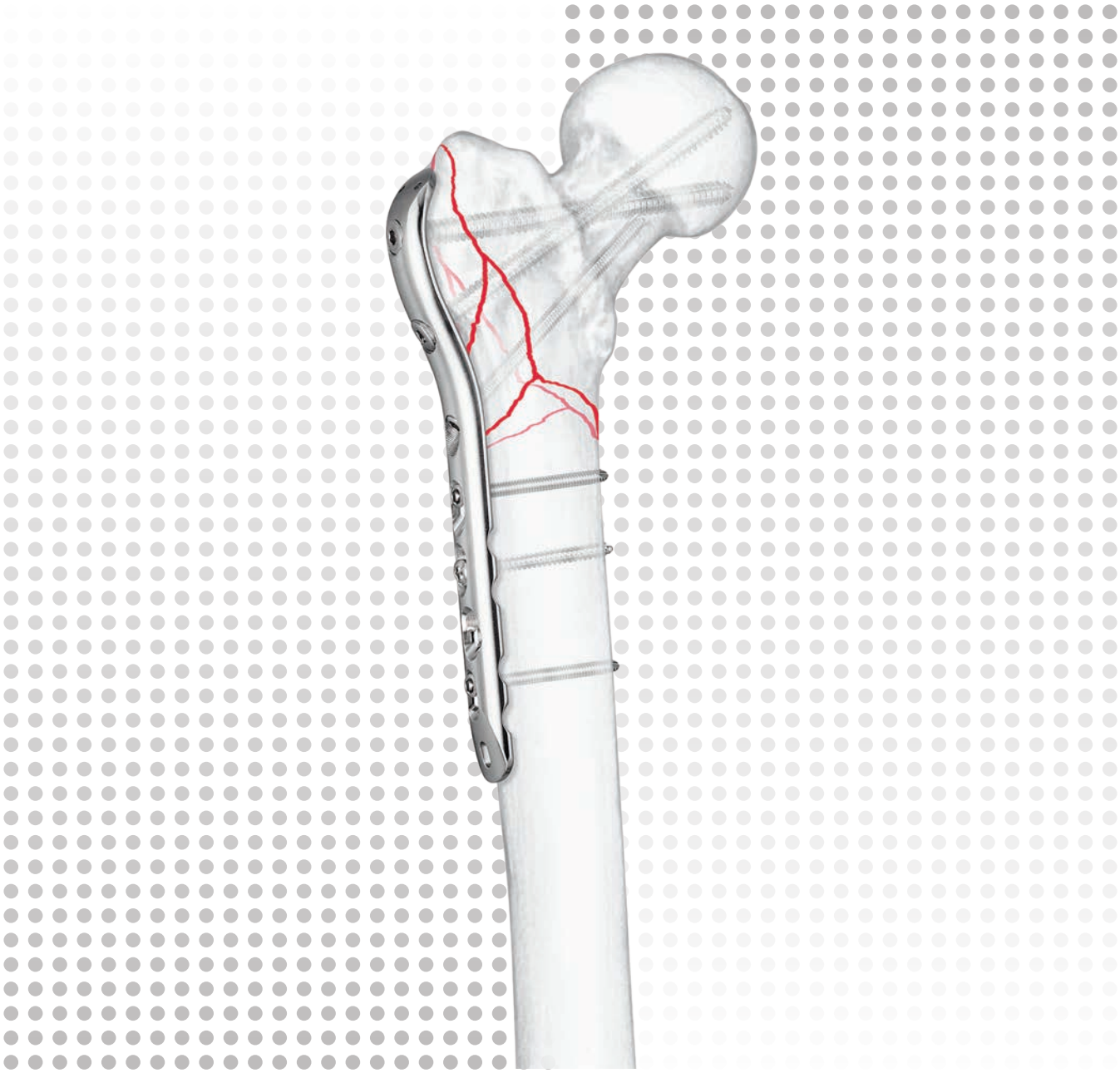
LCP™ Proximal Femoral Plate 4.5/5.0

Part of the LCP Periarticular Plating System

Surgical Technique



AO approved by AO Technical Commission

DePuy Synthes
THE ORTHOPAEDICS COMPANY OF Johnson & Johnson

Image intensifier control

This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

Processing, Reprocessing, Care and Maintenance
For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:
http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance
For general information about reprocessing, care and maintenance of DePuy Synthes reusable devices, instrument trays and cases, as well as processing of DePuy Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:
http://emea.depuysynthes.com/hcp/reprocessing-care-maintenance

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Overview

The DePuy Synthes LCP™ Proximal Femoral Plate 4.5/5.0 is part of the LCP Periarticular Plating System, which merges locking screw technology with conventional plating techniques.

The LCP Periarticular Plating System is capable of addressing fractures of the proximal femur with the LCP Proximal Femoral Plate 4.5/5.0 or the LCP Proximal Femoral Hook Plate 4.5/5.0.

The LCP Periarticular Plating System also contains the following systems:

- LCP Condylar Plate 4.5/5.0
- LCP Proximal Tibia Plate 4.5/5.0
- LCP Medial Proximal Tibia Plate 4.5/5.0

Locking Compression Plate

The Locking Compression Plate (LCP) has combi-holes in the plate shaft that combine a dynamic compression unit (DCU) hole with a locking screw hole.

■ Note:

More detailed information on conventional and locked plating principles can be found in the DePuy Synthes Locking Compression Plate (LCP) Technique Guide.

LCP Proximal Femoral Plate

The LCP Proximal Femoral Plate is a limited-contact stainless steel plate. The proximal portion of the plate is contoured for the proximal femur. Proximal femoral fixation in osteopenic bone is achieved by the screw angulation and the locking interface with the plate. The remaining screw holes in the plate shaft are combi-holes. This provides plate-to-bone apposition and axial compression or angular stability.

- Anatomically contoured to approximate the lateral aspect of the proximal femur
- Plates are for left or right femur to accommodate average femoral neck anteversion
- Plate lengths allow spanning of the entire diaphysis in segmental fracture patterns
- Use of locking screws provides an angular stable construct
- Accepts the articulated tension device to tension the plate and create a load sharing construct
- Available in 316L stainless steel
- The three proximal screw holes are at the following angles to the plate shaft:
  - First proximal hole (7.3 mm): 95°
  - Second proximal hole (7.3 mm): 120°
  - Third proximal hole (5.0 mm): 135°

Intended Use, Indications and Contraindications can be found in the corresponding system Instructions For Use.

The AO Principles of Fracture Management

Mission

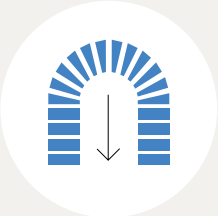
The AO's mission is promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

AO Principles[1,2]

1.

Fracture reduction and fixation to restore anatomical relationships.

2.



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

3.

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

4.

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

[1] Müller ME, Allgöwer M, Schneider R, Willenegger H. Manual of Internal Fixation. 3rd ed. Berlin, Heidelberg New York: Springer 1991.
[2] Buckley RE, Moran CG, Apivatthakakul T. AO Principles of Fracture Management: 3rd ed. Vol. 1: Principles, Vol. 2: Specific fractures. Thieme; 2017.

Implantation

1. Preparation

Required sets
LCP Proximal Femoral Plate Set 4.5/5.0 (stainless steel)
Periarticular LCP Plating System Instrument Set
Cannulated Locking and Cannulated Conical Screw
∅ 5.0 and 7.3 mm Set
LCP Large Fragment Instrument Set
LCP Large Fragment Screw Set

Complete the preoperative radiographic assessment and prepare the preoperative plan. AP and lateral radiographs of the entire femur are necessary for complete evaluation. Traction radiographs and views of the contralateral femur are useful adjuncts in the planning process.

When considering use of the LCP Proximal Femoral Plate, identify proper placement of the three proximal screws.

Determine plate length and approximate screw lengths and instruments to be used. Position the patient supine on a radiolucent operating table, or a fracture extension table for lower energy fracture settings. Fluoroscopic visualization of the femur in both AP and lateral views must be verified prior to patient draping.

2. Reduce fracture

Reduce the fracture using a fracture table, clamps, Schanz screws, or other conventional reduction techniques. Alternatively, provisional indirect fracture reduction may be facilitated by attaching the LCP Proximal Femoral Plate to the proximal segment with appropriately oriented screws, and then to the diaphysis with plate holding forceps.

▲ Precaution:

The fracture has to be meticulously reduced in order to avoid implant failure.

3. Insert guide wires and establish screw trajectories

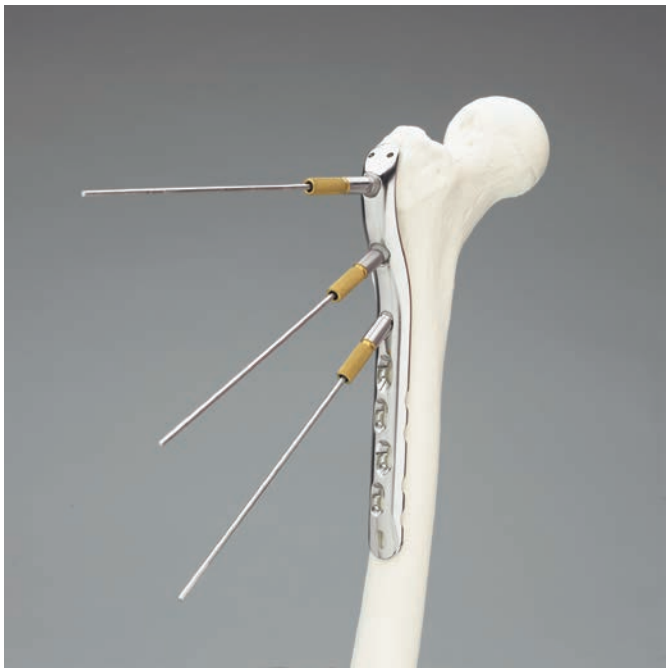
Instruments	
324.175	Wire Guide 7.3, for Guide Wire ∅ 2.5 mm
324.174	Wire Guide 5.0, for Guide Wire ∅ 2.5 mm
310.243	Guide Wire ∅ 2.5 mm with drill tip

Prior to placing the plate on the bone, thread the wire guides into the plate holes for each of the three proximal locking screws. Use the wire guide 7.3 in the two proximal screw holes, and a wire guide 5.0 in the third locking screw hole. The wire guides can also be used as a manipulation aid for positioning the plate on the proximal femur.

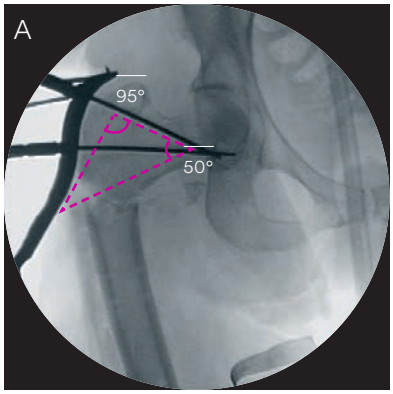
Using fluoroscopic image control (AP and lateral), insert a guide wire through the wire guide in each of the three proximal locking holes. For proper screw measurement, guide wires should reach but not penetrate subchondral bone.

■ Note:

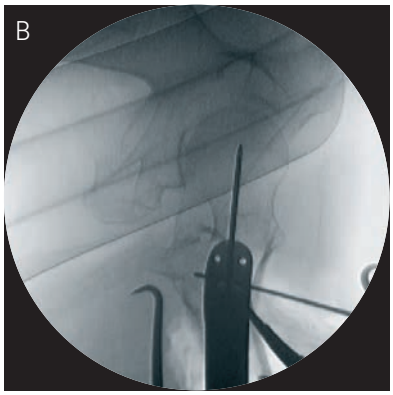
It is more important to properly place guide wires in the proximal femur (considering the desired screw positions) than it is to precisely match the contour of the plate to the anatomy of the femur. The ability to lock the screws to the plate obviates the need for precise plate contouring and compressing the plate to the bone.

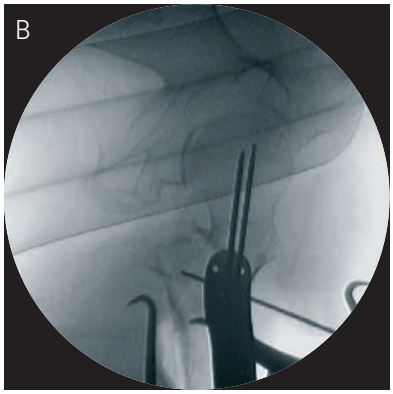


A. Placement of the proximal guide wire in the AP view is into the midportion of the inferomedial quadrant of the femoral head along a path subtending a 50° angle relative to the calcar femoralis. Guide wire placement in this manner will facilitate placement of the proximal locking screw at a 95° angle to the femoral shaft.



B. The proximal wire is ideally placed slightly posterior to central in the lateral view. This accommodates an anteverted position for the second guide wire and screw. Accurate positioning of the proximal guide wire (and ultimately the locking screw) assures frontal plane alignment.





■ Note:

Before a guide wire is inserted into the second wire guide, verify correct sagittal plane alignment of the plate on the proximal femur. This usually requires both visual and fluoroscopic assessment and reduces the risk of an extension (apex anterior) deformity when the plate is attached to the diaphysis.

When this alignment is satisfactory, insert the guide wires through the next two (distal) wire guides, maintaining biplanar fluoroscopic control. In some patterns, insertion of the third guide wire may have to be deferred until final reduction (and compression, where possible) has been achieved.

4. Insert proximal 7.3 mm screw

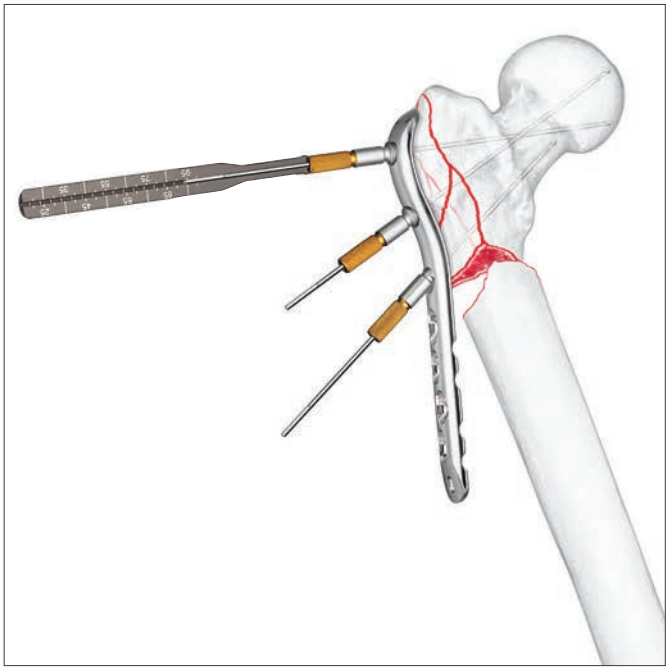
Instruments	
319.701	Measuring Device
314.050	Screwdriver, hexagonal, cannulated
For predrilling dense bone	
310.632	Drill Bit ∅ 5.0 mm, cannulated
310.634	Drill Bit ∅ 4.3 mm, cannulated

Using the measuring device measure for screw length over the guide wire. Select the appropriate length 7.3 mm cannulated locking screw. Use the screwdriver to remove the wire guide.

■ Note:

The self-drilling, self-tapping flutes of the 7.3 mm and 5.0 mm screws make predrilling and pretapping unnecessary in most cases. In dense bone, the lateral cortex can be predrilled, if necessary.

- Use the drill bit ∅ 5.0 mm for 7.3 mm screws.
- Use the drill bit ∅ 4.3 mm for 5.0 mm screws.



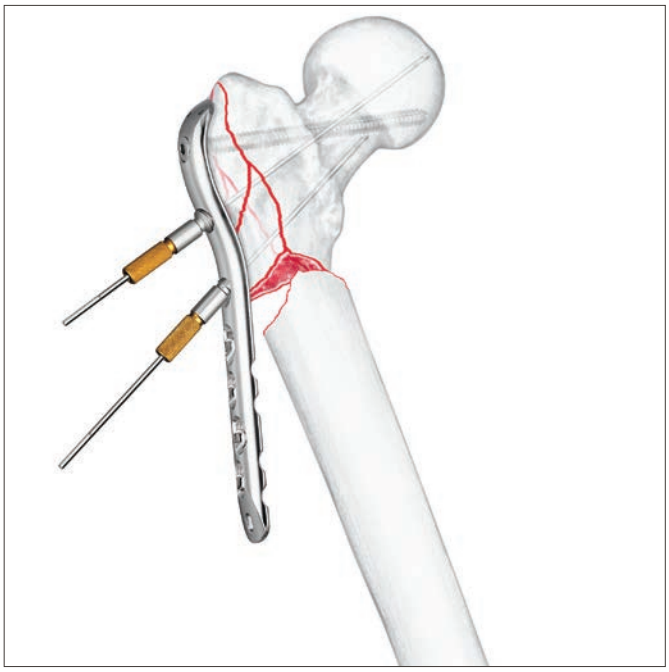
Insert the screw, using fluoroscopy, with the screwdriver. This screw, as with all locking screws not protected by a torque limiting attachment, may be inserted using power. However, final seating and tightening must be done manually. Once the screw has been locked to the plate, the guide wire may be removed.

▲ Precautions:

- Do not engage the screw head with the plate hole while inserting under power. Screw engagement and final locking must be done manually with the torque limiter.
- Recheck each locking screw prior to closing to verify that the screws are securely locked to the plate. Screw heads must be flush with the plate in the locked position before they can be considered fully seated.
- Angular stability cannot be achieved with cannulated conical screws. It is always recommended to replace conical screws with locking screws to ensure angular stability.

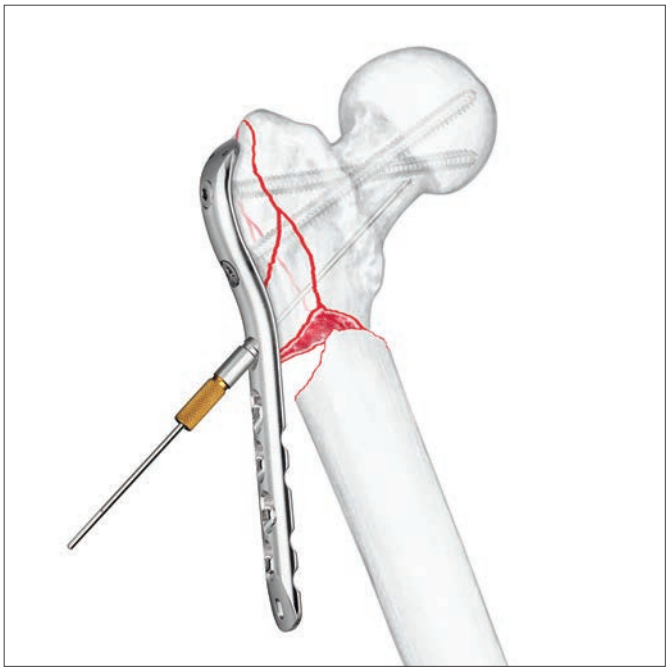
■ Note:

In some cases it may be necessary to pull the plate to the bone; if so, use a fully threaded 7.3 mm cannulated conical screw in the proximal screw hole. However, use caution, to avoid changing the alignment of the guide wire with the conical screw. If malalignment occurs, it may preclude final exchange of the conical screw for a locking screw, and thereby weaken the overall strength of the plate construct.



5. Insert second 7.3 mm screw

Insert the second 7.3 mm screw using the same technique as described in step 4.



6. Approximate the plate to the femoral diaphysis

Instrument	
321.120	Tension Device, articulated, span 20 mm

Secure the plate to the lateral femoral shaft with bone holding forceps, adjusting horizontal plane alignment (rotation) as appropriate. Length restoration and fracture reduction can be facilitated by a number of indirect means, including a fracture table, the Articulated Tension Device (ATD), the large distractor, the large distractor/compressor, or a large external fixator. Judicious, soft tissue preserving, direct reduction techniques with clamps may also be appropriate in some cases.

When the fracture pattern permits, a tensioning device should be applied to the end of the plate to tension the plate and compress the fracture.

■ Note:

Using the ATD to realign the fragments, tension the plate, and compress the fracture creates a load-sharing construct. Alternatively, although less desirable, the plate can be used as a bridging construct in patterns with segmental comminution where plate tensioning cannot be accomplished.

7. Insert 4.5 mm cortex screws

Instruments	
310.310	Drill Bit ∅ 3.2 mm
323.460	Universal Drill Guide 4.5/3.2
319.100	Depth Gauge
314.270	Screwdriver, hexagonal, large

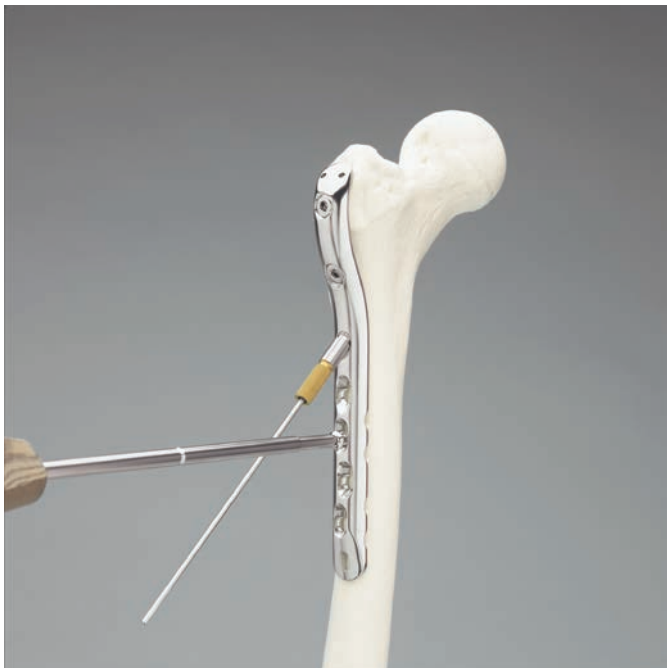
Use the drill bit through the drill guide to predrill the bone. For the neutral position, press the drill guide down in the non-threaded hole. To obtain compression, place the drill guide at the end of the non-threaded hole away from the fracture (do not apply downward pressure on the spring-loaded tip.)

Notes:

- All 4.5 mm cortex screws must be inserted into the plate shaft before insertion of any locking screws in the plate shaft.
- For detailed instructions please consult the DePuy Synthes Locking Compression Plate (LCP) Technique Guide.

Measure for screw length using the depth gauge.

Select and insert the appropriate length 4.5 mm cortex screw using the screwdriver. Insert as many standard 4.5 mm cortex screws as necessary.



8. Insert 5.0 mm locking screws

Instruments	
323.042	LCP Drill Sleeve
310.430	LCP Drill Bit ∅ 4.3 mm
319.100	Depth Gauge
511.771	Torque Limiter, 4.0 Nm
314.119	Screwdriver Shaft Stardrive, T25, self-holding
314.150 or 314.152 or 324.052	Screwdriver Shaft, hexagonal Screwdriver Shaft, hexagonal, self-holding Torque-indicating Screwdriver, 4.0 Nm
397.705	Handle for Torque Limiter Nos. 511.770 and 511.771
311.431	Handle with Quick Coupling

Attach the drill sleeve to the threaded portion of a hole in the plate shaft.

Carefully drill the screw hole using the drill bit. Read the drilled depth directly from the laser mark on the drill bit or determine the screw length with the depth gauge.

Insert the appropriate length 5.0 mm locking screw with a power tool and the torque limiter or manually with a handle and the torque limiter. The screw has to be tightened manually. After one click, the recommended torque is reached.

▲ Precaution:

Do not engage the screw head with the plate hole while inserting under power. Screw engagement and final locking must be done manually with the torque limiter.

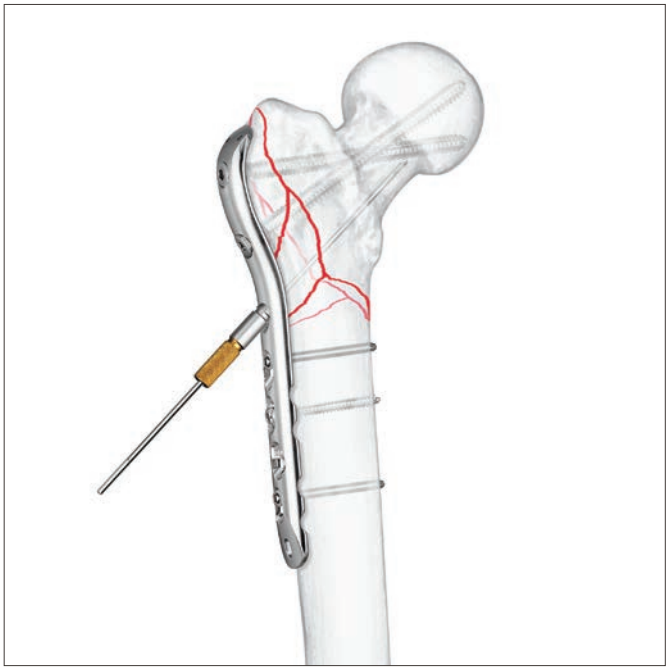
■ Notes:

- Use of the drill guide is required. It centers the drill bit in the threaded portion of the combi-hole and thus creates a screw trajectory that ensures that the screw engages properly in the plate.
- Holes for locking screws may be drilled unicortically or bicortically, depending on bone quality.
- For detailed instructions please consult the DePuy Synthes Locking Compression Plate (LCP) Technique Guide.

Repeat as necessary to insert additional locking screws.

▲ Precaution:

Recheck each locking screw before closing to verify that the screws are securely locked to the plate. Screw heads must be flush with the plate in the locked position before they can be considered fully seated.



9. Insert oblique 5.0 mm cannulated locking screw

Instruments	
319.701	Measuring Device
314.050	Screwdriver, hexagonal, cannulated

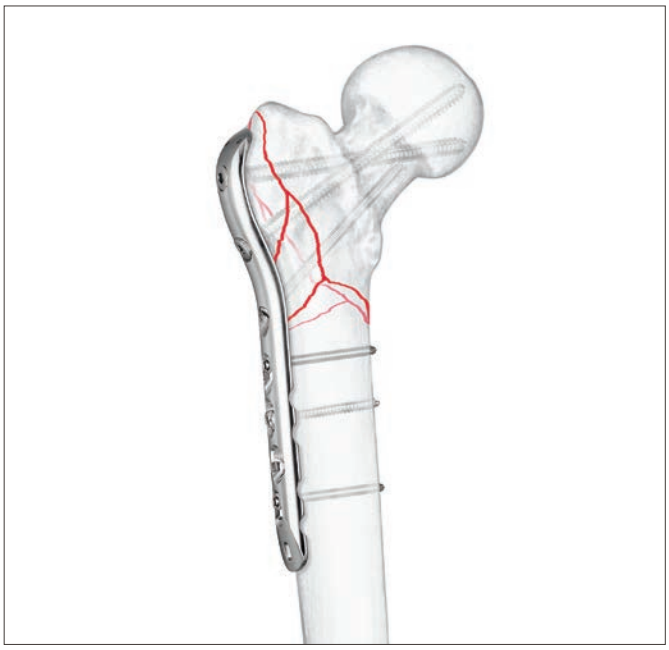
Using the wire guide and guide wire previously inserted at this hole location, measure for the screw length with the measuring device. The correct length measurement will place the screw at the tip of the guide wire.

Screw length considerations: The angled 5.0 mm cannulated locking screw is intended to converge with 7.3 mm screw to create a buttress. This convergence should occur when using a 5.0 mm cannulated locking screw that is 85 mm in length.

Remove the wire guide and insert the appropriate length screw over the guide wire and into the bone using the screwdriver. Locking screws may be inserted using power equipment. However, final seating and tightening must be done manually.

▲ Precautions:

- The need for an oblique 5.0 mm cannulated locking screw is fracture configuration dependent and should be determined during preoperative planning.
- Securely tighten all locking screws again prior to closing.



10. Implant Removal

In case the physician decides to remove the implants, implants can be removed by using general surgical instruments. In case of difficult removal circumstances, a Screw Extraction Set Handling Technique is available with corresponding instructions.

General Notes

Cleaning

Instrument	
319.461	Cleaning Stylet ∅ 2.5 mm, for Cannulated Instruments

Cleaning the cannulation in each instrument is imperative for proper function. Instruments should be cleared intra-operatively using the cleaning stylet to prevent accumulation of debris in the cannulation and potential binding of the instruments about the guide wire.

Preliminary plate shaft attachment

The Tension Device ∅ 4.0 mm (324.033) can be used to approximate the plate shaft to the diaphysis and counteract medial diaphyseal displacement.

Reduction and fixation

- If an extension table is used, careful traction should be applied to prevent the gastrocnemius muscle from pulling the distal fragment posteriorly or into hyperflexion. Posterior support of the distal fragment can assist reduction.
- Sagittal plane reduction may be facilitated using a Schanz screw as a "joystick" in the anterior cortex of the distal fragment. Insertion of a Schanz screw into the proximal fragment may also be helpful. Should it still be impossible to achieve fracture reduction, extend the incision to improve access.
- When using a radiolucent table, towel bumps can be used under the diaphyseal segment to help reduce the fracture in the lateral plane.
- Limb axis can be checked using the C-Arm and a cautery cord from the femoral head to the center of the ankle joint on an AP view. Use the C-Arm at the knee to check that the cord passes 10 mm medially to the center of the knee joint. Adjustment to varus-valgus reduction should be performed before locking screw placement in the malaligned fragment.
- Fractures not treated acutely should be placed in skeletal traction to maintain length until plate fixation can be performed.

LCP Proximal Femoral Plates 4.5/5.0

Stainless steel	Holes	Length (mm)	
242.802	2	139	right
242.804	4	175	right
242.806	6	211	right
242.808	8	247	right
242.810	10	283	right
242.812	12	319	right
242.814	14	355	right
242.816	16	391	right
242.102	2	139	left
242.104	4	175	left
242.106	6	211	left
242.108	8	247	left
242.110	10	283	left
242.112	12	319	left
242.114	14	355	left
242.116	16	391	left

All plates are available sterile packed. For sterile implants add suffix S to article number.

Screws

Cannulated Locking Screw ∅ 7.3 mm
(02.207.020–02.207.145)

Creates a locked, screw-plate construct
- Threaded conical head
- Fully threaded shaft
- Self-drilling, self-tapping tip

Cannulated Conical Screw ∅ 7.3 mm
(02.207.250–02.207.295)
Compresses the plate to the bone

- Smooth conical head
- Fully threaded shaft
- Self-drilling, self-tapping tip

Cannulated Conical Screw ∅ 7.3 mm
(02.207.450–02.207.545)
Compresses the plate to the bone

- Smooth conical head
- Partially threaded shaft
- Self-drilling, self-tapping tip

Cannulated Locking Screw ∅ 5.0 mm
(02.205.025–2.205.145)
Creates a locked, screw-plate construct

- Threaded conical head
- Fully threaded shaft
- Self-drilling, self-tapping tip

Cannulated Conical Screw ∅ 5.0 mm
(02.205.240–02.205.295)
Compresses the plate to the bone

- Smooth conical head
- Partially threaded shaft
- Self-drilling, self-tapping tip

Locking Screw ∅ 5.0 mm
(◉ 213.314–213.390–◉ 212.201–212.227)
Creates a locked, screw-plate construct

- Threaded conical head
- Fully threaded shaft
- Self-tapping tip

Cortex Screw ∅ 4.5 mm
(214.814–214.940)

- May be used in the DCU portion of the combi-holes in the plate shaft
- Compresses the plate to the bone

Screws are available non-sterile and sterile packed. For sterile screws add suffix S to article number.*

*Not all lengths may be available sterile

Drill and Wire Guides

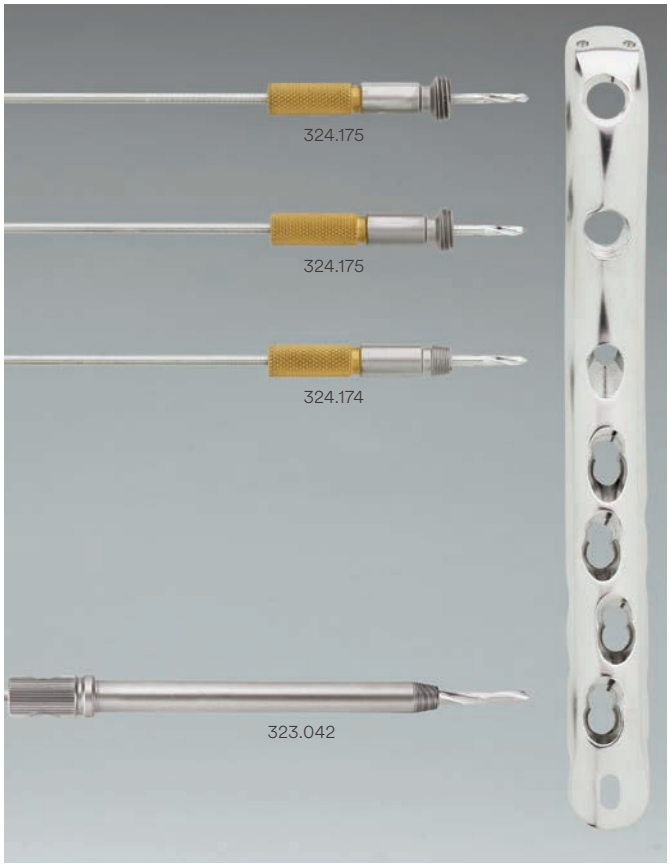
Drill guides for self-tapping screws

323.042	LCP Drill Sleeve 5.0, for Drill Bits ∅ 4.3 mm	
324.203*	Drill Guide ∅ 4.3 mm, percutaneous, with thread	

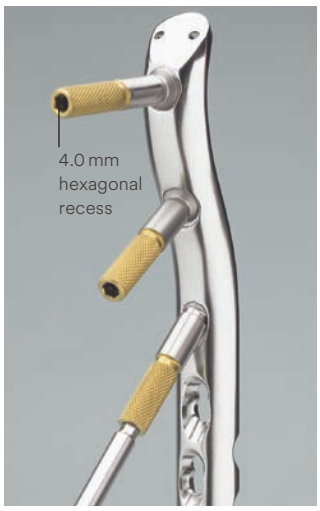
Wire guides for cannulated screws

324.174	Wire Guide 5.0, for Guide Wire ∅ 2.5 mm	
324.175	Wire Guide 7.3, for Guide Wire ∅ 2.5 mm	
324.215*	Wire Guide 5.0, percutaneous, for Guide Wire ∅ 2.5 mm	

* Found in the Percutaneous Instrument Set

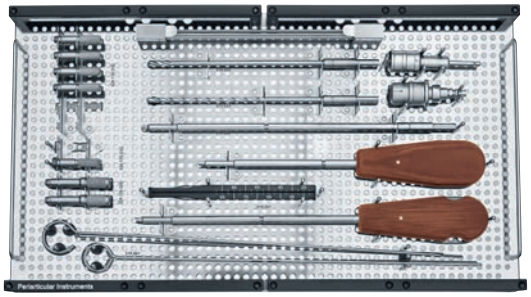


The hexagonal Screwdriver (313.930) and the cannulated hexagonal Screwdriver (314.050) for Cannulated Screws ∅ 6.5 and 7.3 mm can be used to facilitate insertion and removal of wire and drill guides.

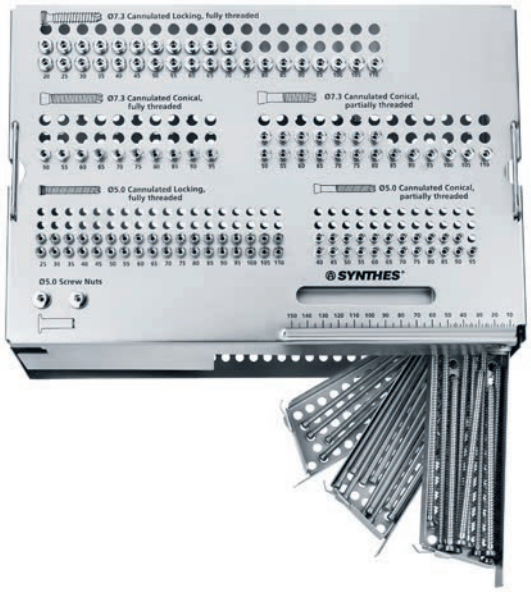


Sets

01.120.021	**Periarticular Instruments**
68.120.447	Vario Case
68.120.445	Insert



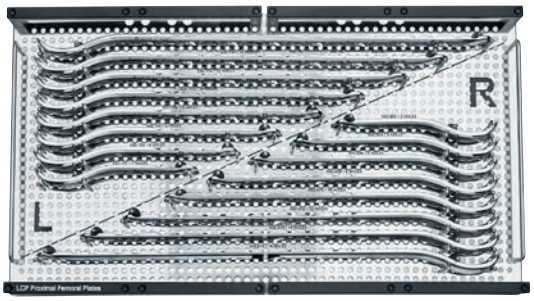
01.120.022	**Cannulated Conical and Cannulated Locking Screws ∅ 7.3 and 5.0 mm (stainless steel)**
68.120.450	Sterilizing Tray



Additionally required

– LCP Large Fragment Instrument Set
– LCP Large Fragment Screw Set

01.120.325	**LCP Proximal Femoral Plates 4.5/5.0**
68.120.332	Insert



MRI Information

Torque, Displacement and Image Artifacts according to ASTM F 2213, ASTM F 2052 and ASTM F2119

Non-clinical testing of worst case scenario in a 3 T MRI system did not reveal any relevant torque or displacement of the construct for an experimentally measured local spatial gradient of the magnetic field of 3.69 T/m. The largest image artifact extended approximately 169 mm from the construct when scanned using the Gradient Echo (GE). Testing was conducted on a 3 T MRI system.

Radio-Frequency-(RF-)induced heating according to ASTM F2182

Non-clinical electromagnetic and thermal testing of worst case scenario lead to peak temperature rise of 9.5 °C with an average temperature rise of 6.6 °C (1.5 T) and a peak temperature rise of 5.9 °C (3 T) under MRI Conditions using RF Coils (whole body averaged specific absorption rate [SAR] of 2 W/kg for 6 minutes [1.5 T] and for 15 minutes [3 T]).

▲ Precautions:

The above mentioned test relies on non-clinical testing. The actual temperature rise in the patient will depend on a variety of factors beyond the SAR and time of RF application. Thus, it is recommended to pay particular attention to the following points:

- It is recommended to thoroughly monitor patients undergoing MR scanning for perceived temperature and/or pain sensations.
- Patients with impaired thermoregulation or temperature sensation should be excluded from MR scanning procedures.
- Generally, it is recommended to use a MR system with low field strength in the presence of conductive implants. The employed specific absorption rate (SAR) should be reduced as far as possible.
- Using the ventilation system may further contribute to reduce temperature increase in the body.

Not all products are currently available in all markets.
This publication is not intended for distribution in the USA.
Intended use, Indications and Contraindications can be found in the corresponding system Instructions for Use.
All Surgical Techniques are available as PDF files at www.depuysynthes.com/ifu

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