Part of the DePuy Synthes Locking Compression Plate (LCP®) System

3.5 mm LCP® Anterolateral Distal Tibia Plates

Surgical Technique

DePuy Synthes

PART OF THE Johnson&Johnson FAMILY OF COMPANIES

Table of Contents

MR Information
The 3.5 mm LCP Anterolateral Distal Tibia Plates 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 3.5 mm LCP Anterolateral Distal Tibia Plates System in the MR environment is unknown. Scanning a patient who has this device may result in patient injury.

Image intensifier control

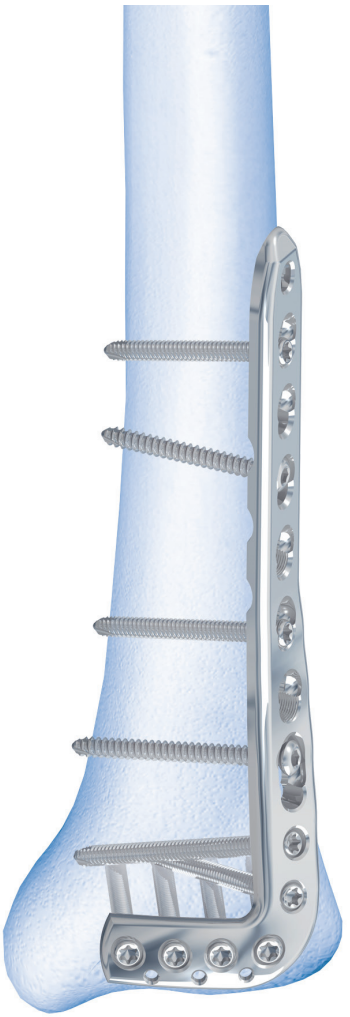
3.5 mm LCP Anterolateral Distal Tibia Plates

The 3.5 mm LCP® Anterolateral Distal Tibia Plate is part of the DePuy Synthes LCP System that merges locking screw technology with conventional plating techniques.

The plate is stainless steel and features a limited-contact shaft profile. The Combi holes in the LCP Plate shaft combine a dynamic compression unit (DCU) hole with a locking screw hole. Combi holes provide flexibility of axial compression and locking capability throughout the length of the plate shaft.

The head of the plate features four locking holes that accept 3.5 mm locking, 2.7 mm cortex, 3.5 mm cortex or 4.0 mm cancellous bone screws. The Combi holes in the plate shaft accept 3.5 mm locking, 3.5 mm cortex, and 4.0 mm cancellous bone screws; the screwheads are recessed in these holes to minimize screw prominence.

Fixation with the 3.5 mm LCP Anterolateral Distal Tibia Plate has many similarities to traditional plate fixation methods, with a few important improvements. Locking screws provide the ability to create a fixed-angle construct while using standard AO plating techniques. Locking capability is important for fixed-angle constructs in osteopenic bone or multifragmentary fractures where screw purchase is compromised. These screws do not rely on plate-to-bone compression to resist patient load, but function similarly to multiple small angled blade plates.



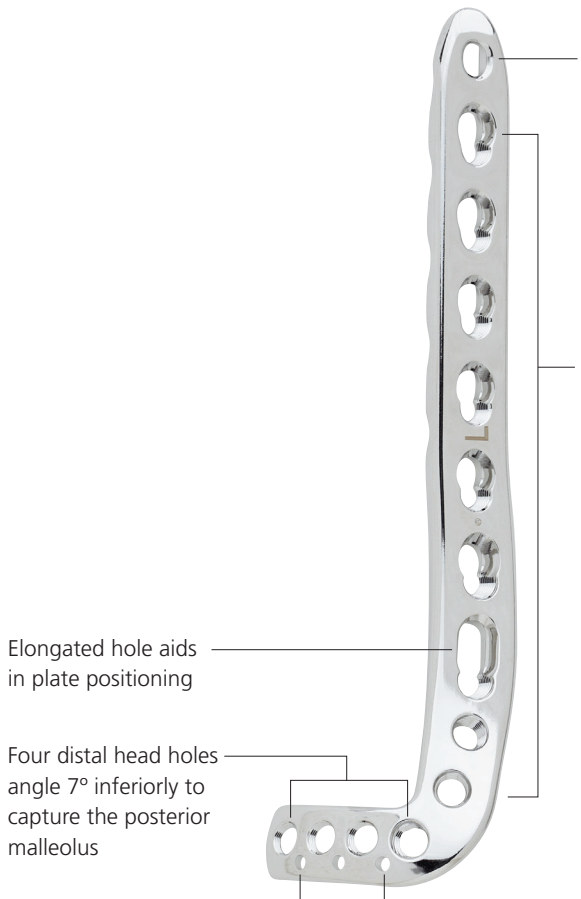
Note: For information on fixation principles using conventional and locked plating techniques, please refer to the *Small Fragment Locking Compression Plate (LCP) Technique Guide*.

Features

– Anatomically shaped
– Shaft holes accept 3.5 mm locking screws, 3.5 mm cortex screws and 4.0 mm cancellous screws
– Head holes accept 3.5 mm locking screws, 2.7 mm and 3.5 mm cortex screws and 4.0 mm cancellous screws
– 3.6 mm shaft thickness tapers to 2.0 mm distally
– 60° twist in shaft is contoured for the distal tibia anatomy
– Tapered tip for submuscular insertion
– 316L stainless steel or titanium alloy*

Benefits

– Distal locking screws provide support for the articular surface
– Targeted locking for Volkmann's triangle and the Chaput fragment
– The head of the plate is designed to provide a low-profile construct when using locking screws or 2.7 mm cortex screws
– DePuy Synthes LCP Plate technology (Combi holes)



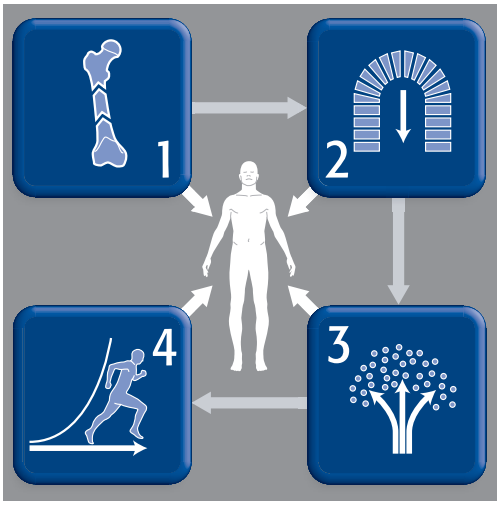
* Ti-6Al-7Nb

AO Principles

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.[1,2]

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.

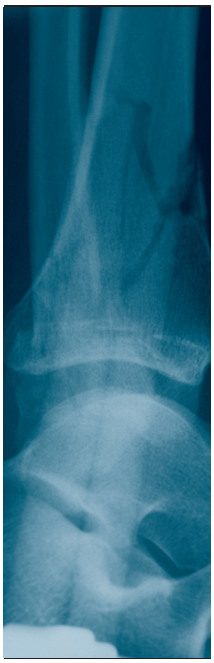
Indications

The 3.5 mm LCP Anterolateral Distal Tibia Plate is indicated for fractures, osteotomies and nonunions of the distal tibia, particularly in osteopenic bone.

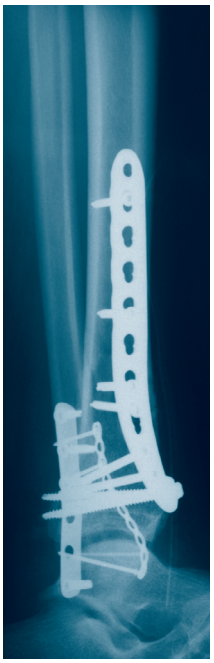
Clinical Cases

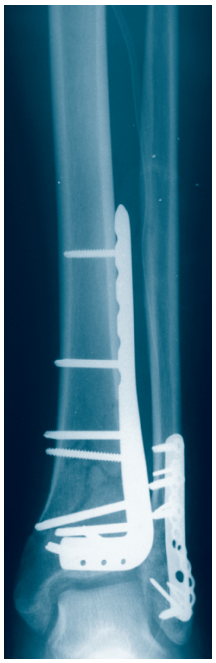
Case 1

50-year-old male, jumped from wall


Preoperative lateral

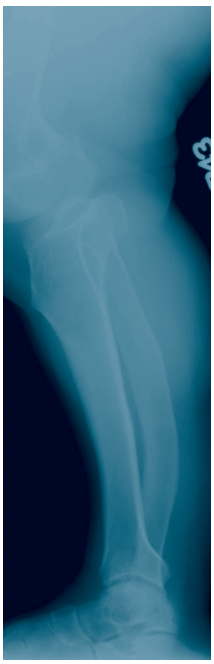

Preoperative AP


Postoperative lateral


Postoperative AP

Case 2

51-year-old female, corrective osteotomy


Preoperative lateral


Preoperative AP


Postoperative lateral


Postoperative AP

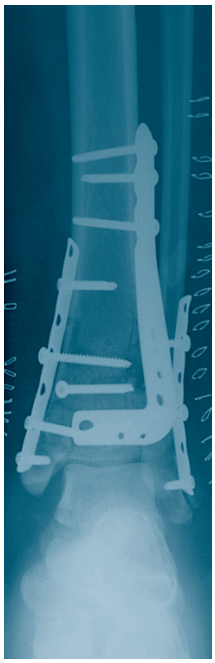
Case 3

33-year-old female, unrestrained MVA


Preoperative lateral


Preoperative AP


Postoperative lateral

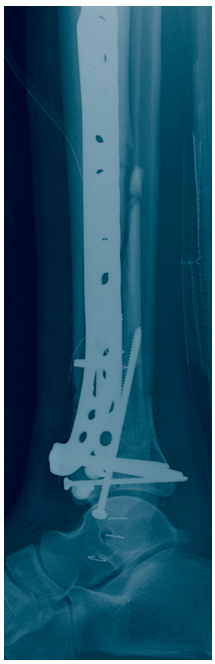

Postoperative AP

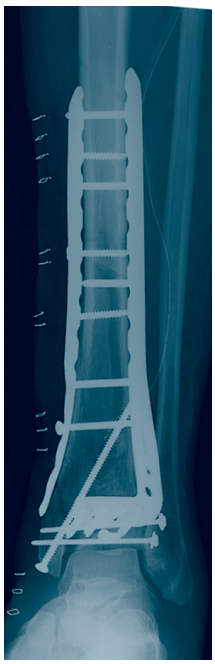
Case 4

52-year-old female, MVA


Preoperative lateral


Preoperative AP


Postoperative lateral

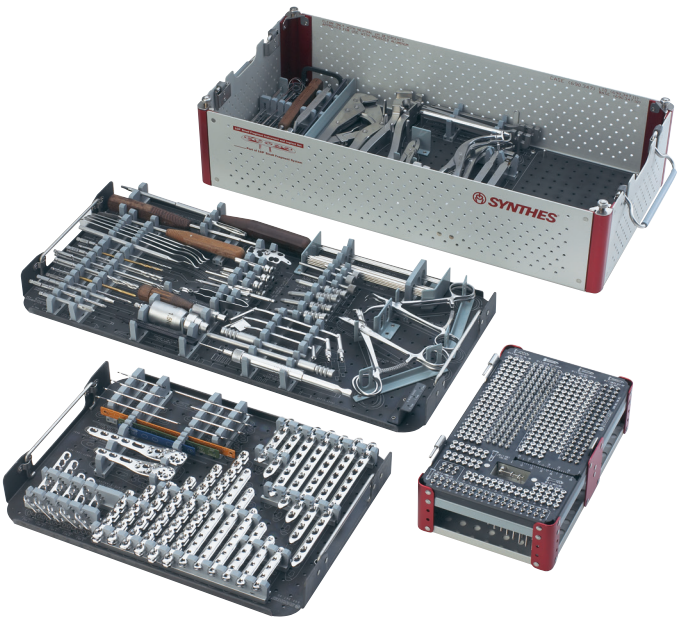

Postoperative AP

1
Preparation

Required set	
105.434	Small Fragment LCP Instrument and Implant Set, with self-tapping screws

Optional sets	
105.90	Bone Forceps Set
115.700	Large Distractor Set

Optional instruments	
03.122.001	2.8 mm LCP Drill Guide, long
03.122.002	2.8 mm Calibrated Drill Bit
321.12	Articulated Tension Device, found in the Basic Instrument Set, for LC-DCP and DCP (115.04)
321.15	Socket Wrench, 11 mm
329.04	Bending Iron
329.05	Bending Iron
329.30	Plate-Bending Press
394.35	Large Distractor
395.49	Medium Distractor

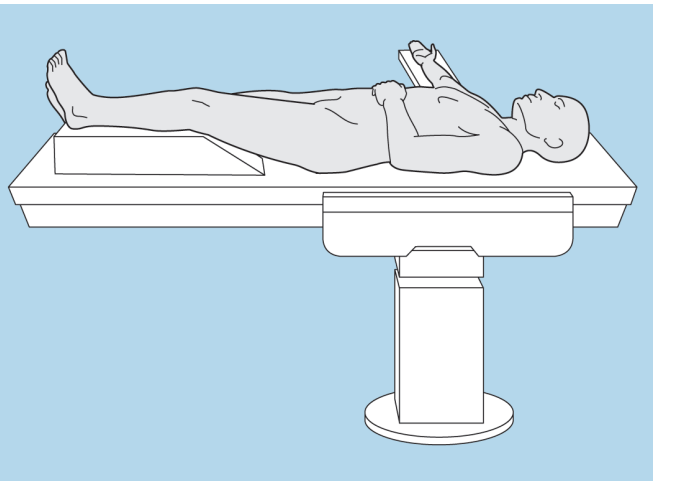


Complete the preoperative radiographic assessment and plan. Determine plate length and instruments to be used. Determine distal screw placement to ensure proper screw placement in the metaphysis.

Position patient

Position the patient supine on a radiolucent operating table. Visualization of the distal tibia under fluoroscopy in both the lateral and AP views is recommended. Elevate the leg on a padded rest with the knee moderately flexed to assist placement in a neutral position. Place the opposite leg level on tabletop.

Warning: The direction of locking screws is already determined for normal anatomy based on the design of the plate. If manual contouring in the metaphyseal area is necessary, verify new screw trajectories using the K-wire screw placement verification technique on page 14.



Reduce Surface

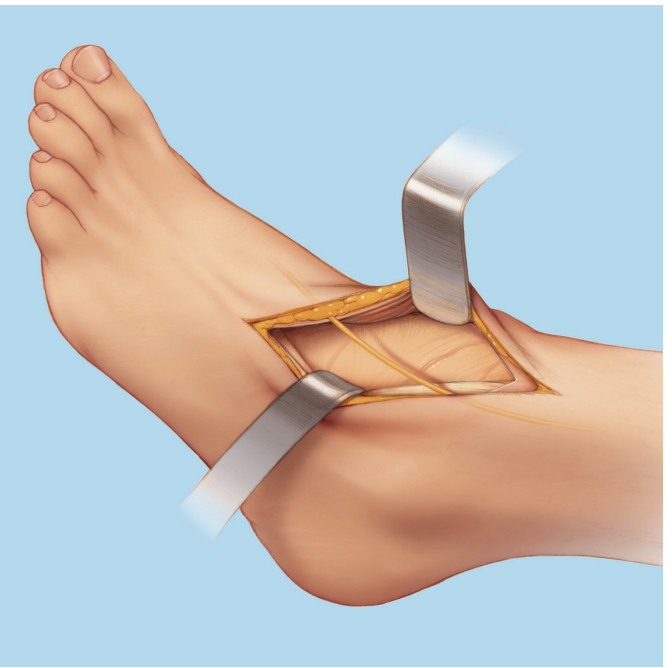
2
Reduce articular surface

Optional instruments

394.35	Large Distractor
395.49	Medium Distractor

Approach
A longitudinal and straight incision should be centered at the ankle joint, parallel to the fourth metatarsal distally, and between the tibia and fibula proximally. Proximal extension of the incision should end seven or eight centimeters above the joint. Distally the incision can be extended to the level of the talonavicular joint, allowing exposure of the talar neck. The joint can be exposed using an arthrotomy.

Note: The superficial peroneal nerve and neurovascular bundle usually cross the surgical incision proximal to the ankle joint and should be protected throughout the surgical procedure.



Reduce fracture/articular surface

Note: Application of an external fixator or a distractor may facilitate visualization and reduction of the joint. A lateral distractor can be placed from the talar neck to the mid-tibia (from lateral to medial) to maximize joint visualization by distracting and plantar-flexing the talus.

The articular reduction is confirmed with image intensification. Temporary reduction can be obtained with multiple Kirschner wires. Multiple options exist for maintaining the reduction including:
– Independent lag screws
– Lag screws through the plate
– Locking screws through the plate

Insert Plate

K-wires can be placed through the distal end of the plate to assist with temporary maintenance of the reduction and for plate placement.

Locking screws do not provide interfragmentary compression; therefore, any desired compression must be achieved with standard lag screws. The articular fractures must be reduced and compressed before fixation of the 3.5 mm LCP Anterolateral Distal Tibia Plate with locking screws.

Note: To verify that independent lag screws will not interfere with plate placement, evaluate placement intraoperatively with AP and lateral fluoroscopic images.

3

Insert plate

Optional instrument

324.031	Threaded Plate Holder

Open the area as necessary to expose the metaphysis.

Slide the shaft submuscularly along the lateral tibial cortex, beneath the anterior compartment muscles and neurovascular bundle. Use special care to protect the superficial peroneal nerve and neurovascular bundle, which typically cross under the incision proximal to the ankle joint. The distal row of screws will sit just proximal to the joint. Use fluoroscopic imaging during plate placement in both the AP and lateral planes to ensure a safe implant location proximally along the lateral tibia.

Note: Insert a threaded plate holder into one of the distal holes as a handle for insertion.

Position Plate

4

Position plate and fix provisionally

Optional instruments

292.20	2.0 mm Kirschner Wire, 150 mm, trocar point
324.024	Push-Pull Reduction Device

The plate may be temporarily held in place using any of the following options. These options also prevent plate rotation while inserting the first locking screw:

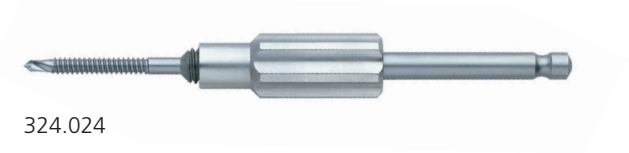
– Push-pull reduction device in a screw hole that will not immediately be used (as shown in this technique guide)
– 3.5 mm cortex screw or 4.0 mm cancellous bone screw in a locking or Combi hole
– Standard plate holding forceps
– K-wires through the plate
– 2.7 mm cortex screw in one of the distal holes

After plate insertion, check alignment on the bone using fluoroscopy. Ensure proper reduction before inserting the first locking screw. Once the locking screws are inserted, further reduction is not possible without loosening the locking screws.

Notes:
– This locking plate is precontoured to fit the anterolateral distal tibia. If the plate contour is changed, it is important to check the position of the screws in relation to the joint, using the screw placement verification technique on page 14.
– To adjust the plate into final position, insert a K-wire or partially insert a cortex screw or cancellous bone screw into the elongated hole or a Combi hole before inserting a locking screw.

Optional instruments

310.288	2.8 mm Drill Bit
312.648	2.8 mm Threaded Drill Guide
324.024	Push-Pull Reduction Device



324.024

The push-pull reduction device is placed through plate holes to push or pull bone fragments in relation to the plate. This instrument can be used for:

– Stabilization of plate-bone orientation during insertion of the first screws
– Translational adjustments
– Provisional fixation
– Alignment of segmental fragments
– Minor varus-valgus adjustment

Connect the push-pull reduction device to a power drive and place it in the desired hole. With the nut in the highest position possible, begin power insertion of the push-pull reduction device into the near cortex. Stop insertion before the end of the threaded portion meets the plate surface. Attempting to advance beyond this point may cause screw threads to strip in the bone.

Remove the power tool and begin tightening the nut toward the plate while monitoring progress under C-arm. Stop when the desired reduction is achieved.

Screw Placement Verification (optional)

5

Screw placement verification (optional)

Instruments	
292.71	1.6 mm Kirschner Wire with Thread
310.288	2.8 mm Drill Bit
312.648	2.8 mm Threaded Drill Guide
323.023	1.6 mm Wire Sleeve
323.025	Direct Measuring Device

Since the direction of the locking screw depends on the contour of the plate, final screw position may be verified with K-wires before insertion. This becomes especially important when the plate has been manually contoured, applied near the joint, or for nonstandard anatomy.

With the 2.8 mm threaded drill guide in the desired locking hole, insert the 1.6 mm wire sleeve into the threaded drill guide.

Insert a 1.6 mm threaded K-wire through the wire sleeve and drill to the desired depth.

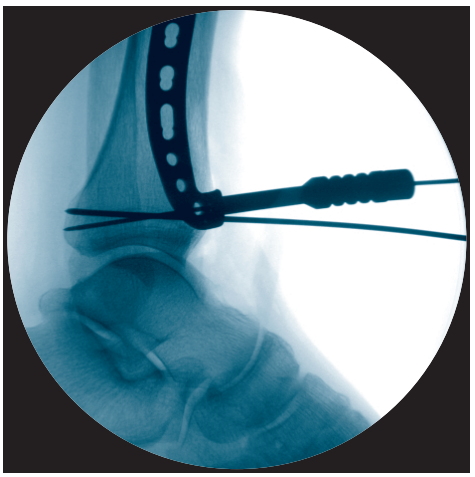
Verify K-wire placement under image intensification to determine if final screw placement will be acceptable.

Precaution: The K-wire position represents the final position of the locking screw. Confirm that the K-wire does not enter the joint.

Measure for screw length by sliding the tapered end of the direct measuring device over the K-wire down to the wire sleeve.

Remove the direct measuring device, K-wire and 1.6 mm wire sleeve, leaving the threaded drill guide in place.

Use the 2.8 mm drill bit to drill. Remove the threaded drill guide. Insert the appropriate length locking screw.



Insert Screws

6
Insert screws

Instruments	
310.288	2.8 mm Drill Bit
312.648	2.8 mm Threaded Drill Guide
314.115	StarDrive Screwdriver, T15
314.116	StarDrive Screwdriver Shaft, T15
319.01	Depth Gauge
511.770 or 511.773	Torque Limiting Attachment, 1.5 Nm Torque Limiting Attachment, 1.5 Nm, quick coupling

Determine the combination of screws to be used for fixation. If a combination of locking and cortex screws will be used, cortex screws should be inserted first to pull the plate to the bone.

Note: To secure the plate to the tibia prior to locking screw insertion, it is recommended to pull the plate to the bone using a cortex screw or a push-pull reduction device.

If a locking screw will be used as the first screw, be sure the fracture is reduced and the plate is held securely to the bone. This prevents plate rotation as the screw is locked to the plate.

Locking screw insertion
Insert the 2.8 mm threaded drill guide into a locking hole or Combi hole until fully seated.

Use the 2.8 mm drill bit to drill to the desired depth.

Remove the drill guide.

Use the depth gauge to determine screw length.

Insert the screw.

6

Insert screws continued

Instruments

03.122.001	2.8 mm LCP Drill Guide, long
03.122.002	2.8 mm Calibrated Drill Bit

Locking screw insertion continued

Option: Direct measuring with calibrated drill bit

Determine where locking screws will be used. Screw the 2.8 mm LCP Drill Guide into a threaded hole until it is fully seated. Use the 2.8 mm calibrated drill bit to drill to the desired depth. Determine the screw length directly from the drill bit.

Insert the locking screw under power, using the torque limiting attachment and the StarDrive™ Screwdriver shaft, or insert it manually, using the StarDrive Screwdriver. Hold the plate securely on the bone to prevent plate rotation as the screw is locked to the plate.

Note: When using the torque limiting attachment, the screw is securely locked into the plate when a "click" is heard.

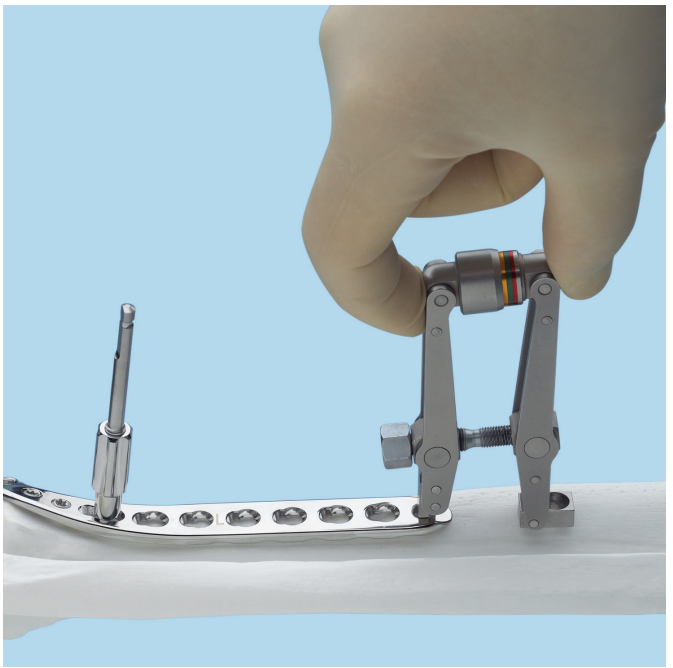
Precaution: Never use the StarDrive Screwdriver shaft directly with power equipment unless using a torque limiting attachment.

Articulated tension device (optional)

Instrument	
321.12	Articulated Tension Device

Once reduction is satisfactory, and if it is appropriate based on fracture morphology, the plate can be loaded in tension using the articulated tension device.*

Note: In simple fracture patterns, the articulated tension device may facilitate anatomic reduction. This device may be used to generate either compression or distraction.



Nonlocking screw insertion

Instruments	
310.25	2.5 mm Drill Bit
323.36	3.5 mm Universal Drill Guide

Use the 2.5 mm drill bit through the 3.5 mm universal drill guide to predrill the bone. For the neutral position, press the drill guide down in the nonthreaded hole. To obtain compression, place the drill guide at the end of the nonthreaded hole away from the fracture (do not apply downward pressure on the spring-loaded tip).

Note: To safely place screws in the tibial diaphysis, a second incision may be required to avoid damage to the neurovascular bundle in the anterior compartment and the superficial peroneal nerve.

* Found in the Basic Instrument Set for LC-DCP and DCP (115.04)

6

Insert screws continued

Instruments

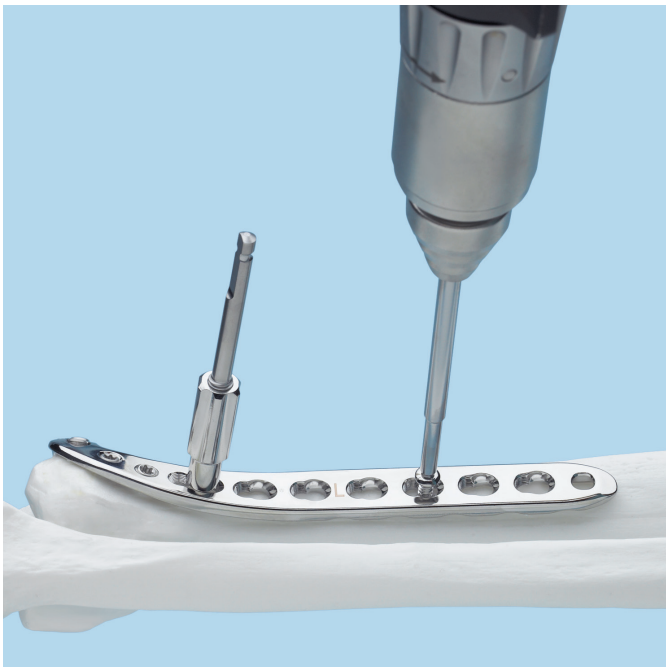
314.02	Small Hexagonal Screwdriver
314.03	Small Hexagonal Screwdriver Shaft
319.01	Depth Gauge, for small screws

Nonlocking screw insertion continued

Measure for screw length using the depth gauge for small screws.

Select and insert the appropriate 3.5 mm cortex screw using the small hexagonal screwdriver or the small hexagonal screwdriver shaft.

If used, remove the push-pull reduction device.



Shaft locking screws

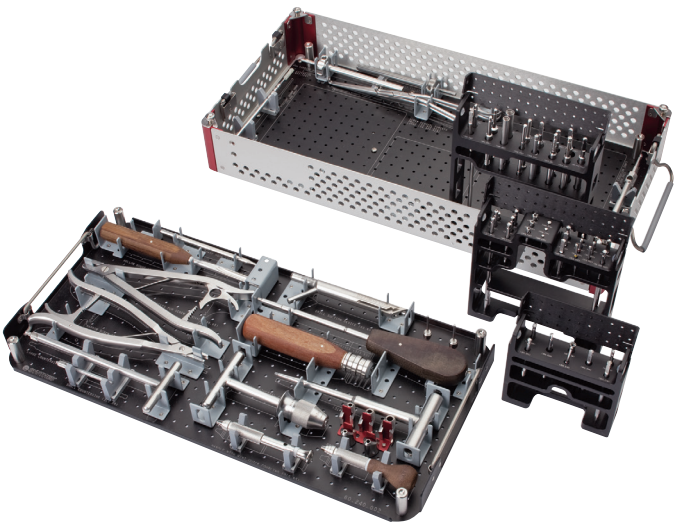
If using the threaded portion of the Combi holes, repeat the steps as described for distal locking screw insertion.

Implant Removal (optional)

Implant removal (optional)

Optional sets	
01.240.001	Screw Removal Set
105.971	Screw Removal Set

Optional instruments	
309.520	Conical Extraction Screw
311.43	Handle, with quick coupling



To remove locking screws, unlock all screws from the plate, then remove the screws completely from the bone. This prevents simultaneous rotation of the plate when unlocking the last locking screw.

If the screws cannot be removed with the screwdriver (e.g. if the hexagonal or StarDrive Recess of a locking screw is damaged or if the screws are stuck in the plate), insert the conical extraction screw with left-handed thread into the screwhead using the handle with quick coupling and loosen the locking screw by turning counterclockwise.

Screws Used With the 3.5 mm LCP Anterolateral Distal Tibia Plate

Stainless Steel and Titanium

4.0 mm Cancellous Bone Screws

Found in the Small Fragment LCP System

– May be used in the DCU portion of the Combi holes in the plate shaft or in round locking holes
– Compress the plate to the bone or create axial compression
– Fully or partially threaded shaft

206.010–206.060
406.010–406.060

207.010–207.070
407.010–407.070

3.5 mm Locking Screws

Found in the Small Fragment LCP System

– Create a locked, fixed-angle screw/plate construct
– Fully threaded shaft
– Self-tapping tip
– Used in the locking portion of the Combi holes or in round locking holes

212.101–212.124
412.101–412.124

3.5 mm Cortex Screws

Found in the Small Fragment LCP System

– May be used in the DCU portion of the Combi holes in the plate shaft or in round locking holes
– Compress the plate to the bone or create axial compression
– Fully threaded shaft

204.810–204.860
404.810–404.855

2.7 mm Cortex Screws

Found in the Small Fragment LCP System

– May be used in the distal locking holes
– Compress the plate to the bone
– Fully threaded shaft

202.810–202.855
402.810–402.855

Selected Instruments From the Small Fragment LCP Instrument and Implant Set (105.434)

03.122.001	2.8 mm LCP Drill Guide, long, for 3.5 mm LCP plates Used with 03.122.002	
03.122.002	2.8 mm Drill Bit, quick coupling, 248 mm/95 mm calibration Used with 03.122.001	
292.20	2.0 mm Kirschner Wire, 150 mm, trocar point	
292.71	1.6 mm Kirschner Wire with Thread, 150 mm, trocar point, 5 mm thread length	
310.25	2.5 mm Drill Bit, 110 mm	
310.288	2.8 mm Drill Bit, 165 mm	
311.43	Handle, with quick coupling	

312.648	2.8 mm Threaded Drill Guide	
314.02	Small Hexagonal Screwdriver with Holding Sleeve	
314.03	Small Hexagonal Screwdriver Shaft	
314.115	StarDrive Screwdriver, T15	
314.116	StarDrive Screwdriver Shaft, T15, quick coupling	
319.01	Depth Gauge, for small screws	
323.023	1.6 mm Wire Sleeve	

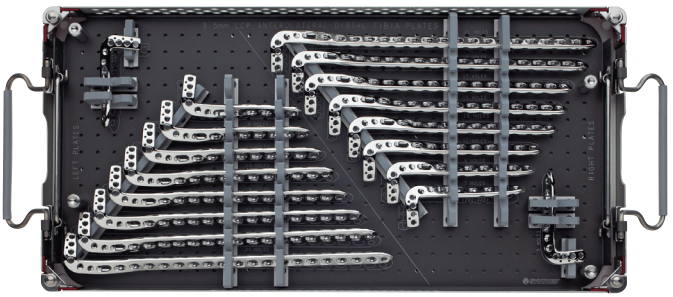
Selected Instruments From the Small Fragment LCP Instrument and Implant Set (105.434) continued

323.025	Direct Measuring Device	
323.36	3.5 mm Universal Drill Guide	
324.024	Push-Pull Reduction Device	
324.031	Threaded Plate Holder, long, for 3.5 mm locking hole	
329.04	Bending Iron, for 2.7 mm and 3.5 mm plates, 150 mm length Used with 329.05	
329.05	Bending Iron, for 2.7 mm and 3.5 mm plates, 150 mm length Used with 329.04	
511.770 or 511.773	Torque Limiting Attachment, 1.5 Nm Torque Limiting Attachment, 1.5 Nm, quick coupling	

3.5 mm LCP Anterolateral Distal Tibia Plate Implant Set
Stainless Steel (01.124.001) and Titanium (01.124.002)

Graphic Case

690.469	Graphic Case for 3.5 mm LCP Anterolateral Distal Tibia Plates
60.124.002	Graphic Case for 3.5 mm Titanium LCP Anterolateral Distal Tibia Plates



Implants

3.5 mm LCP Anterolateral Distal Tibia Plates

Stainless Steel Left◊	Titanium Left	Stainless Steel Right◊	Titanium Right	Holes	Length (mm)
241.441	441.441	241.440	441.440	5	80
241.443	441.443	241.442	441.442	7	106
241.445	441.445	241.444	441.444	9	132
241.447	441.447	241.446	441.446	11	158
241.449	441.449	241.448	441.448	13	184
241.451	441.451	241.450	441.450	15	210
241.453	441.453	241.452	441.452	17	236
241.455	441.455	241.454	441.454	19	262
241.457	441.457	241.456	441.456	21	288

241.445 241.444 441.445 441.444

Required Set

105.434	Small Fragment LCP Instrument and Implant Set, with self-tapping screws
405.434	Titanium Small Fragment LCP Instrument and Implant Set, with self-tapping screws

Also Available Sets

01.240.001	Screw Removal Set
105.90	Bone Forceps Set
115.700	Large Distractor Set

Also Available Instruments

03.122.001	2.8 mm LCP Drill Guide, long, for 3.5 mm LCP plates
03.122.002	2.8 mm Drill Bit, quick coupling, 248 mm/95 mm calibration
309.520	Conical Extraction Screw
321.12	Articulated Tension Device
321.15	Socket Wrench, 11 mm
329.04	Bending Iron
329.05	Bending Iron
329.30	Plate-Bending Press
394.35	Large Distractor
395.49	Medium Distractor

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

Note: For additional information, please refer to the package insert or www.e-ifu.com.

For detailed cleaning and sterilization instructions, please refer to www.depuysynthes.com/hcp/cleaning-sterilization or sterilization instructions, if provided in the instructions for use.

Limited Warranty and Disclaimer: DePuy Synthes products are sold with a limited warranty to the original purchaser against defects in workmanship and materials. Any other express or implied warranties, including warranties of merchantability or fitness, are hereby disclaimed.

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

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

Some devices listed in this technique guide may not have been licensed in accordance with Canadian law and may not be for sale in Canada. Please contact your sales consultant for items approved for sale in Canada.

Not all products may currently be available in all markets.

DePuy Synthes

PART OF THE Johnson & Johnson FAMILY OF COMPANIES

Manufactured or distributed by:
Synthes USA Products, LLC
1302 Wrights Lane East
West Chester, PA 19380

Synthes USA, LLC
1101 Synthes Avenue
Monument, CO 80132

Synthes GmbH
Luzernstrasse 21
4528 Zuchwil, Switzerland

To order (USA): 800-523-0322
To order (Canada): 844-243-4321

Note: For recognized manufacturer, refer to the product label.

www.depuysynthes.com

DSUS/TRM/1016/1159 Rev B 05/21 DV