail end and end cap should be 2 to 3 mm below the cartilage, to minimize the risk of impingement while providing maximum stability.



## 2

### Insert end cap

---

#### Instrument

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03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, 330 mm length
------------	---

---

Use the T25 StarDrive Screwdriver to securely tighten the end cap.

---

#### Notes:

- The end cap must be inserted securely below the humeral head surface to avoid impingement. If in doubt, choose a shorter end cap.
  - To minimize the chance of cross threading, turn the end cap counterclockwise until the thread of the end cap aligns with the nail.
- 



## 3

### Insert sutures (optional)

The stability of the osteosynthesis can be improved with the insertion of sutures. Place one or more heavy, nonabsorbable sutures in the region of the tendinous insertion of the supraspinatus, infraspinatus, and subscapularis muscles.

Attach the sutures to the MultiLoc Screw using the suture holes provided.



# Implant Removal (optional)

## 1

### Remove end cap

#### Instruments

03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, 330 mm length
03.019.024	Extraction Screw for MultiLoc Humeral Nailing System

Implant removal is an optional procedure.

Carefully dissect the soft tissues and visualize all locking implants.

Remove the end cap, using the T25 StarDrive Screwdriver.

Thread the extraction screw into the nail.



## 2

### Remove 3.5 mm locking screws

#### Instruments

03.019.005	Handle with Quick Coupling, 150 mm
314.116	StarDrive Screwdriver Shaft, T15, quick coupling

Assemble the screwdriver shaft and handle and remove all 3.5 mm locking screws.





### 3

#### Remove MultiLoc Screws

---

##### Instruments

---

03.019.005	Handle with Quick Coupling, 150 mm
03.019.010	Extraction Shaft for 4.5 mm Titanium MultiLoc Screws, quick coupling

---

Assemble the extraction shaft and handle and remove all MultiLoc Screws.

---

**Note:** If 3.5 mm locking screws were used, remove them first.

---



### 4

#### Remove 4.0 mm locking screws

---

##### Instrument

---

03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, 330 mm length
------------	---

---

Remove all 4.0 mm locking screws with the T25 StarDrive Screwdriver.

---

**Note:** Ensure the extraction screw is connected to the nail before removing the last locking screw.

---



## 5

### Remove nail

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#### Instrument

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03.019.028      Combined Hammer, 360 grams

---

- ⓘ Before nail extraction, ensure all locking screws are removed.

Remove the nail. If resistance is encountered, use gentle hammer blows to extract the nail.



## 6

### Difficult extraction of screws

In case of difficulty in removal of screws with the standard technique described in sections 2-4, use the instruments and technique from the Screw Removal Set.

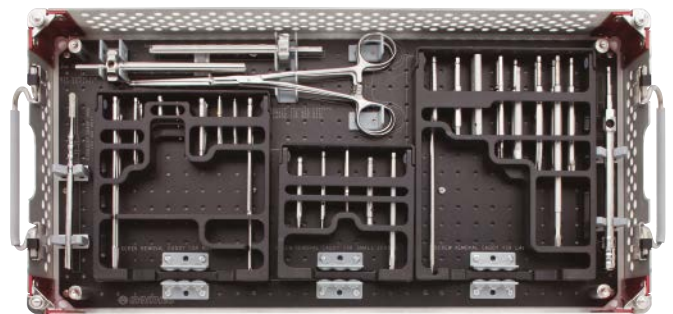
---

#### Optional Set

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01.240.001      Screw Removal Set

---



## 7

### Difficult extraction of 3.5 mm locking screw

In case of difficulty in extracting the 3.5 mm locking screw in the head of a MultiLoc Screw use the conical extraction screw first.

If the 3.5 mm locking screw cannot be extracted even with a conical extraction screw, use the technique described below to drill out the head of the screw.

#### Instruments

03.607.048	4.8 mm Drill Sleeve Clip-on, for 03.607.110
03.607.110	Drill Suction Device
309.004S	4.0 mm Carbide Drill Bit, sterile
309.521	Conical Extraction Screw for 3.5 mm Screws

Attach the carbide drill bit to the universal chuck of the power tool.

Before drilling attach the 4.8 mm drill sleeve to the drill suction device. Connect the drill suction device to the irrigation system and the vacuum pump. Switch on the rinsing equipment and the vacuum pump.

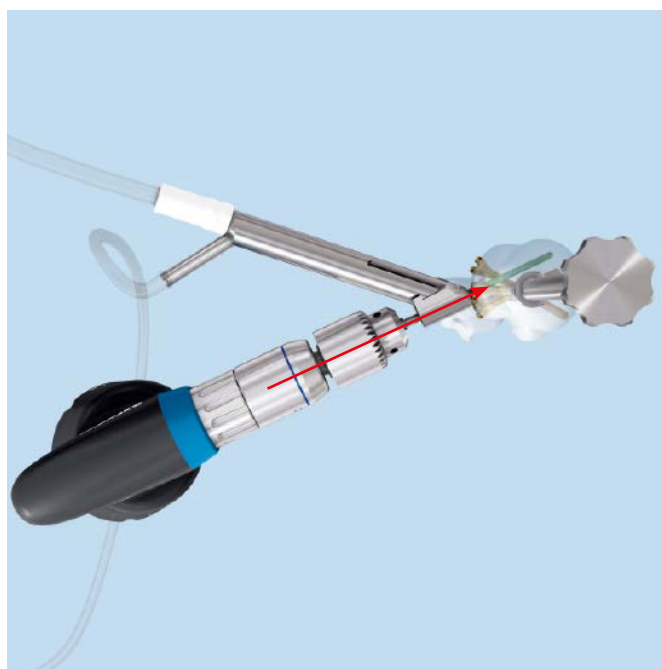
Position the drill suction device on the relevant screw.

Insert the drill bit into the drill sleeve, start up the drill and then start the drilling process.

Carefully drill co-axially to the axis of the 3.5 mm locking screw until the screw head is completely removed.

**Precaution:** Be careful to maintain the drilling direction coaxially to the 3.5 mm locking screw. Avoid drilling into the direction of the MultiLoc Screw.

Once the head of the 3.5 mm locking screw has disengaged with the MultiLoc Screw, remove the MultiLoc Screw with the technique described in step 3. Extract the shaft of the 3.5 mm locking screw with the technique for removal of broken screws described in the Screw Removal Set.



# Implants

## Titanium MultiLoc Humeral Nails, sterile

Straight, cannulated nails with right and left designs

### Material

Titanium-6% aluminium-7% niobium alloy

### Diameters

MultiLoc Proximal Humeral Nail:

- 8.0 mm (proximal diameter 9.5 mm)
- 9.5 mm (proximal diameter 11.0 mm)

MultiLoc Humeral Nail

- 7.0 mm (proximal diameter 9.5 mm)
- 8.5 mm (proximal diameter 9.5 mm)

### Color

Blue

### Cross section

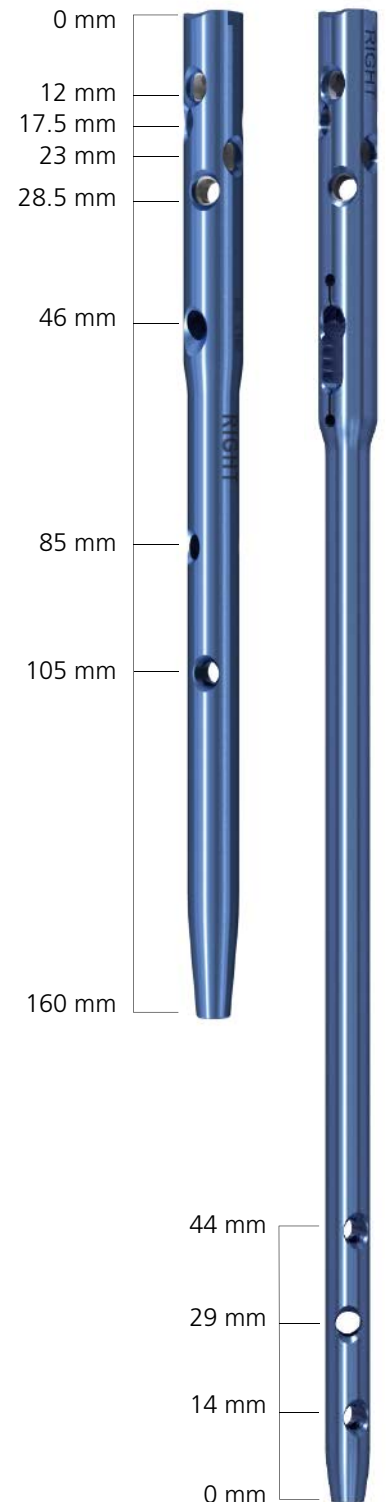
Round

MultiLoc Proximal Humeral Nails, sterile

Length	8.0 mm	8.0 mm	9.5 mm	9.5 mm
(mm)	right	left	right	left
160	04.016.034S	04.016.035S	04.016.038S	04.016.039S

MultiLoc Humeral Nails, sterile

Length	7.0 mm	7.0 mm	8.5 mm	8.5 mm
(mm)	right	left	right	left
180	04.016.180S	04.017.180S	04.018.180S	04.019.180S
195	04.016.195S	04.017.195S	04.018.195S	04.019.195S
210	04.016.210S	04.017.210S	04.018.210S	04.019.210S
225	04.016.225S	04.017.225S	04.018.225S	04.019.225S
240	04.016.240S	04.017.240S	04.018.240S	04.019.240S
255	04.016.255S	04.017.255S	04.018.255S	04.019.255S
270	04.016.270S	04.017.270S	04.018.270S	04.019.270S
285	04.016.285S	04.017.285S	04.018.285S	04.019.285S
300	04.016.300S	04.017.300S	04.018.300S	04.019.300S
315	04.016.315S	04.017.315S	04.018.315S	04.019.315S



4.5 mm Titanium MultiLoc Screws<sup>◊</sup>

Material

Titanium-6% aluminium-7% niobium alloy

Drill

3.8 mm

Color

Gold

Dimensions

- 20 mm to 60 mm lengths, in 2 mm increments
- Outer diameter: 4.5 mm
- Core diameter: 3.9 mm
- MultiLoc recess
- Fully threaded
- Blunt screw tip
- Self-cutting, countersinkable screwhead with suture holes

	Length (mm)		Length (mm)
04.019.020	20	04.019.042	42
04.019.022	22	04.019.044	44
04.019.024	24	04.019.046	46
04.019.026	26	04.019.048	48
04.019.028	28	04.019.050	50
04.019.030	30	04.019.052	52
04.019.032	32	04.019.054	54
04.019.034	34	04.019.056	56
04.019.036	36	04.019.058	58
04.019.038	38	04.019.060	60
04.019.040	40		



<sup>◊</sup>Available nonsterile or sterile-packed. Add “S” to product number for sterile product.

### 3.5 mm Titanium Locking Screws<sup>◇</sup>, with T15 StarDrive Recess



#### Material

Titanium-6% aluminium-7% niobium alloy

#### Drill

2.8 mm

#### Color

Green

#### Dimensions

- 26 mm to 52 mm lengths
- Outer diameter: 3.5 mm
- Core diameter: 2.9 mm
- T15 StarDrive Recess
- Fully threaded
- Self-tapping

	Length (mm)		Length (mm)
412.109	26	412.117	40
412.110	28	412.118	42
412.111	30	412.134	44
412.112	32	412.136	46
412.113	34	412.120	48
412.115	36	412.121	50
412.116	38	412.122	52

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

4.0 mm Titanium Locking Screws<sup>◊</sup>, with T25 StarDrive Recess



Material

Titanium-6% aluminium-7% niobium alloy

Drill

3.2 mm

Color

Blue

Dimensions

- 18 mm to 70 mm lengths, in 2 mm increments
- Outer diameter: 4.0 mm
- Core diameter: 3.3 mm
- T25 StarDrive Recess
- Fully threaded
- Self-tapping

	Length (mm)		Length (mm)
04.005.408	18	04.005.438	48
04.005.410	20	04.005.440	50
04.005.412	22	04.005.442	52
04.005.414	24	04.005.444	54
04.005.416	26	04.005.446	56
04.005.418	28	04.005.448	58
04.005.420	30	04.005.450	60
04.005.422	32	04.005.452	62
04.005.424	34	04.005.454	64
04.005.426	36	04.005.456	66
04.005.428	38	04.005.458	68
04.005.430	40	04.005.460	70
04.005.432	42		
04.005.434	44		
04.005.436	46		

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

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## Titanium MultiLoc End Caps, sterile

### Material

Titanium-6% aluminium-7% niobium alloy

### Color

Gray



### 0 mm extension

- Protects nail threads from tissue ingrowth
- Diameter 6.0 mm
- StarDrive T25 Recess

### 2 mm, 5 mm, 10 mm, or 15 mm extension

- Extends nail height if nail is overinserted
- Protects nail threads from tissue ingrowth
- Diameter: 9.5 mm
- T25 StarDrive Recess

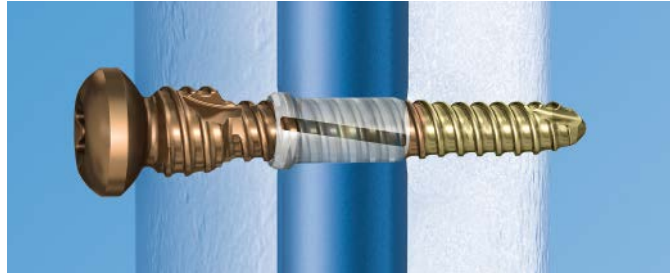
	Extension (mm)
04.019.000S	0
04.019.002S	2
04.019.005S	5
04.019.010S	10
04.019.015S	15



# Angular Stable Locking System (ASLS) (optional)

## What is ASLS?

The Angular Stable Locking System (ASLS) provides the ability to create a fixed-angle construct to an intramedullary nail. Therefore, it combines the advantages of angular stability and a minimally invasive approach. ASLS together with an intramedullary nail form the principle of the Intramedullary Fixator.

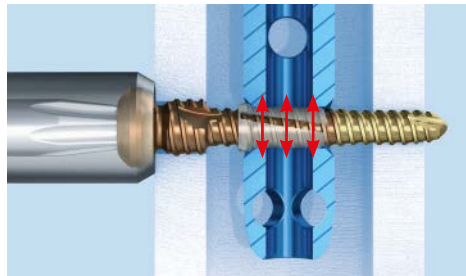
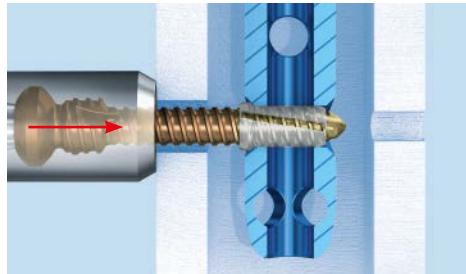


## How does ASLS work?

The system consists of a screw with three outer diameters and a resorbable sleeve.

The resorbable sleeve is placed on the screw tip which has the smallest screw diameter and is pushed into the locking hole of the nail.

During screw advancement, the resorbable sleeve is expanded by the larger middle diameter. Radial expansion of the sleeve and its fixation in the nail creates the angular stability.



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**ASLS screws**

- Titanium-6% aluminium-7% niobium alloy (TAN)
- Fully threaded shaft with 3 diameters
- Self-tapping, blunt tip
- Stardrive T25 Recess
- Sterile packed



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**ASLS sleeves**

- 70:30 poly (L-lactide-co-D,L-lactide)
- Bioresorbable, provides 80% decreased fracture site motion during first 12 weeks of healing
- Gradually degrades within 2 years (resorption rate varies per patient and implant site)
- Inner thread for secure fit to screw
- Expands in nail locking hole
- Sterile packed



For additional information please refer to the *DePuy Synthes ASLS Technique Guide*.

# Instruments

03.010.039 10.0 mm Cannulated Awl



03.010.060 3.2 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



03.010.064 8.0 mm/3.2 mm Drill Sleeve, 200 mm



03.010.069 3.2 mm Trocar



03.010.103 3.2 mm Three-Fluted Drill Bit, needle point, 145 mm, quick coupling



03.010.106 Direct Measuring Device, for locking screws to 100 mm, for IM nails



03.019.001 Radiographic Ruler for MultiLoc Humeral Nailing System



03.019.003 10.0 mm Hollow Drill Bit, for MultiLoc Humeral Nailing System



03.019.004 11.5 mm Hollow Drill Bit, for 9.5 mm MultiLoc Proximal Humeral Nail



03.019.005 Handle with Quick Coupling, 150 mm



03.019.006 Insertion Handle for MultiLoc Proximal Humeral Nail



03.019.007      Connecting Screw, cannulated, for MultiLoc Humeral Nail



03.019.008      Aiming Arm, lateral, for MultiLoc Proximal Humeral Nail



03.019.009      Aiming Arm, anterior, for MultiLoc Proximal Humeral Nail



03.019.010      Extraction Shaft for 4.5 mm Titanium MultiLoc Screws, quick coupling



03.019.011      Reduction Instrument for MultiLoc Humeral Nailing System, length 330 mm



03.019.012 Aiming Arm, for MultiLoc Humeral Nail



03.019.013 13.0 mm/10.0 mm Protection Sleeve, for 4.5 mm Titanium MultiLoc Screws, 150 mm



03.019.014 10.0 mm/3.8 mm Drill Sleeve, for 03.019.013



03.019.015 3.8 mm Trocar, for 03.019.014



03.019.016 3.8 mm Three-Fluted Drill Bit, quick coupling, calibrated, 270 mm



03.019.017 Depth Gauge, for MultiLoc Humeral Nailing System



03.019.018 6.5 mm Drill Bit, conical, with stop



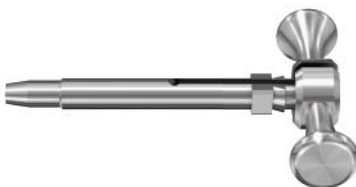
03.019.019 Centering Sleeve for 3.5 mm Titanium Locking Screws and 4.5 mm Titanium MultiLoc Screws



03.019.020 StarDrive Screwdriver, T25, with Coupling for 03.019.019, 330 mm



03.019.021 5.8 mm/2.8 mm Drill Sleeve, for 03.019.019



03.019.023 End Cap Ruler, for MultiLoc Humeral Nailing System



03.019.024 Extraction Screw, for MultiLoc Humeral Nailing System



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03.019.025      Screwdriver for 4.5 mm Titanium MultiLoc  
Screws, self-retaining, 330 mm




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03.019.026      2.5 mm Guide Rod with Stop, trocar tip,  
230 mm



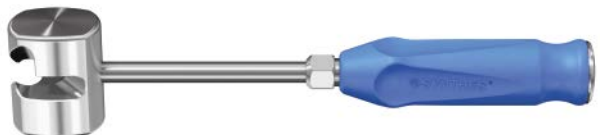

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03.019.027      Protection Sleeve for 03.019.003 and  
03.019.004




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03.019.028      Combined Hammer, 360 grams











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03.019.029      Depth Probe for MultiLoc Humeral  
Nailing System





03.019.038	Compression Screw for MultiLoc Humeral Nail	
03.019.040	2.5 mm Kirschner Wire Sleeve, for MultiLoc Humeral Nailing System	
292.16	1.6 mm Kirschner Wire, trocar point, 150 mm	
292.26	2.5 mm Kirschner Wire, trocar point, 285 mm	
310.284	2.8 mm Drill Bit, quick coupling, 165 mm	
314.116	StarDrive Screwdriver Shaft, T15, quick coupling	
319.97	Screw Forceps	

321.16 Combination Wrench, 11.0 mm width  
across flats



321.20 Ratchet Wrench, 11.0 mm width  
across flats



351.719 Extension Tube for Depth Gauge



393.105 Small Universal Chuck with T-Handle



511.773 Torque Limiting Attachment, 1.5 Nm,  
quick coupling



## Optional Instruments

03.010.060◇	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration	
03.010.100◇	3.2 mm Three-Fluted Drill Bit, needle point, for use with Radiolucent Drive, quick coupling, 145 mm	
03.010.103◇	3.2 mm Three-Fluted Drill Bit, needle point, quick coupling, 145 mm	
03.010.093	Reaming Rod Push Rod with Ball Handle	
03.019.003◇	10.0 mm Hollow Drill Bit for MultiLoc Humeral Nailing System	
03.019.004◇	11.5 mm Hollow Drill Bit for 9.5 mm MultiLoc Proximal Humeral Nail	
03.019.016◇	3.8 mm Three-Fluted Drill Bit, quick coupling, calibrated, 270 mm, for 03.019.014	

◇ Available nonsterile or sterile-packed. Add S to catalog number for sterile product

03.019.018◇ 6.5 mm Drill Bit, conical, with stop



03.019.026◇ 2.5 mm Guide Rod with Stop, trocar tip, 230 mm, for Hollow Drill Bit



03.019.030 Aiming Arm Knob for MultiLoc Humeral Nailing System, for 03.019.008 and 03.010.405



03.019.031 Aiming Arm Knob for MultiLoc Humeral Nailing System, for 03.019.009



310.288 2.8 mm Drill Bit, 165 mm, quick coupling



351.709S 2.5 mm Reaming Rod with ball tip, 650 mm, sterile



◇ Available nonsterile or sterile-packed. Add S to catalog number for sterile product

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397.705 Handle, quick coupling



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511.770 Torque Limiting Attachment, 1.5 Nm



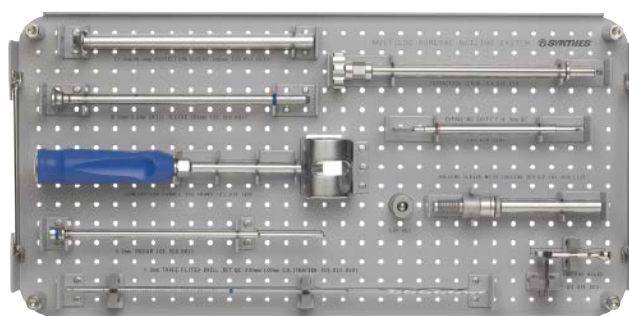
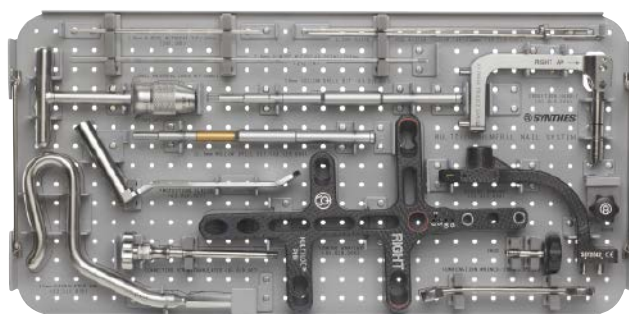
# MultiLoc Proximal Humeral Nail Instrument Set (01.019.004)

## Graphic Case

60.019.001 Graphic Case for MultiLoc Proximal Humeral Nail Instrument Set

## Instruments

- 03.010.039 10.0 mm Cannulated Awl
- 03.010.060 3.2 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
- 03.010.064 8.0 mm/3.2 mm Drill Sleeve, 200 mm
- 03.010.069 3.2 mm Trocar
- 03.010.112 Holding Sleeve with Locking Device
- 03.019.003 10.0 mm Hollow Drill Bit, for MultiLoc Humeral Nailing System
- 03.019.004 11.5 mm Hollow Drill Bit, for 9.5 MultiLoc Proximal Humeral Nail
- 03.019.005 Handle with quick coupling, 150 mm
- 03.019.006 Insertion Handle for MultiLoc Proximal Humeral Nail
- 03.019.007 Connecting Screw, Cannulated, for MultiLoc Humeral Nail
- 03.019.008 Aiming Arm, Lateral, for MultiLoc Proximal Humeral Nail
- 03.019.009 Aiming Arm, Anterior, for MultiLoc Proximal Humeral Nail
- 03.019.010 Extraction Shaft for 4.5 mm Titanium MultiLoc Screws, quick coupling
- 03.019.013 13.0 mm/10.0 mm Protection Sleeve, for 4.5 mm Titanium MultiLoc Screws, 150 mm, 3 ea.
- 03.019.014 10.0 mm/3.8 mm Drill Sleeve, for 03.019.013, 3 ea.
- 03.019.015 3.8 mm Trocar, for 03.019.014, 2 ea.
- 03.019.016 3.8 mm Three-Fluted Drill Bit, quick coupling, calibrated, 270 mm, 2 ea.
- 03.019.017 Depth Gauge for MultiLoc Humeral Nail



Note: For additional information, please refer to package insert.

For detailed cleaning and sterilization instructions, please refer to [www.synthes.com/cleaning-sterilization](http://www.synthes.com/cleaning-sterilization) or sterilization instructions, if provided.

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03.019.018	6.5 mm Drill Bit, conical, with stop
03.019.019	Centering Sleeve for 3.5 mm Locking Screws and 4.5 mm Titanium MultiLoc Screws, 3 ea.
03.019.020	StarDrive Screwdriver, T25, with coupling for 03.019.019, length 330 mm
03.019.021	5.8 mm/2.8 mm Drill Sleeve, for 03.019.019, 3 ea.
03.019.023	End Cap Ruler for MultiLoc Humeral Nailing System
03.019.024	Extraction Screw for MultiLoc Humeral Nailing System
03.019.025	Screwdriver for 4.5 mm Titanium MultiLoc Screws, self-retaining, 330 mm
03.019.026	2.5 mm Guide Rod with Stop, Trocar Tip, 230 mm length, 2 ea.
03.019.027	Protection Sleeve, for 03.019.003 and 03.019.004
03.019.028	Combined Hammer, 360 grams
03.019.029	Depth Probe for MultiLoc Humeral Nail System
292.16	1.6 mm Kirschner Wire, 150 mm, trocar point
292.26	2.5 mm Kirschner Wire, 285 mm, trocar point
310.284	2.8 mm Drill Bit, quick coupling, 165 mm, 2 ea.
314.116	StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling
319.97	Screw Forceps
321.16	Combination Wrench, 11.0 mm width across flats
393.105	Small Universal Chuck with T-Handle
511.773	Torque Limiting Attachment, 1.5 Nm, quick coupling

# MultiLoc Humeral Nail (Long) Instrument Set (01.019.007)

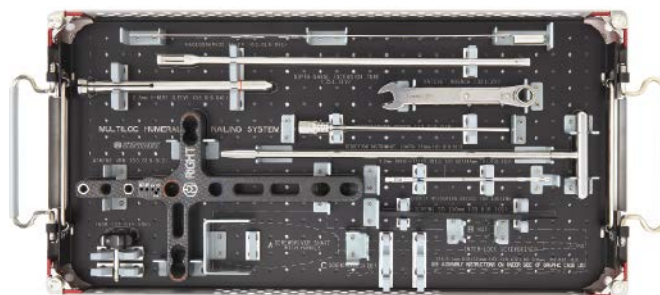
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## Graphic Case

60.019.009 Graphic Case for MultiLoc Humeral Nail (Long) Instrument Set

## Instruments

- 03.010.103 3.2 mm Three Fluted Drill Bit, quick coupling, needle point, 145 mm
- 03.010.106 Direct Measuring Device for locking screws to 100 mm, for IM nails
- 03.019.001 Radiographic Ruler for MultiLoc Humeral Nailing System
- 03.019.011 Reduction Instrument for MultiLoc Humeral Nailing System, length 330 mm
- 03.019.012 Aiming Arm for MultiLoc Humeral Nail
- 03.019.038 Compression Screw for MultiLoc Humeral Nail
- 03.019.040 2.5 mm K-wire sleeve for MultiLoc Humeral Nailing System
- 321.20 Ratchet Wrench, 11 mm width across flats
- 351.709S 2.5 mm Reaming Rod with ball tip, 650 mm, sterile
- 351.719 Extension Tube for Depth Gauge

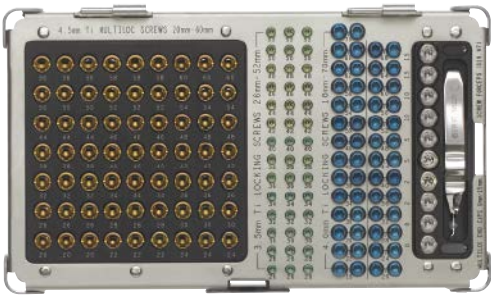




# MultiLoc Humeral Nail Implant Set (01.019.005)

## Screw Rack

60.019.004 Screw Rack for MultiLoc Humeral Nailing System



## Implants

4.0 mm Titanium Locking Screw, with T25 StarDrive Recess, for IM Nails, sterile, 2 ea.

	Length (mm)		Length (mm)
04.005.408S	18	04.005.436S	46
04.005.410S	20	04.005.438S	48
04.005.412S	22	04.005.440S	50
04.005.414S	24	04.005.442S	52
04.005.416S	26	04.005.444S	54
04.005.418S	28	04.005.446S	56
04.005.420S	30	04.005.448S	58
04.005.422S	32	04.005.450S	60
04.005.424S	34	04.005.452S	62
04.005.426S	36	04.005.454S	64
04.005.428S	38	04.005.456S	66
04.005.430S	40	04.005.458S	68
04.005.432S	42	04.005.460S	70
04.005.434S	44		

4.5 mm Titanium MultiLoc Screw, 3 ea.

	Length (mm)		Length (mm)
04.019.020	20	04.019.042	42
04.019.022	22	04.019.044	44
04.019.024	24	04.019.046	46
04.019.026	26	04.019.048	48
04.019.028	28	04.019.050	50
04.019.030	30	04.019.052	52
04.019.032	32	04.019.054	54
04.019.034	34	04.019.056	56
04.019.036	36	04.019.058	58
04.019.038	38	04.019.060	60
04.019.040	40		

3.5 mm Titanium Locking Screw, self-tapping, with StarDrive  
Recess, sterile, 2 ea.

	Length (mm)		Length (mm)
412.109S	26	412.118S	42
412.110S	28	412.134S	44
412.111S	30	412.136S	46
412.112S	32	412.120S	48
412.113S	34	412.121S	50
412.115S	36	412.122S	52
412.116S	38		
412.117S	40		

Titanium MultiLoc End Cap, sterile, 2 ea.

04.019.000S	0 mm extension
04.019.002S	2 mm extension
04.019.005S	5 mm extension
04.019.010S	10 mm extension
04.019.015S	15 mm extension

MultiLoc Proximal Humeral Nails, sterile

Length (mm)	8.0 mm	8.0 mm	9.5 mm	9.5 mm
	right	left	right	left
160	04.016.034S	04.016.035S	04.016.038S	04.016.039S

MultiLoc Humeral Nails, sterile

Length (mm)	7.0 mm	7.0 mm	8.5 mm	8.5 mm
	right	left	right	left
180	04.016.180S	04.017.180S	04.018.180S	04.019.180S
195	04.016.195S	04.017.195S	04.018.195S	04.019.195S
210	04.016.210S	04.017.210S	04.018.210S	04.019.210S
225	04.016.225S	04.017.225S	04.018.225S	04.019.225S
240	04.016.240S	04.017.240S	04.018.240S	04.019.240S
255	04.016.255S	04.017.255S	04.018.255S	04.019.255S
270	04.016.270S	04.017.270S	04.018.270S	04.019.270S
285	04.016.285S	04.017.285S	04.018.285S	04.019.285S
300	04.016.300S	04.017.300S	04.018.300S	04.019.300S
315	04.016.315S	04.017.315S	04.018.315S	04.019.315S

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