

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

# 3.5 mm LCP® Distal Tibia T-Plates

Surgical Technique





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## MR Information

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

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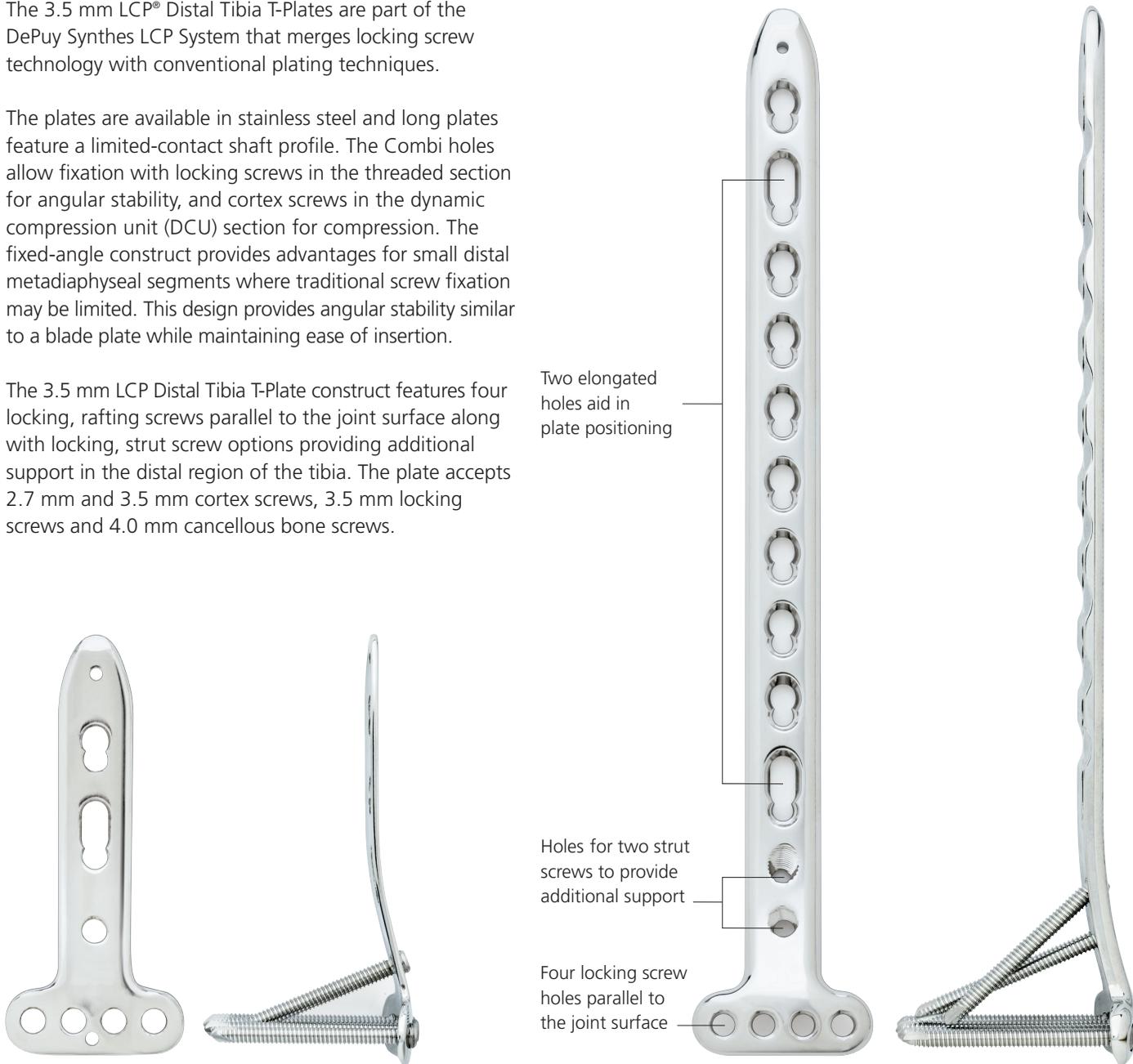
 Image intensifier control

## 3.5 mm LCP Distal Tibia T-Plates

The 3.5 mm LCP® Distal Tibia T-Plates are part of the DePuy Synthes LCP System that merges locking screw technology with conventional plating techniques.

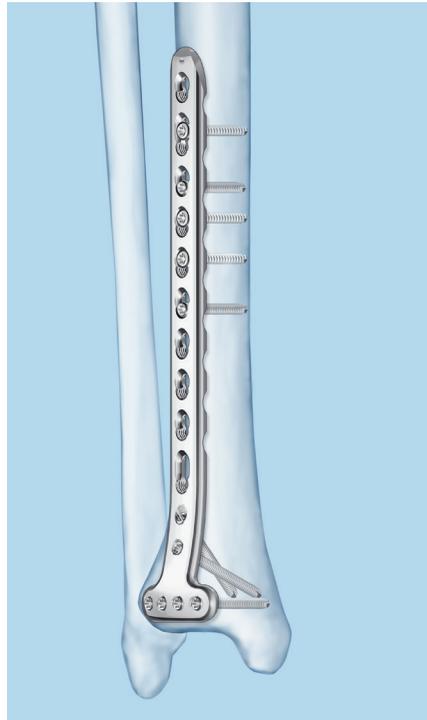
The plates are available in stainless steel and long plates feature a limited-contact shaft profile. The Combi holes allow fixation with locking screws in the threaded section for angular stability, and cortex screws in the dynamic compression unit (DCU) section for compression. The fixed-angle construct provides advantages for small distal metadiaphyseal segments where traditional screw fixation may be limited. This design provides angular stability similar to a blade plate while maintaining ease of insertion.

The 3.5 mm LCP Distal Tibia T-Plate construct features four locking, rafting screws parallel to the joint surface along with locking, strut screw options providing additional support in the distal region of the tibia. The plate accepts 2.7 mm and 3.5 mm cortex screws, 3.5 mm locking screws and 4.0 mm cancellous bone screws.



**Long plate features**

- Anatomically shaped
- Two elongated holes for positioning
- 3.6 mm shaft thickness tapers to 2.4 mm distally
- 4.5 mm narrow shaft width
- Four locking rafting screws in distal portion
- Two locking strut screws (38 mm maximum length)
- Head holes accept 2.7 mm and 3.5 mm cortex screws and 3.5 mm locking screws
- Shaft holes accept 3.5 mm locking, 3.5 mm cortex and 4.0 mm cancellous bone screws
- Available with 8, 12 or 16 shaft holes



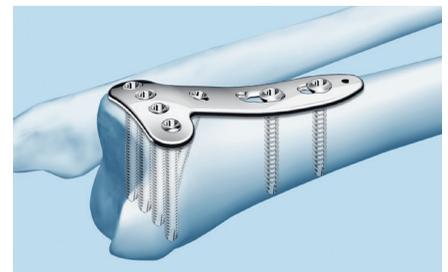
**Short plate features**

- Anatomically shaped
- One elongated hole for positioning
- 1.5 mm thickness
- 4.5 mm narrow shaft width
- Four locking rafting screws in distal portion
- One locking strut screw (38 mm maximum length)
- Head holes accept 2.7 mm and 3.5 mm cortex screws and 3.5 mm locking screws
- Shaft holes accept 3.5 mm locking, 3.5 mm cortex and 4.0 mm cancellous bone screws
- Available with 3 or 5 shaft holes

**Anterior approach**



**Posterior approach**



# AO Principles

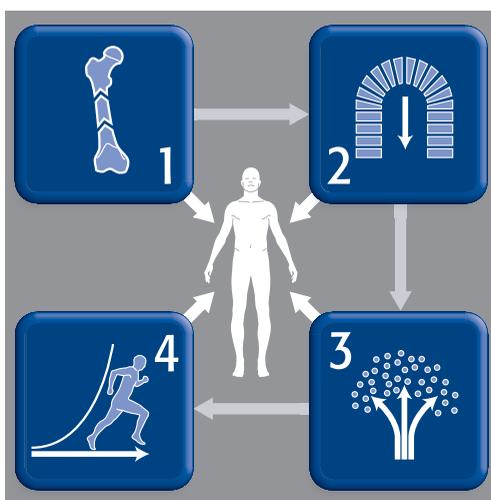
In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.<sup>1,2</sup>

## 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

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The Synthes 3.5 mm LCP Distal Tibia T-Plates are indicated for fixation of fractures, osteotomies, and nonunions of the distal tibia, especially in osteopenic bone.

The posterior lateral approach is preferred. It is particularly useful in achieving stable fixation of a short distal tibial articular segment where other approaches may be compromised due to soft tissue concerns (traumatic wounds, muscle flap coverage or tenuous skin). It is also a useful fixation option when concomitant posterior bone grafting is required. The indications include fractures with articular involvement; however, these fractures need to be addressed with the principles of articular fracture surgery prior to plate application.



# Clinical Case

## Case 1

46-year-old female, MVA

Open distal tibia fracture with metadiaphyseal comminution and mild articular involvement managed in a staged fashion. Fracture was managed with debridement, spanning external fixation followed by anatomic reduction of the joint surface; required stable fixation of the distal articular segment to the intact diaphysis, bone grafting of the defect and avoidance of compromised anterior medial tissues.



Preoperative AP



Preoperative lateral



Initial fixation PA



Initial fixation lateral



Postoperative PA



Postoperative lateral



One month follow-up-AP



One month follow-up-lateral

# Position Patient

## 1

### Position patient

Position the patient prone on a radiolucent operating table. Pad bony prominences and take care with arm positioning. The ipsilateral posterior iliac crest may be prepped, if autogenous bone grafting is desired. A sterile thigh tourniquet is used in this situation.

- ① Visualization of the distal tibia under fluoroscopy in both the lateral and PA views is recommended. A small towel bump under the anterior aspect of the operative limb facilitates obtaining a lateral image while avoiding the contralateral limb. This bump is also useful to avoid an apex anterior deformity from the foot abutting the table.
- ① **Note:** The direction of locking screws is predetermined by the plate design. If manual contouring in the metaphyseal area is necessary, verify new screw trajectories using K-wire screw placement (see Step 6). The use of image intensification is recommended.



# Approach for Long Plates

## 2

### Approach

Treatment protocol is often dictated by the soft tissue component of the injury as well as osseous injury. A staged protocol is often used, as these injuries tend to be high energy mechanisms. Often this consists of open fracture management and spanning external fixation. Limited articular fixation may be warranted if soft tissues allow.

Tibial stabilization may proceed when the soft tissue condition is appropriate. Careful preoperative planning will assess need for correction of tibial and or fibular deformity, as well as for bone grafting.

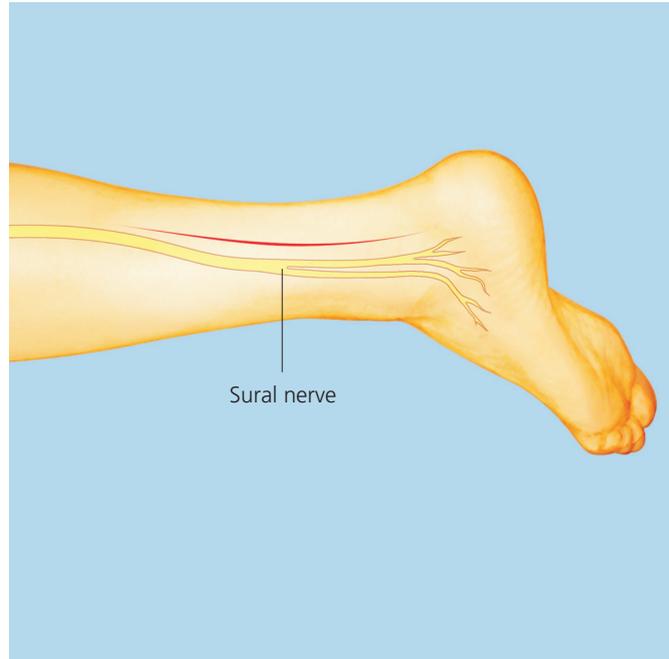
External fixators may be removed before proceeding or used to aid in alignment and reduction.

Make a skin incision lateral to the Achilles tendon. The sural nerve lies in the subcutaneous layer and must be protected. The nerve runs midline and traverses lateral at the distal extent of the incision.

Identify the interval between the peroneal tendons (lateral compartment) and tendoachilles (posterior superficial).

Identify the posterior border of the fibula medial to the peroneals. Continue the dissection along the posterior medial border of the fibula onto the interosseous membrane. Carefully elevate the posterior deep compartment from the interosseous membrane to protect the posterior and peroneal neurovascular systems.

Continue dissection by working above and below the zone of injury where there is less distortion of the normal anatomy.



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Visualize and protect the traversing vascular branches of the posterior aspect of the tibia. These communicating branches between the peroneal and posterior tibial system should be protected, when possible, to preserve blood supply, but may need to be ligated to facilitate reduction and fixation.

The distal tibia may be visualized to the level of the ankle. Intra-articular visualization requires capsulotomy of the posterior ankle capsule.

# Reduction

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## 3

### Reduction

The correction of alignment and rotation is dictated by the preoperative plan, depending on whether the case is a relatively acute fracture, a delayed union, or a corrective osteotomy.

#### Technique options

- 1 Anatomic fibular stabilization will often aid in the restoration of alignment. This may also be the case in the delayed/malunion setting where fibular osteotomy may be needed to obtain correction in alignment. This can easily be performed via the same posterior lateral approach.
- 2 The design of the plate will facilitate reduction. Correct placement of the plate on the distal segment will aid in the reduction of the distal segment to the shaft. Fluoroscopy should be used to identify the appropriate position of the distal locking screws. This should be perpendicular to the long axis of the tibia and proximal to the articular surface on lateral image. PA image should show the plate well aligned in the coronal plane.

Provisional fixation of plate to the distal segment is obtained with a standard screw or K-wire.

- 3 Alternative reduction maneuver involves positioning the plate on well aligned tibia that has been reduced with provisional fixation, clamps or external bumps.

When distal plate position is verified, place locked screws in the distal segment. Reduce the proximal portion of the plate to the shaft using standard screws. Dynamic compression is achieved when fracture morphology will allow.

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#### Notes:

Alternatively, locked screws may be used in the shaft, in the case of osteopenia or poor bone quality. This is done only **after** the plate is reduced to the proximal segment.

In the case of segmental defects, bone graft may be needed before definitive plate placement. The bone may also need preparation in the case of a delayed or nonunion. When this is not required, the graft may be placed after the plate is positioned.

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# Determine Plate Length

## 4

### Determine plate length

#### Required set

105.434	Small Fragment LCP Instrument and Implant Set, with self-tapping screws
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#### Optional instruments

03.100.031	Bending Pliers, for 3.5 mm low profile reconstruction plates
329.29	Bending Pliers, for 2.7 mm and 3.5 mm reconstruction plates

Select a plate length appropriate for the fracture.

Due to varying patient anatomy, slight bending may be necessary. Using bending pliers, contour the plate, as needed. The proximal shaft portion of the long plates may need to be contoured prior to fixation to obtain an optimal fit.



# Plate and Screw Placement

## 5

### Position plate and fix provisionally

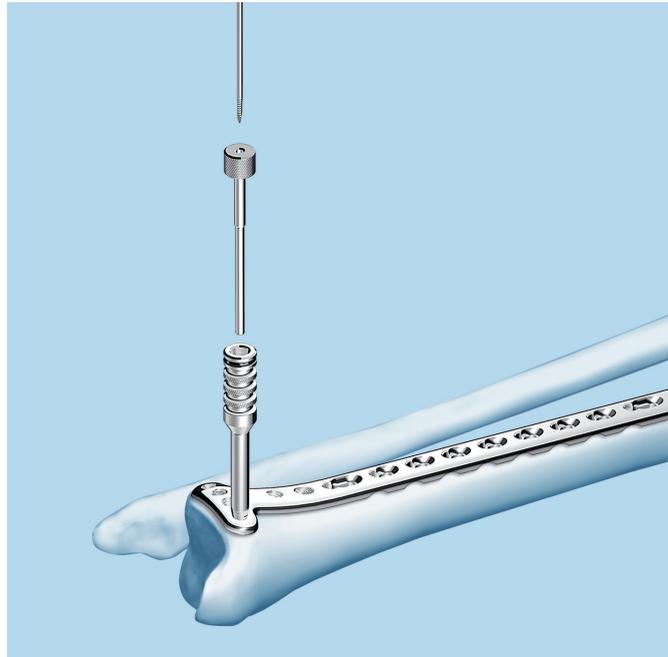
#### Instruments

292.71	1.6 mm Kirschner Wire
312.648	2.8 mm Threaded Drill Guide
323.023	1.6 mm Wire Sleeve

- 1 Position the plate on the reduced bone. Attach the threaded drill guide into a distal locking hole and insert the 1.6 mm wire sleeve. Place a K-wire through the wire sleeve and temporarily attach the plate to the bone. After plate insertion, check alignment on the bone using fluoroscopy.

Position the plate on the shaft of the tibia and insert a K-wire through the proximal K-wire hole for temporary fixation. Use this technique when the tibia is relatively reduced at the time of plate placement. Often stable distal fixation is achieved, then the plate is reduced to the proximal segment.

**Note:** The plate is precontoured to fit the posterior distal tibia. If the plate contour is changed, check the position of the screws relative to the joint, using screw placement verification.



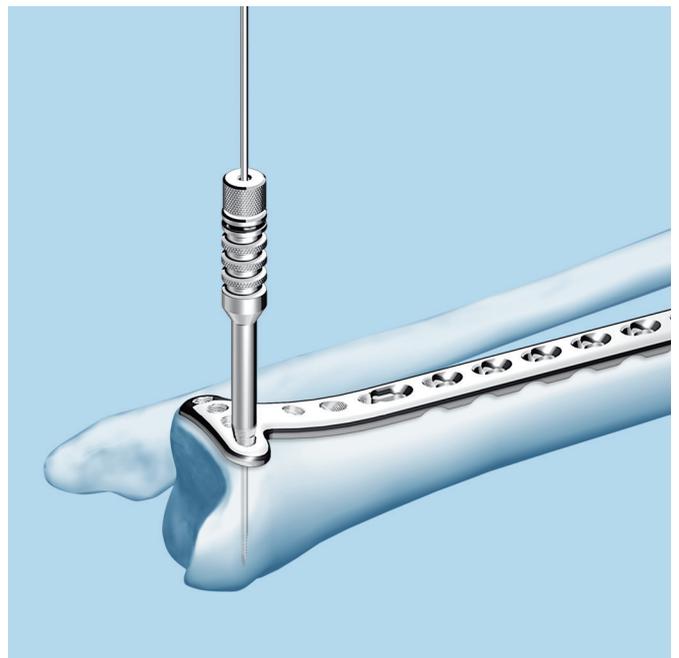
## 6

### Screw placement verification

The direction of the locking screws depends on the plate. Verify the final screw position with K-wires before insertion, especially if the plate has been manually contoured for unusual anatomy.

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

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



# Insert Screws

Determine the combination of screws to be used for fixation. If a combination of locking and cortex screws will be used, the cortex screws should be inserted first to ensure that the plate has appropriate bone contact.

**Important:** 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, to prevent plate rotation as the screw is locked to the plate.

## 7 Fixation with 3.5 mm locking screws

### 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, for 03.122.001
or	
310.288	2.8 mm Drill Bit, quick coupling, 165 mm
312.648	2.8 mm Threaded Drill Guide
314.115	StarDrive Screwdriver, T15
or	
314.116	StarDrive Screwdriver Shaft, quick coupling, T15
319.01	Depth Gauge
511.770	Torque Limiting Attachment, 1.5 Nm
or	
511.773	Torque Limiting Attachment, 1.5 Nm, quick coupling

**Note:** Insert distal screws in the plate head and then insert strut screws.

Insert the 2.8 mm threaded drill guide into a 3.5 mm locking hole until fully seated. Use the calibrated 2.8 mm drill bit to drill to the desired depth. Read screw length from the calibration on the drill bit. Insert screw.



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**Alternative technique**

Remove the drill guide. Use the depth gauge to determine screw length.

**Option**

Insert the locking screw under power using the 1.5 Nm 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.

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**Notes:**

Take care to verify screw length in the shaft of the tibia. Screws which are too long will cause symptoms on the anterior aspect of the tibia.

The maximum length for the strut screws is 38 mm. The strut screw has slight interference with the two center distal rafting screws.

Be careful when drilling prior to screw placement.

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## 8

### Fixation with 3.5 mm cortex screws

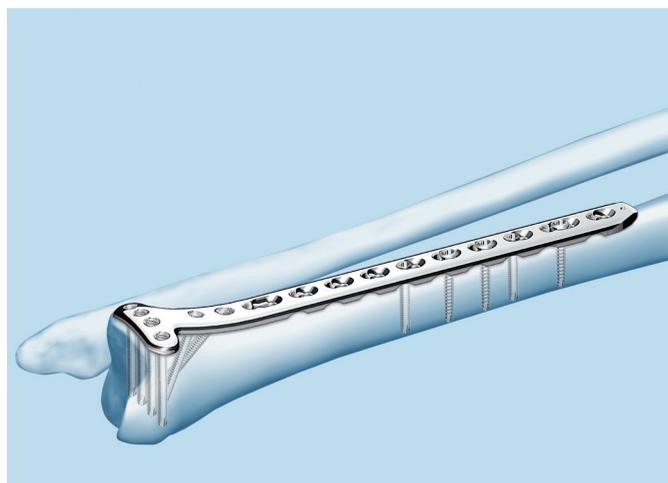
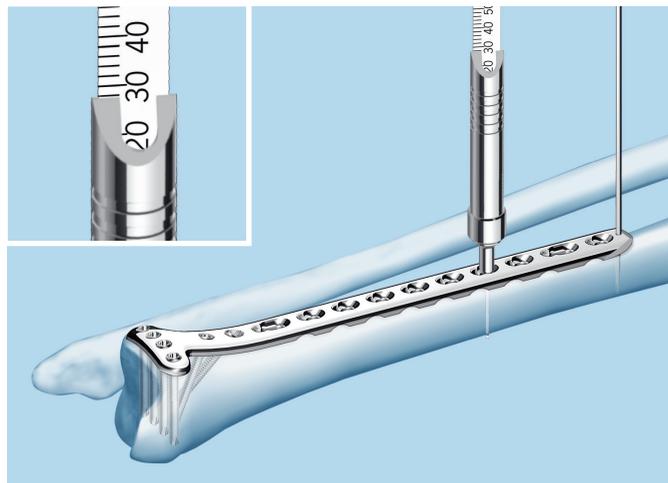
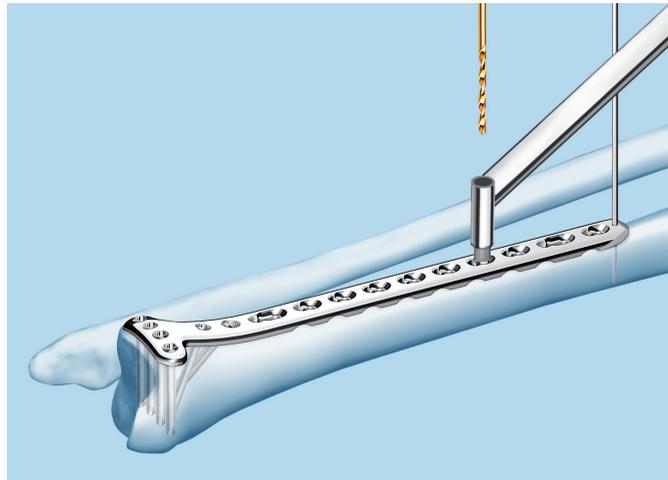
#### Instruments

310.25	2.5 mm Drill Bit, quick coupling, gold, 110 mm
310.35	3.5 mm Drill Bit, quick coupling, 110 mm
311.43	Handle, with quick coupling, small
314.02	Small Hexagonal Screwdriver with Holding Sleeve
or	
314.03	Small Hexagonal Screwdriver Shaft, quick coupling
319.01	Depth Gauge
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).

Measure for screw length using the depth gauge.

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



## Confirm Reduction

### 9

#### Confirm reduction and fixation

- Carefully assess final reduction and fixation, by both direct visualization and image intensification. PA and lateral fluoroscopic visualization should confirm reduction and appropriate positioning of the plate and screws.



# Anterior Approach and Technique for Short Plates

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## 1

### Approach

Use an anterior or anteromedial incision for exposure of the anterior fragment.

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## 2

### Reduce

- 1 Reduce the fracture fragments and confirm reduction using image intensification. Temporary reduction can be obtained by placing a Kirschner wire through the proximal K-wire hole.



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## 3

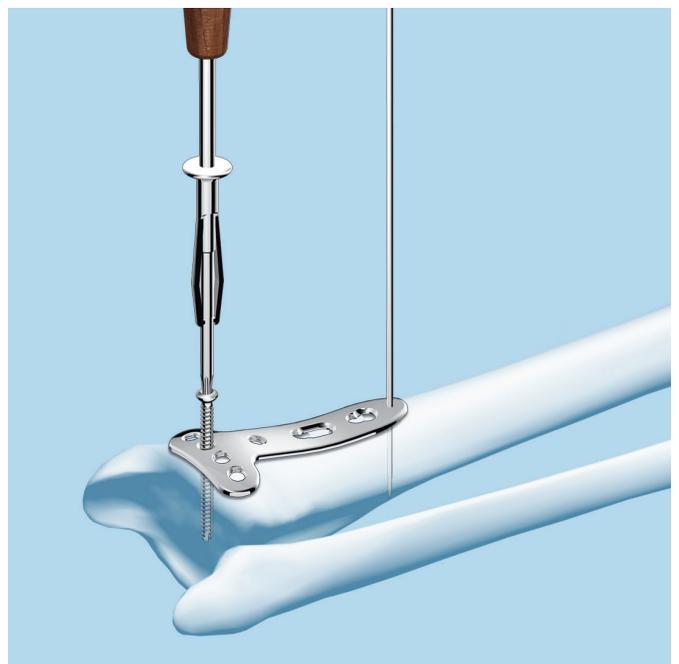
### Insert plate

Open the area as necessary to expose the fracture. Carefully insert the plate under the soft tissue for placement on the shaft.

#### 4

##### Insert screws

3.5 mm cortex screws are recommended for the distal row of screws. Use the standard AO screw insertion technique.



**4**

**Insert screws** *continued*

If using a locking screw in the locking shaft hole (strut screw), the recommended maximum length is 38 mm. If inserting a longer screw, there may be interference with the distal rafting screws.



# Posterior Approach and Technique for Short Plates

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## 1

### Approach

Use a posterolateral incision for direct exposure of the posterior fragment.

---

## 2

### Reduce

- ① Reduce the fracture fragments and confirm reduction using image intensification. Temporary reduction can be obtained with multiple Kirschner wires.
- 

## 3

### Insert plate

Open the area as necessary to expose the fracture. Carefully insert the plate under the soft tissue for placement on the shaft.

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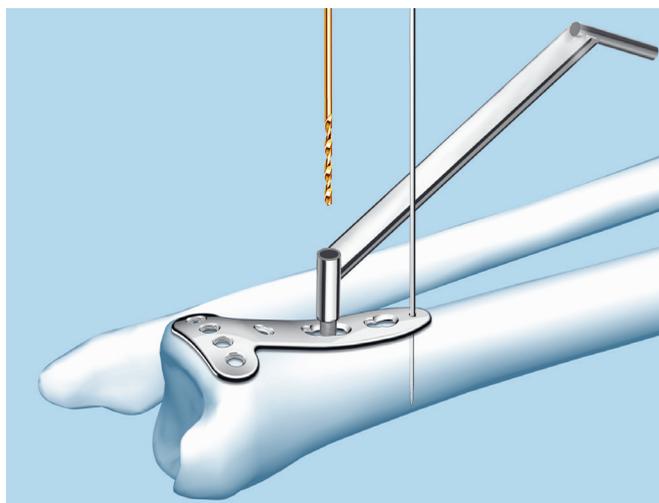
#### 4

##### Position plate and fix provisionally

- After plate insertion, check alignment on the bone using fluoroscopy. Make any adjustments before inserting screws.

The plate can be temporarily held in place with a Kirschner wire.

**Note:** These plates are precontoured to fit the posterior distal tibia. If the plate contour is changed, it is important to check the position of the screws in relation to the joint.



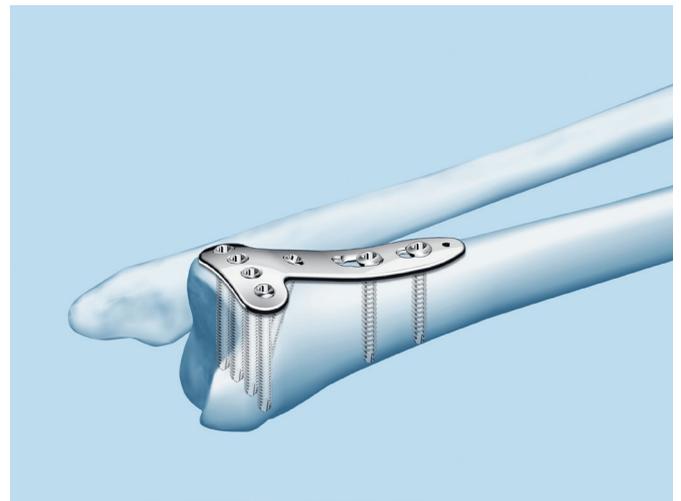
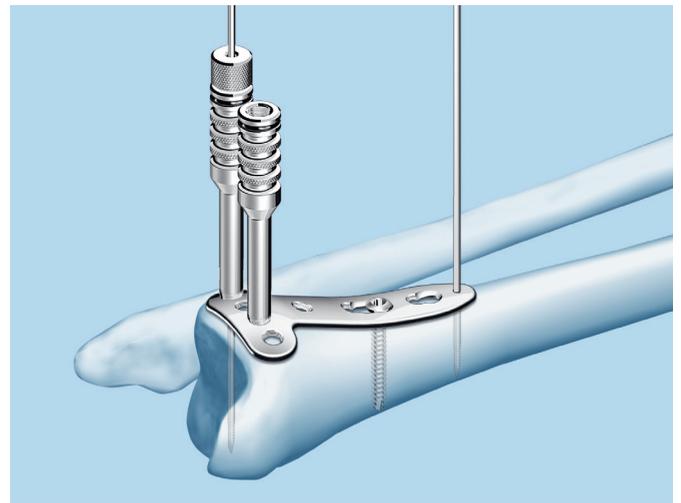
## 5

### Insert screws

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.

For screw insertion, see pages 14–16.



## Postoperative Treatment

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Postoperative treatment with locking compression plates does not differ from conventional internal fixation procedures. A splint may be used postoperatively to rest the soft tissues and maintain a neutral position for the ankle. Motion is initiated when the soft tissue condition is appropriate. Weight-bearing is dictated by the bone-implant construct and clinical judgment.

# Implant Removal

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## Optional set

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01.240.001 Screw Removal Set

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## Optional instruments

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309.520 Conical Extraction Screw

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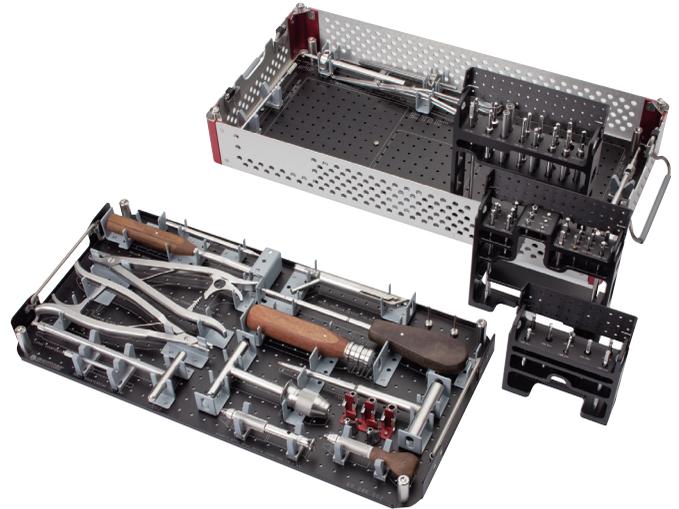
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311.43 Handle, with quick coupling

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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 the locking screws are 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 it counterclockwise.



## Screws Used with the 3.5 mm LCP Distal Tibia T-Plates\*

### 2.7 mm Cortex Screws, self-tapping

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



202.810–202.855

### 3.5 mm Cortex Screws, self-tapping

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



204.810–204.860

### 3.5 mm Locking Screws, self-tapping, with StarDrive Recess

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



212.101–212.124

### 4.0 mm Cancellous Bone Screws

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



206.010–206.060



207.010–207.050

\* Found in the Small Fragment LCP Screw Set

## 3.5 mm LCP Distal Tibia T-Plates

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### 3.5 mm LCP Distal Tibia T-Plates

	Holes	Length (mm)
02.112.203	3	64
02.112.205	5	90

### 3.5 mm LCP Posterior Distal Tibia T-Plates

	Holes	Length (mm)
02.112.208	8	132
02.112.212	12	184
02.112.216	16	236



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

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292.71 1.6 mm Kirschner Wire with Thread, trocar point, 150 mm



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310.25 2.5 mm Drill Bit, quick coupling, 110 mm, gold



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310.288 2.8 mm Drill Bit, quick coupling, 165 mm



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310.35 3.5 mm Drill Bit, quick coupling, 110 mm



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311.43 Handle, with quick coupling



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312.648 2.8 mm Threaded Drill Guide



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314.02 Small Hexagonal Screwdriver with Holding Sleeve



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314.03 Small Hexagonal Screwdriver Shaft, quick coupling



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

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314.115 StarDrive Screwdriver, T15, self-retaining



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314.116 StarDrive Screwdriver Shaft, T15, self-retaining, quick coupling



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319.01 Depth Gauge



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323.023 1.6 mm Wire Sleeve



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323.26 2.7 mm Universal Drill Guide



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324.031 Threaded Plate Holder, long



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511.773 Torque Limiting Attachment, 1.5 Nm, quick coupling



## 3.5 mm LCP Distal Tibia T-Plate Set (01.112.050)

### Graphic Case

60.112.050 3.5 mm LCP Distal Tibia T-Plate Graphic Case

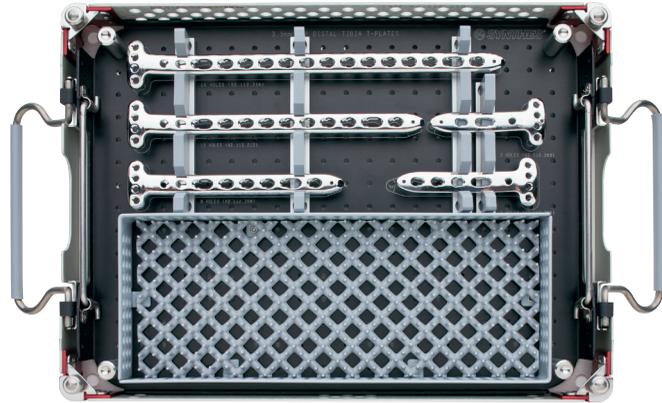
### Implants

3.5 mm LCP Distal Tibia T-Plates

	Holes	Length (mm)
02.112.203	3	64
02.112.205	5	90

3.5 mm LCP Posterior Distal Tibia T-Plates

	Holes	Length (mm)
02.112.208	8	132
02.112.212	12	184
02.112.216	16	236



### Required Set

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

### Also Available

01.240.001 Screw Removal Set

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

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



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West Chester, PA 19380

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1101 Synthes Avenue  
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Luzernstrasse 21  
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