LCP™ Distal Fibula Plates

Part of the DePuy Synthes locking compression plate (LCP) 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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LCP Distal Fibula Plates

Overview

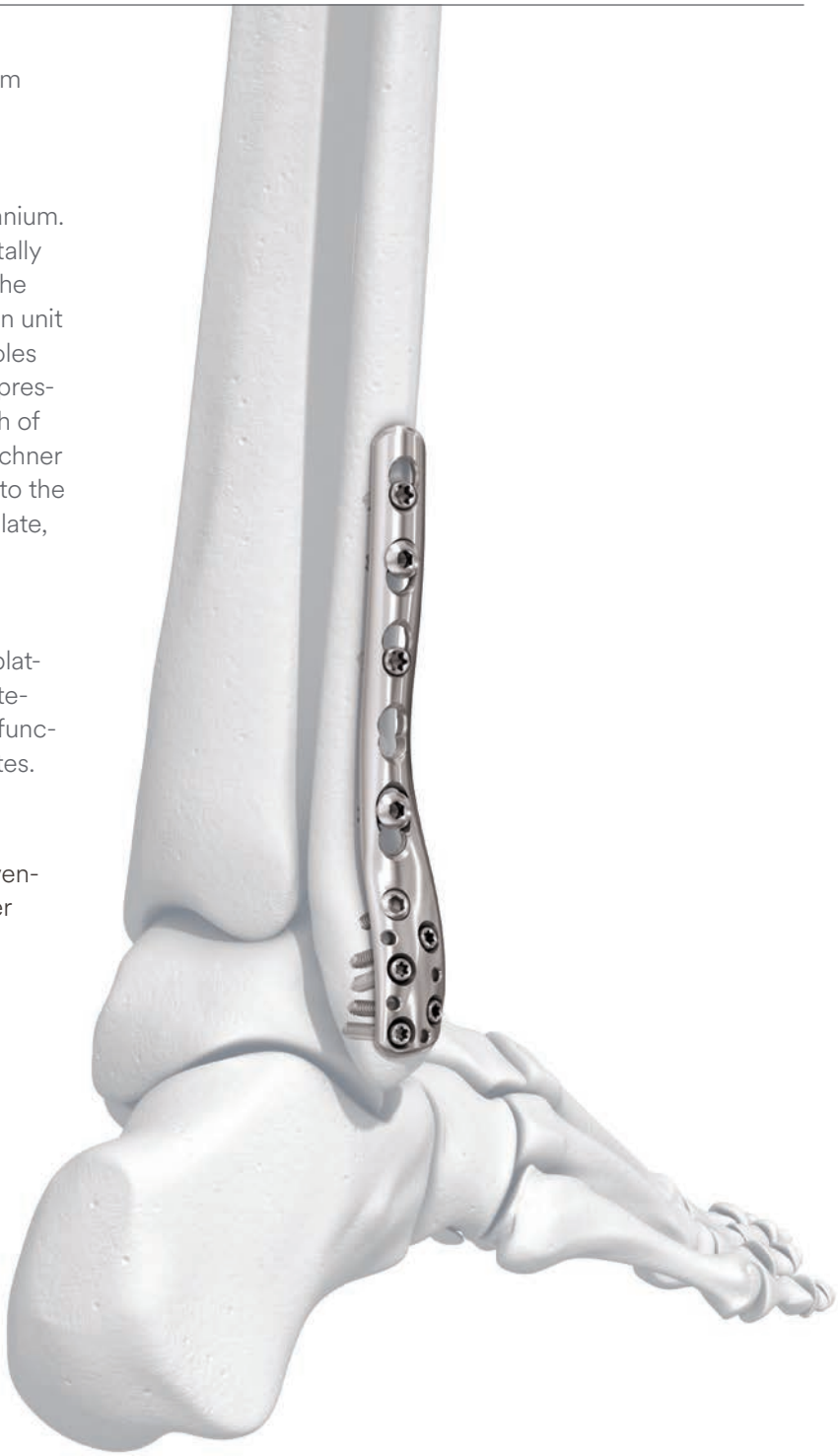
The LCP™ Distal Fibula Plates are part of the DePuy Synthes locking compression plate system that merges locking screw technology with conventional plating techniques.

The plates are available in stainless steel and titanium. The plates are anatomically contoured, both distally and along the fibular shaft. The combi-holes in the LCP plate shaft combine a dynamic compression unit (DCU) hole with a locking screw hole. Combi-holes provides flexibility with the options of axial compression and locking capability throughout the length of the plate shaft. Kirschner wire holes accept Kirschner wires (up to 2.0 mm) to temporarily fix the plate to the distal fibula, and to confirm the location of the plate, relative to the distal fibula.

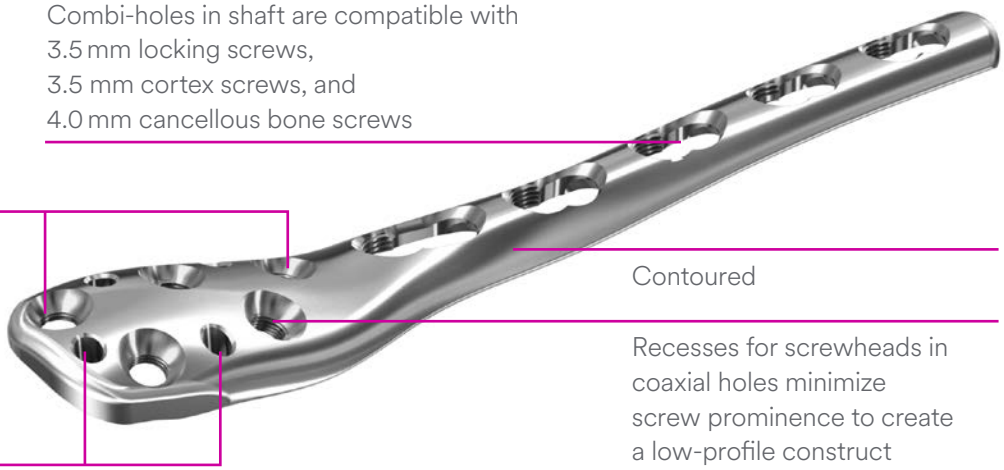
Locking screws provide the ability to create a fixed-angle construct while using standard AO plating techniques. These screws do not rely on plate-to-bone compression to resist patient load, but function similarly to multiple, small, angled blade plates.

■ Note:

For information on fixation principles using conventional and locked plating techniques, please refer to the LCP Locking Compression Plate Surgical Technique.



LCP Lateral Distal Fibula Plate



Combi-holes in shaft are compatible with 3.5 mm locking screws, 3.5 mm cortex screws, and 4.0 mm cancellous bone screws

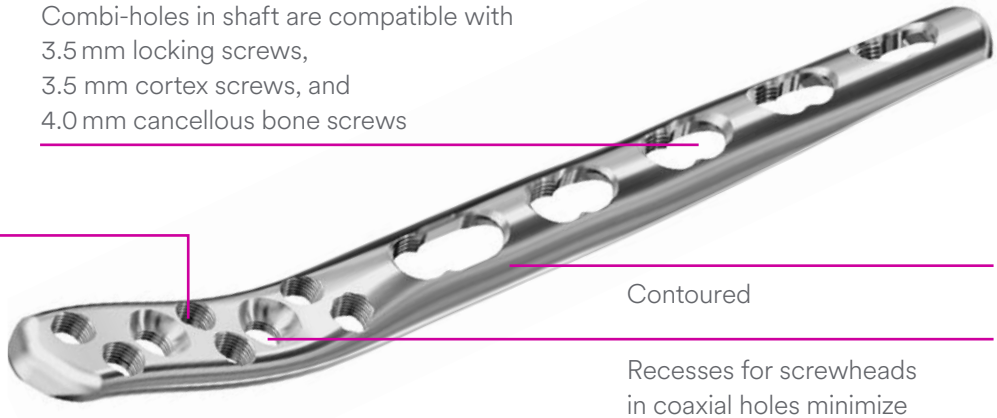
Five coaxial distal holes are compatible with 2.4 mm and 2.7 mm locking and 2.7 mm cortex screws to provide multiple screw options

Contoured

Recesses for screwheads in coaxial holes minimize screw prominence to create a low-profile construct

Four Kirschner wire holes in the head are compatible with 2.0 mm Kirschner wires

LCP Posterolateral Distal Fibula Plate



Combi-holes in shaft are compatible with 3.5 mm locking screws, 3.5 mm cortex screws, and 4.0 mm cancellous bone screws

Six round locking holes and two coaxial holes are compatible with 2.4 mm and 2.7 mm locking and 2.7 mm cortex screws to provide multiple screw options

Contoured

Recesses for screwheads in coaxial holes minimize screw prominence to create a low-profile construct

Screw profiles in coaxial hole

Cortex screw 2.7

Locking screw 2.7 (head 2.4)

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

The AO Principles of Fracture Management

Mission

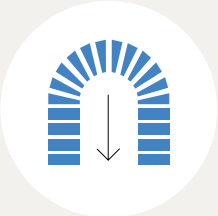
The AO's mission is promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

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.

Preoperative Planning

■ Note:

The techniques for implanting the lateral and postero-lateral distal fibula plates are similar. The following describes implantation of a lateral plate.

Complete the preoperative radiographic assessment and prepare the preoperative plan. Determine plate length and distal screw locations to ensure proper plate selection and position, and screw placement in the distal fibula.

Required sets

Modular small fragment instrument trays*

68.122.013	Modular Tray for Small Fragment Basic Instruments
68.122.015	Modular Tray for Screw Insertion 3.5/4.0 mm
68.104.007	Modular Tray for Screw Insertion 2.4/2.7 mm

* It is also possible to use the non-modular LCP Small Fragment Instrument Set and LCP Compact Foot Basic Instruments or other Instrument Sets for LCP 2.4/2.7.

Modular screw rack

All screws are available in a modular screw rack which can be arranged as needed.

68.122.020	Modular Insert 2/3, for Modular Screw Rack for Screws 3.5/4.0 mm
or 68.122.060	Modular Insert 1/3, for Modular Screw Rack for Screws 3.5 mm
68.122.021	Modular Insert 1/3, for Modular Screw Rack for Screws 2.7/2.4 mm
68.000.113	Screw Rack, size 1/2, for Modular Insert

Optional modular small fragment instrument trays

68.122.019	Modular Tray for Small Fragment Bending Instruments
68.122.014	Modular Tray for Small Fragment Reduction Instruments

Patient Positioning and Approach

1. Position patient

Position the patient supine with a sandbag (bump) underneath the buttock of the affected side. This allows the foot to lie in a neutral position and prevents the normal external rotation of the leg. Elevate the leg on a padded rest with the knee slightly flexed to assist placement in a neutral position.

Visualization of the distal fibula under image intensification in both the lateral and AP views is recommended.

Note:

The direction of the locking screws is determined by the design of the plate, based on the average anatomy of the distal fibula. If manual contouring of the plate in the metaphyseal area is necessary, or if the patient's normal anatomy is not well matched by the implant, the distal screw trajectories will be altered. The screw trajectories can be confirmed using the Kirschner wire screw placement verification technique.

2. Approach

Make a straight lateral or posterolateral surgical incision to expose the fibular fracture, the distal fibula, and the fibular diaphysis. A lateral incision directly over the fibula can accentuate plate prominence and the wound closure will be directly over the implant.

Alternatively, the incision can be placed along the posterolateral border of the fibula where there is more soft tissue coverage.

▲ Precaution:

Be careful not to damage the superficial peroneal nerve proximally and anteriorly, or the sural nerve posteriorly.

Deep dissection allows exposure of the fibula along its length. An extraperiosteal approach to the fibula proximal to the fracture is usually preferred.

Implantation

1. Reduce fracture

Expose and clean the fracture site and reduce the fracture. It is critical that fibular length, alignment and rotation are accurately restored.

In spiral or oblique fracture patterns, a clamp can be applied for reduction. Provisional reduction can be maintained with pointed reduction forceps or Kirschner wires.

Alternatively, in some fracture patterns, the plate can be used to assist and guide the reduction. This may be especially important in comminuted fractures where a bridging technique is used.

■ Note:

Application of an external fixator or distractor may facilitate obtaining fibular length, fracture reduction and visualization of the distal tibiofibular joint.

Confirm the reduction under image intensification. Temporary reduction can be obtained with clamps, multiple Kirschner wires, or independent lag screws if the fracture pattern allows. Kirschner wires can be placed through the distal end of the plate to assist with temporary maintenance of the reduction and for plate placement. Options for maintaining the reduction depend on the fracture configuration and include:

- Independent lag screws
- Lag screws through the plate
- Locking screws through the plate

Locking screws do not provide interfragmentary compression; compression must be achieved with standard lag screws or by using the plate itself to compress the fracture. The fracture must be reduced and compressed before fixation of the LCP distal fibula plate with locking screws in simple fracture configurations. If a bridge plate technique is planned, the implant can be secured proximally and distally using locking screws, if the fibular length, alignment and rotation are correct.

2. Insert plate

Expose the fibula proximally as needed for plate application. In the majority of circumstances, an open approach for plate application will be performed.

Occasionally, a sub muscular plate insertion will be performed using a minimally invasive technique. The LCP Lateral Distal Fibula Plate can be slid along the lateral fibular shaft and positioned with the distal end of the plate approximately 5 mm from the tip of the fibula.

■ Note:

The LCP Posterolateral Distal Fibula Plate is typically positioned 8–10 mm from the tip of the fibula.

3. Position plate and fix provisionally

Temporarily hold the plate in position using any of the following options. These options also prevent plate rotation while inserting the first locking screw:

- Standard plate holding forceps
- Kirschner wires placed through the plate distally and/or proximally
- 2.7 mm cortex screw placed in one of the distal holes
- 3.5 mm cortex screw placed in a combi-hole

After plate insertion, check plate placement and alignment under image intensification. Ensure proper reduction before inserting the first locking screw. Once locking screws are inserted, further reduction is not possible without loosening the locking screws.

Verify plate placement under image intensification to determine if final screw and plate placement are acceptable.

4. Distal screw insertion

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.

■ Note:

To secure the plate to the fibula before locking screw insertion, it is recommended to pull the plate to the bone using a cortex screw.

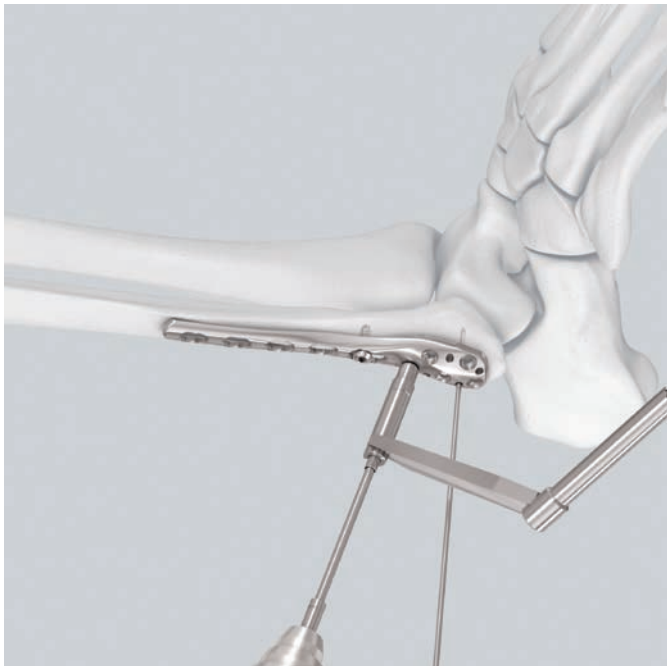
4a. Nonlocking screw insertion – fixation with 2.7 mm cortex screws

Instruments	
311.430	Handle with Quick Coupling, length 110 mm
310.260	Drill Bit ∅ 2.7 mm, length 100/75 mm, 2-flute, for Quick Coupling
314.467 or 313.302	Screwdriver Shaft, STARDRIVE™, T8, self-holding Screwdriver STARDRIVE™, T8, cylindrical, with Groove, shaft ∅ 3.5 mm
319.005	Depth Gauge for Screws ∅ 2.0 and 2.4 mm, measuring range up to 40 mm
323.062	Drill Bit ∅ 2.0 mm, with double marking, length 140/115 mm, 3-flute, for Quick Coupling
323.260	Universal Drill Guide 2.7

Use the ∅ 2.0 mm drill bit through the 2.7 mm universal drill guide to predrill the bone.

Measure for screw length using the depth gauge.

Select and insert the appropriate 2.7 mm cortex screw using the T8 STARDRIVE™ screwdriver or the T8 STARDRIVE screwdriver shaft attached to the handle.



4b. Locking screw insertion

If a locking screw is 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.

Instruments	
311.430	Handle with Quick Coupling, length 110 mm
or 03.110.005	Handle for Torque Limiters 0.4/0.8/1.2 Nm
323.061	LCP™ Drill Sleeve 2.7 (head LCP 2.4), with Scale up to 60 mm, for Drill Bits ∅ 2.0 mm
323.062	Drill Bit ∅ 2.0 mm, with double marking, length 140/115 mm, 3-flute, for Quick Coupling
314.467	Screwdriver Shaft, STARDRIVE™, T8, self-holding
319.005	Depth Gauge for Screws ∅ 2.0 and 2.4 mm, measuring range up to 40 mm
319.010	Depth Gauge for Screws ∅ 2.7 to 4.0 mm, measuring range up to 60 mm
511.776	Torque Limiting Attachment, 0.8 Nm, quick coupling

Screw the LCP drill sleeve into one of the 2.4 mm locking holes until fully seated. Use the ∅ 2.0 mm drill bit to drill to the desired depth and check the depth of the drill bit under image intensification.

Determine the required length of the screw by using the scale on the drill guide. If a single marking is visible on the drill bit, the scale from 0–30 mm applies; if a double marking is visible, the scale from 30–60 mm applies.

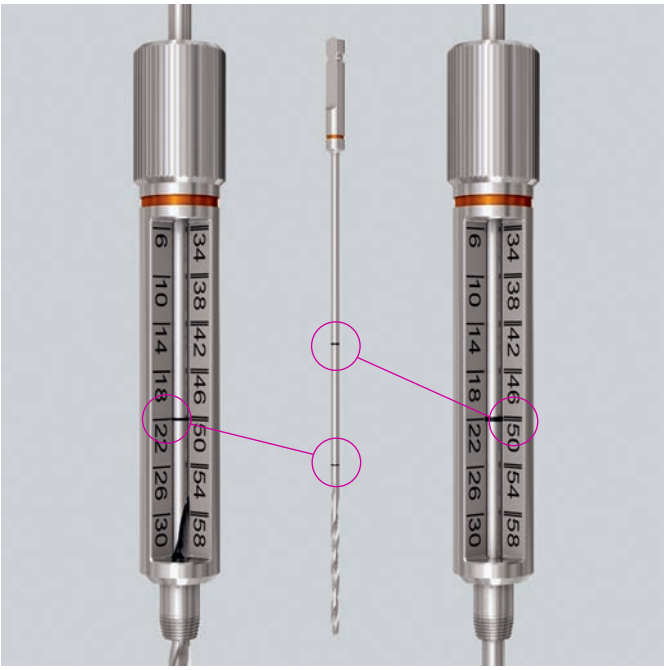
Option: Use a depth gauge to check screw length.

■ Note:

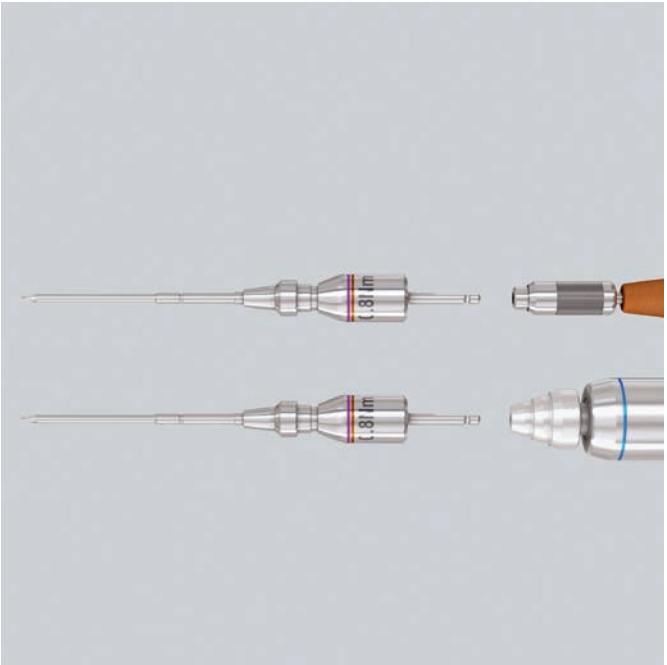
If depth gauge 319.010 is used for 2.7 mm screws, subtract 4 mm from the measured length to obtain the correct screw length.

▲ Precaution:

When determining appropriate screw length, ensure that the screw tip will not protrude past the articular surface.



The 2.7 mm locking screw can be inserted manually or with power. For power insertion, use the T8 STARDRIVE screwdriver shaft attached to the 0.8 Nm torque limiting attachment. For manual insertion, use a handle with quick coupling. Insert additional locking screws, as planned.



5. Shaft screw insertion

5a. Nonlocking screw insertion – fixation with 3.5 mm cortex screws

Instruments	
310.250	Drill Bit ∅ 2.5 mm, length 110/85 mm, 2-flute, for Quick Coupling
310.350	Drill Bit ∅ 3.5 mm, length 110/85 mm, 2-flute, for Quick Coupling
311.431	Handle with Quick Coupling
314.030	Screwdriver Shaft, hexagonal, small, ∅ 2.5 mm
or 314.070	Screwdriver, hexagonal, small, ∅ 2.5 mm, with Groove
314.116	Screwdriver Shaft STARDRIVE™ 3.5, T15, self-holding, for AO/ASIF Quick Coupling
or 314.115	Screwdriver STARDRIVE™ 3.5, T15
319.010	Depth Gauge for Screws ∅ 2.7 to 4.0 mm, measuring range up to 60 mm
323.360	Universal Drill Guide 3.5

Use the ∅ 2.5 mm drill bit through the 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 3.5 mm cortex screw using the appropriate recessed screwdriver.

5b. Locking screw insertion

Instruments	
323.027	LCP™ Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm
310.284	LCP™ Drill Bit ∅ 2.8 mm with Stop, length 165 mm, 2-flute, for Quick Coupling
314.030	Screwdriver Shaft, hexagonal, small, ∅ 2.5 mm
314.116	Screwdriver Shaft STARDRIVE™ 3.5, T15, self-holding, for AO/ASIF Quick Coupling
319.010	Depth Gauge for Screws ∅ 2.7 to 4.0 mm, measuring range up to 60 mm
511.770/773	Torque Limiter, 1.5 Nm
397.705/ 311.431	Handle for Torque Limiter /Handle with Quick Coupling

Carefully screw the LCP drill sleeve into the threaded hole of the plate. Predrill the screw hole with a LCP drill bit ∅ 2.8 mm through both cortices. Read the required screw length directly from the drill bit

Option: Use depth gauge to check length of screw.

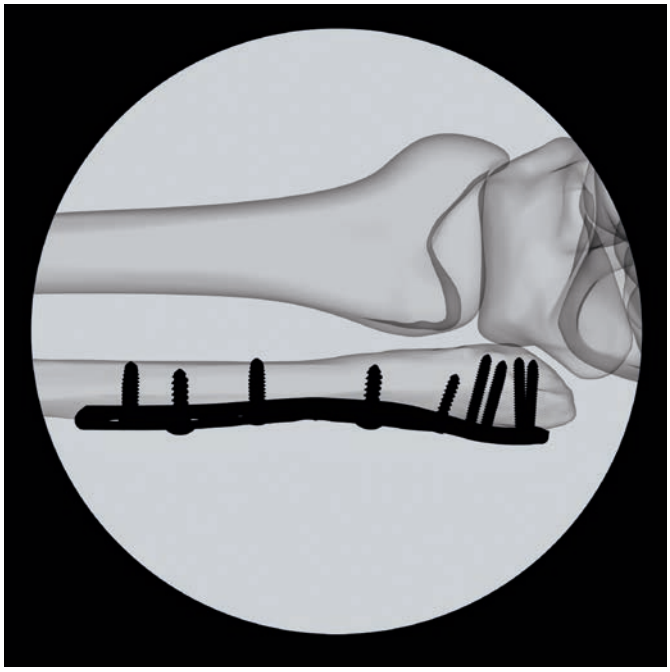
Insert the locking screw with the screwdriver, mounted on torque Limiter 1.5 Nm. Insert screw manually or by machine until a click is heard. If a power tool is used, reduce speed when screwing the head of the locking screw into the plate.

Hold the plate securely on the bone to prevent plate rotation as the screw is locked to the plate.

Repeat the procedure until all required shaft holes are used. Finally, check the locking of the screw.

6. Confirm reduction and fixation

Carefully assess the final reduction and fixation via direct visualization and image intensification. Confirm the stability of the fixation and that there is unrestricted motion at the ankle joint. Using AP and lateral radiographic visualization, confirm reduction and appropriate positioning of the plate and screws.



Implant Removal

Optional instruments

314.030	Screwdriver Shaft, hexagonal, small, ∅ 2.5 mm
314.116	Screwdriver Shaft STARDRIVE™ 3.5, T15, self-holding, for AO/ASIF Quick Coupling
309.521	Extraction Screw for Screws ∅ 3.5 mm
309.510	Extraction Screw, conical, for Screws ∅ 1.5 and 2.0 mm

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 a screw cannot be removed with the screwdriver (e.g. if the hexagonal or STARDRIVE recess of the locking screw
is damaged or if the screw is stuck in the plate), use the T-Handle with Quick-Coupling (311.440) to insert the conical Extraction Screw (309.520 or 309.521) into the screw head, and unscrew the screw in a counterclockwise direction.

Plates

LCP Lateral Distal Fibula Plates*

Stainless steel	Titanium	Holes	Length mm	Left/ right
02.112.136	04.112.136	3	73	right
02.112.137	04.112.137	3	73	left
02.112.138	04.112.138	4	86	right
02.112.139	04.112.139	4	86	left
02.112.140	04.112.140	5	99	right
02.112.141	04.112.141	5	99	left
02.112.142	04.112.142	6	112	right
02.112.143	04.112.143	6	112	left
02.112.144	04.112.144	7	125	right
02.112.145	04.112.145	7	125	left
02.112.148	04.112.148	9	151	right
02.112.149	04.112.149	9	151	left
02.112.152	04.112.152	11	177	right
02.112.153	04.112.153	11	177	left
02.112.156	04.112.156	13	203	right
02.112.157	04.112.157	13	203	left
02.112.160	04.112.160	15	229	right
02.112.161	04.112.161	15	229	left

* All plates are available sterile packed. For sterile implants, add suffix “S” to article number.

LCP Posterolateral Distal Fibula Plates*

Stainless steel	Titanium	Holes	Length mm	Left/ right
02.112.106	04.112.106	3	77	right
02.112.107	04.112.107	3	77	left
02.112.108	04.112.108	4	90	right
02.112.109	04.112.109	4	90	left
02.112.110	04.112.110	5	103	right
02.112.111	04.112.111	5	103	left
02.112.112	04.112.112	6	116	right
02.112.113	04.112.113	6	116	left
02.112.114	04.112.114	7	129	right
02.112.115	04.112.115	7	129	left
02.112.118	04.112.118	9	155	right
02.112.119	04.112.119	9	155	left
02.112.122	04.112.122	11	181	right
02.112.123	04.112.123	11	181	left
02.112.126	04.112.126	13	207	right
02.112.127	04.112.127	13	207	left
02.112.130	04.112.130	15	233	right
02.112.131	04.112.131	15	233	left

* All plates are available sterile packed. For sterile implants, add suffix “S” to article number.

Screws

2.4 mm locking screws, self-tapping

X12.806– X12.830	Locking Screw STARDRIVE™ ∅ 2.4 mm, self-tapping, length 6–30 mm

- Used in the distal locking holes

2.7 mm locking screws (head LCP 2.4), self-tapping

X02.210– X02.260	Locking Screw STARDRIVE™ ∅ 2.7 mm (head LCP™ 2.4), self-tapping, length 10–60 mm

- Used in the distal locking holes

2.7 mm cortex screws, self-tapping

X02.870– X02.900	Cortex Screw STARDRIVE™ ∅ 2.7 mm, self-tapping, length 10–60 mm

- May be used in the distal locking holes

2.7 mm locking screw, self-tapping*

X02.920– X02.960	Locking Screw Ø 2.7 mm (head LCP™ 3.5), self-tapping, length 20–60 mm

2.7 mm cortex screw, self-tapping

X02.962– X02.969	Cortex Screw STARDRIVE™ Ø 2.7 mm, self-tapping, length 42–60 mm

* Not available "TS" packed

3.5 mm locking screws, self-tapping

X12.101– X12.125	Locking Screw STARDRIVE™ ∅ 3.5 mm, self-tapping, length 10–65 mm

- Used in the locking portion of the combi-holes in the plate shaft

3.5 mm cortex screws, self-tapping

0X.200.010– 0X.200.060	Cortex Screw STARDRIVE™ ∅ 3.5 mm, self-tapping, length 10–60 mm

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

4.0 mm cancellous bone screws

X06.010– X06.060	Cancellous Bone Screw ∅ 4.0 mm, fully threaded, length 10–60 mm
X07.010– X07.060	Cancellous Bone Screw ∅ 4.0 mm, length 10/5–60/16 mm

- May be used in the DCU portion of the combi-holes in the plate shaft
- Fully or partially threaded shaft

X=2 Stainless Steel
X=4 Titanium

All screws are available sterile packed. For sterile implants, add suffix “S” or “TS” to article number.

Instruments for screws 2.4/2.7

03.110.005	Handle for Torque Limiters 0.4/0.8/1.2 Nm	
310.260	Drill Bit ∅ 2.7 mm, length 100/75 mm, 2-flute, for Quick Coupling	
311.430	Handle with Quick Coupling, length 110 mm	
313.302	Screwdriver STARDRIVE™, T8, cylindrical, with Groove, shaft ∅ 3.5 mm	
314.467	Screwdriver Shaft, STARDRIVE™, T8, self-holding	
319.005	Depth Gauge for Screws ∅ 2.0 and 2.4 mm, measuring range up to 40 mm	
319.010	Depth Gauge for Screws ∅ 2.7 to 4.0 mm, measuring range up to 60 mm	
323.061	LCP™ Drill Sleeve 2.7 (head LCP™ 2.4), with Scale up to 60 mm, for Drill Bits ∅ 2.0 mm	

323.062	Drill Bit ∅ 2.0 mm, with double marking, length 140/115 mm, 3-flute, for Quick Coupling	
323.260	Universal Drill Guide 2.7	
511.776	Torque Limiter, 0.8 Nm, with AO/ASIF Quick Coupling	

Instruments for screws 3.5/4.0

310.250	Drill Bit ∅ 2.5 mm, length 110/85 mm, 2-flute, for Quick Coupling	
310.284	LCP™ Drill Bit ∅ 2.8 mm with Stop, length 165 mm, 2-flute, for Quick Coupling	
310.350	Drill Bit ∅ 3.5 mm, length 110/85 mm, 2-flute, for Quick Coupling	
311.431	Handle with Quick Coupling	
314.030	Screwdriver Shaft, hexagonal, small, ∅ 2.5 mm	
314.070	Screwdriver, hexagonal, small, ∅ 2.5 mm, with Groove	
314.115	Screwdriver STARDRIVE™ 3.5, T15	
314.116	Screwdriver Shaft STARDRIVE™ 3.5, T15, self-holding, for AO/ASIF Quick Coupling	
319.010	Depth Gauge for Screws ∅ 2.7 to 4.0 mm, measuring range up to 60 mm	
323.027	LCP™ Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm	

323.360	Universal Drill Guide 3.5	
397.705	Handle for Torque Limiter Nos. 511.770 and 511.771	
511.770	Torque Limiter, 1.5 Nm, for Compact Air Drive and Power Drive	
511.773	Torque Limiter, 1.5 Nm, for AO/ASIF Quick Coupling	

MRI Information

Torque, Displacement and Image Artifacts according to ASTM F 2213, ASTM F 2052 and ASTM F 2119

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 F 2182

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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