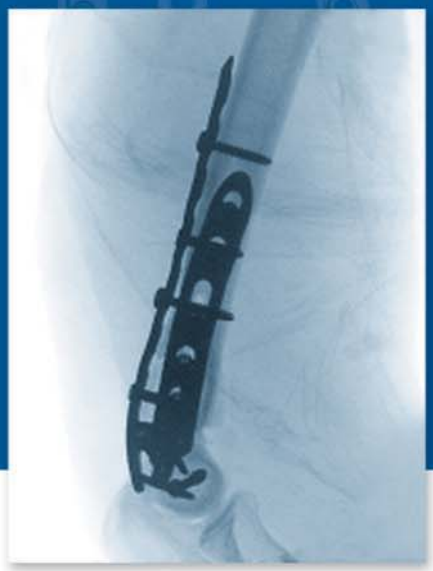
3.5 mm LCP®
Distal Humerus Plates
Technique Guide



SYNTHES®

Original Instruments and Implants of the Association for the Study of Internal Fixation — AO ASIF

The 3.5 mm LCP® Distal Humerus Plates

Indications

The Synthes 3.5 mm LCP® Distal Humerus Plates are indicated for intra-articular fractures of the distal humerus, comminuted supracondylar fractures, osteotomies, and nonunions of the distal humerus.

Additional Set Required

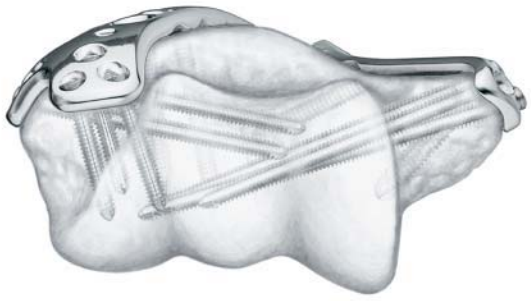
Small Fragment LCP® Instrument and Implant Set [105.434] or [145.434].

Features

- Eighteen (18) posterolateral and medial plates allow implant placement to address the individual fracture pattern.
- Plates are precontoured for anatomical fit.
- Combination (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. A fixed-angle construct provides advantages in osteopenic bone or multifragment fractures where traditional screw purchase is compromised.
- Choice of three lengths of each plate type eliminates the need to cut plates.
- Posterolateral plates offer fixation of the capitulum with three distal screws.

Two-plate technique for distal humerus fractures

Increased stability can be gained from two-plate fixation of distal humerus fractures. The two-plate construct creates a girder-like structure which strengthens the fixation.[1] The posterolateral plate functions as a tension band during elbow flexion, and the medial plate supports the medial side of the distal humerus.



1. Thomas P. Rüedi, et al, ed. *AO Principles of Fracture Management,* New York: Thieme, 2000. pg. 315.

The 3.5 mm LCP® Distal Humerus Plates

- Limited-contact design shaft with 3, 5, and 7 Combi™ holes
- The shaft holes accept 3.5 mm locking screws* in the threaded portion or 3.5 mm cortex screws,* 4.0 mm cortex screws** or 4.0 mm cancellous bone screws* in the compression portion
- Available for left and right humeri
- Made of 316L stainless steel or commercially pure titanium
- Three distal locking holes accept 2.7 mm locking screws or 2.4 mm cortex screws
- Posterolateral plate with lateral support offers option for two additional screws placed lateral to medial

241.286 241.276 241.266

241.287 241.275 241.267

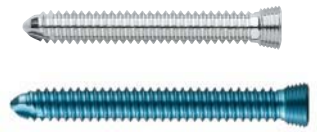
**Available in the Small Fragment LCP® Instrument and Implant Set*
***Available in the Modular Foot Instrument and Implant Set*

Screws

2.7 mm Locking Screw, with T8 StarDrive recess, self-tapping

- Same low-profile head size as 2.4 mm Locking Screw
- Threaded, conical head locks securely into the plate to provide angular stability
- Locked screws allow unicortical screw fixation and load transfer to the near cortex
- StarDrive recess provides improved torque transfer and high strength
- StarDrive recess mates with self-retaining screwdriver

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



x02.210–x02.260

2.7 mm Locking Screw, with T8 StarDrive recess

2.4 mm Cortex Screws, with T8 StarDrive recess, self-tapping

- For use in round holes
- StarDrive recess provides improved torque transfer and high strength
- StarDrive recess mates with self-retaining screwdriver

Note: *In the surgical report please mention the StarDrive recess in both the 2.7 mm Locking Screw and 2.4 mm Cortex Screw. This will remind the surgeon to have a StarDrive screwdriver available if the implants are removed.*

x01.760–x01.790

2.4 mm Cortex Screw, self-tapping, with T8 StarDrive recess

Featured Instruments

For the 3.5 mm LCP® Distal Humerus Plate Set

StarDrive Screwdriver Shaft, T8 [314.467]

Holds 2.7 mm Locking Screws with StarDrive recess and 2.4 mm Cortex Screws with StarDrive recess during insertion and removal.

Holding Sleeve [314.468]

Used on the StarDrive Screwdriver Shaft [314.467] to allow the plate to be pulled to the bone surface before the locking screw is locked into the plate.

2.0 mm Drill Bit with depth mark [323.062]

Used to predrill the hole for the self-tapping 2.7 mm Locking Screws. The mark on the drill bit gives a direct measurement of the screw length when used with the 2.0 mm Threaded Drill Guide [323.061].

2.0 mm Threaded Drill Guide [323.061]

Centers the 2.0 mm Drill Bit to ensure engagement of the locking screw into the threaded plate hole. The Threaded Drill Guide provides direct measurement of the screw length when used with Drill Bit with depth mark [323.062].

Torque Limiting Attachment, 0.8 Nm [511.776]

For insertion of 2.4 mm and 2.7 mm Locking Screws with the StarDrive Screwdriver Shaft [314.467]

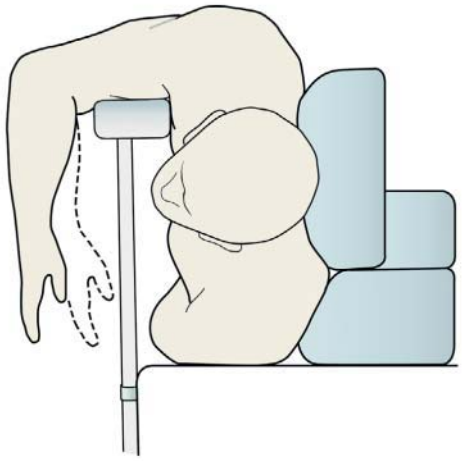
Note: *Never use the StarDrive Screwdriver Shaft [314.467] with power equipment unless used with a Torque Limiting Attachment.*

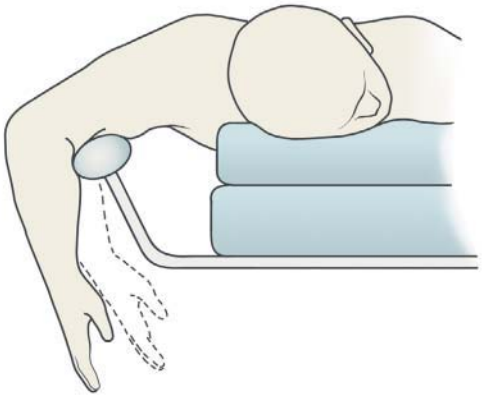
The 3.5 mm LCP® Distal Humerus Plates

General Notes

Patient positioning

The lateral decubitus position is usually chosen. In severe C3 fractures, the fully prone position can be used if the patient is otherwise fit. The arm is rested on a padded bar allowing elbow flexion of 120°.

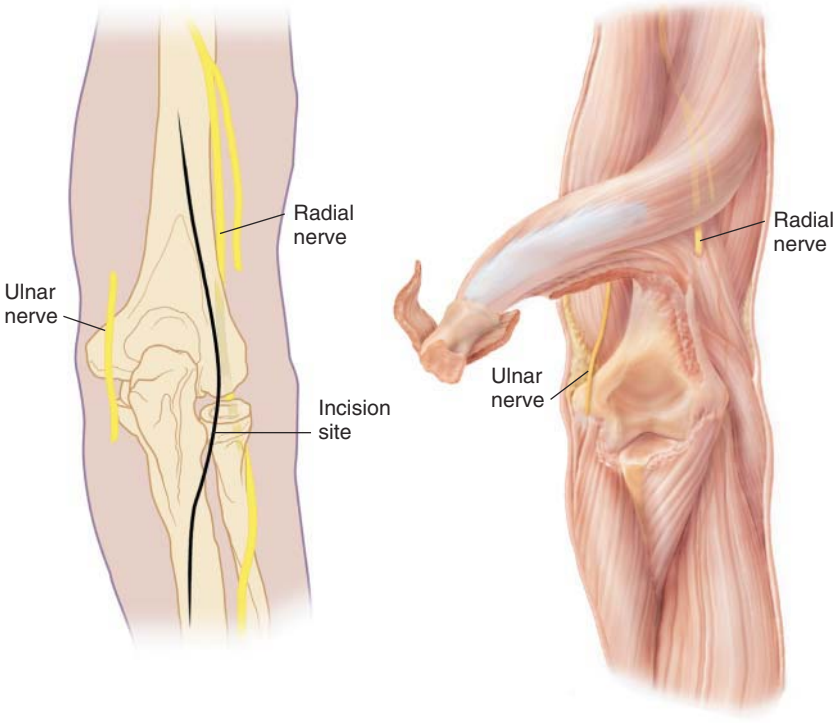




Surgical approach

Fractures are approached through a slightly curved posterior incision just radial to the olecranon. The ulnar nerve is identified; it may need to be isolated and elevated at the ulnar epicondyle.

For comminuted fractures a distally pointed chevron olecranon osteotomy exposes the fracture best and allows stable fixation.



Surgical Technique

Overview

- Reduce articular surface
- Determine plate length and placement
- Choose 3.5 mm LCP posterolateral plate with or without lateral support
- Bend plates if necessary
- Verify plate placement with 2.0 mm K-wires
- Apply posterolateral plate—insert first screw in elongated shaft hole, then insert distal screws
- Apply medial plate—insert first screw in elongated shaft hole, then insert distal screws
- Use 3.5 mm locking screws or 3.5 mm cortex screws to fix the shafts of the posterolateral and medial plates

Reduce fracture and fix temporarily

For C-type fractures, reduce the articular fragments of the distal block under image intensification and use Kirschner wires and/or pointed reduction forceps for temporary fixation. Temporarily fix the distal block to the shaft using K-wires and/or forceps in both columns to ensure that the anatomy of the distal humerus is restored. Ensure that K-wires or forceps will not interfere with subsequent plate placement. If necessary, reduce the articular surface using lag screws.

Determine plate length

Choose plate lengths that offer sufficient fixation proximal to the fracture lines. To prevent extensive diaphyseal stress, it is recommended that the medial and lateral plates are not the same length. For example, use a 5-hole medial plate with a 7-hole posterolateral plate.

Important: *To achieve sufficient stability for early mobilization, use the two-plate technique described on inside front cover.*

Choose 3.5 mm LCP posterolateral plate with or without lateral support

For the posterolateral side, choose the type of implant to be used. The posterolateral plates allow screw insertion in a posterior-anterior direction. The plate with lateral support allows additional screw insertion through the lateral epicondyle in a lateral-medial direction.

Note: *On very small humeri the support may protrude extensively over the lateral epicondyle, in which case the use of the plate without support is recommended.*

Bending the plate

Due to varying patient anatomy, slight bending might be necessary for the posterolateral and medial plates. Contour plates as needed using the Bending Irons [329.04] and [329.05].* Alternatively, Bending Pliers for 2.7 mm and 3.5 mm plates [329.15] may be used.

Bending the lateral support flange of the posterolateral plate is not recommended since it may alter the screw trajectory, or prevent the use of a screw in the distal part of the lateral plate, due to screw collision.

Note: *If only cortex screws are used, the plates must be congruent with the surface of the bone and bending may be required. Bending should be limited to the region of the Combi holes.*

Contouring the posterolateral plate using the Bending Irons [329.04] and [329.05].

**Available in the Small Fragment LCP® Instrument and Implant Set*

Apply Posterolateral Plate with lateral support

1 Determine placement of posterolateral plate

Position the plate on the posterolateral aspect of the distal humerus with the distal spoon-shape portion covering the nonarticulating part of the capitulum, and with the lateral support extending over the most protruding tip of the lateral epicondyle, just proximal to the lateral collateral ligament insertion. Ensure that the shaft portion is positioned at a safe distance from the olecranon fossa.

The position of the plate should allow distal screw insertion through the lateral flange to reach far into the trochlea. Screw trajectory may be visualized with the 2.0 mm Threaded Drill Guide [323.061] and K-wire.

Screw trajectory may be visualized with the 2.0 mm Threaded Drill Guide and K-wire.

Preliminary fixation of the plate shaft to the bone

After reducing the fracture, apply the plate and insert a 3.5 mm Cortex Screw through the DCU portion of the elongated Combi hole using the Universal Drill Guide [323.36]* and the 2.5 mm Drill Bit [310.25]* to predrill both cortices.

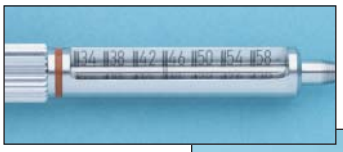
Insert the screw using the Small Hexagonal Screwdriver [314.02]* for manual insertion or the Hexagonal Screwdriver Shaft [314.03]* with a power drive or a handle. **Do not tighten the screw.**

Insert a 3.5 mm Cortex Screw through the DCU portion of the elongated Combi hole.

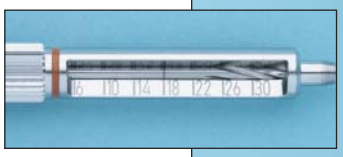
2 Insert distal screws

Insert 2.7 mm Locking Screw

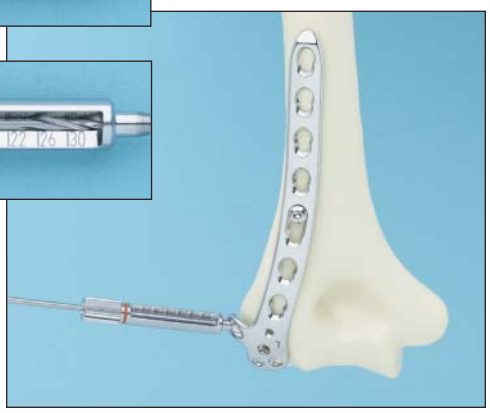
Screw the 2.0 mm Threaded Drill Guide with depth gauge [323.061] into one of the threaded holes of the distal part of the plate and predrill a hole with the 2.0 mm Drill Bit with depth mark [323.062]. Check the depth of the drill bit under image intensification. Determine the length of the screw by using 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 34–60 mm applies.



With double marking visible, scale reads from 34–60 mm.



With single marking visible, scale reads from 0–30 mm.



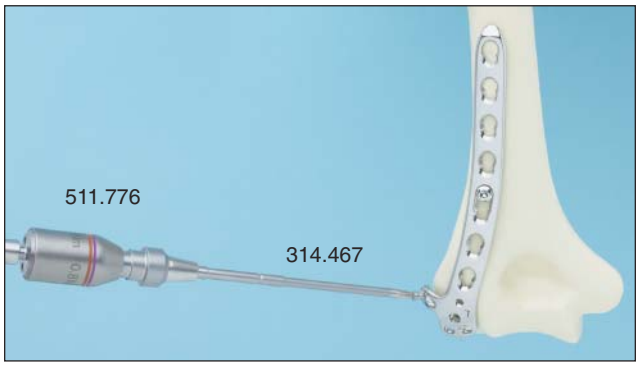
*Available in the Small Fragment LCP® Instrument and Implant Set

Apply posterolateral plate with support (continued)

2 Insert distal screws (continued)

The Depth Gauge [319.006] may also be used to establish approximate screw length.

The 2.7 mm Locking Screw can be inserted manually or with power. For power insertion, use the T8 StarDrive Screwdriver Shaft [314.467] attached to the 0.8 Nm Torque Limiting Attachment [511.776]. For manual insertion, use a Handle with quick coupling [311.43].* Use the Holding Sleeve, for StarDrive Screwdriver Shaft [314.468], if necessary. Repeat for all distal holes to be used.



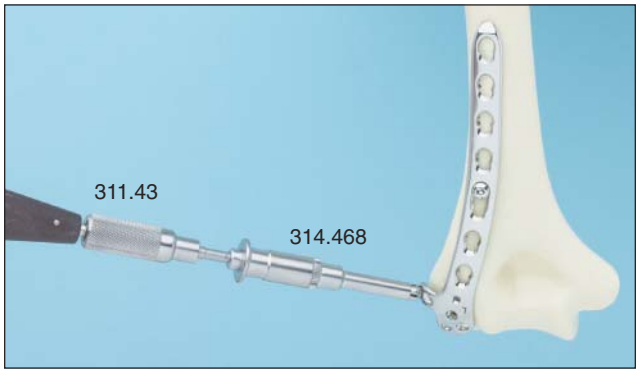
The Torque Limiting Attachment must be used for power insertion.

Option—Insert 2.4 mm Cortex Screw

Use the 2.4 mm Universal Drill Guide [323.202] with the 1.8 mm Drill Bit [310.510] for the threaded hole and the 2.4 mm drill bit for the gliding hole. Determine the length of the screw by using the Depth Gauge [319.006].

For power insertion, use the T8 StarDrive Screwdriver Shaft [314.467] attached to the 0.8 Nm Torque Limiting Attachment [511.776]. For manual insertion, use a Handle with quick coupling [311.43].*

Note: *In the distal portion of the posterolateral plate, pay close attention to the posterior to anterior screw holes during drilling and screw insertion. Confirm screw placement and length with image intensification during movement of the elbow to ensure screws are not exiting through the joint.*



The Handle and Holding Sleeve are used for manual insertion.

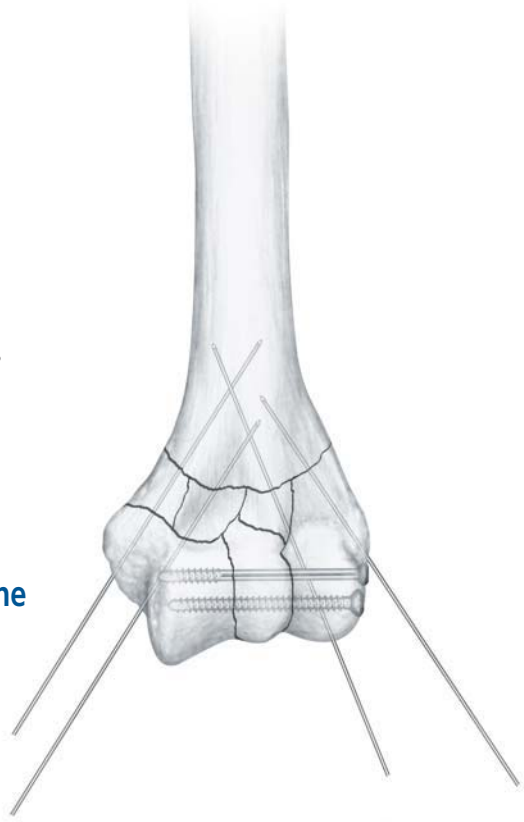
**Available in the Small Fragment LCP® Instrument and Implant Set*

Alternatively: apply posterolateral plate without support

1 Determine plate placement

Please note: When using the posterolateral plate without support, it is important to reduce and fix the distal block with lag screws according to the *AO Principles of Fracture Management*.[2]

Reduce the distal block to the shaft using Kirschner wires and reduction forceps for temporary fixation.



2 Preliminary fixation of the plate shaft to the bone

After reducing the fracture, apply the plate and insert a 3.5 mm Cortex Screw through the DCU portion of the elongated Combi hole (see page 7).

3 Insert distal screws (see page 8)

Position and fix medial plate

1 Position the plate

Position the medial plate on the medial ridge and slightly dorsal to the intermuscular septum, with the distal tip reaching down to the insertion of the medial collateral ligament.

Distal screws should reach as far as possible into the bone. Choose a plate position that allows the longest possible screws.

Bending of the distal part of the plate is recommended to ensure optimal position of the long screws through the articular block.

Note: *Small adjustments in the position of the medial plate impact the final direction of the screws and will influence the choice of screw lengths.*

Use the 2.0 mm Threaded Drill Guide with depth gauge [323.061] and a Kirschner wire to determine the optimal position of the plate.

2. Ibid. pg. 314.

Position and fix medial plate (continued)

2 Preliminary fixation of the plate to the bone

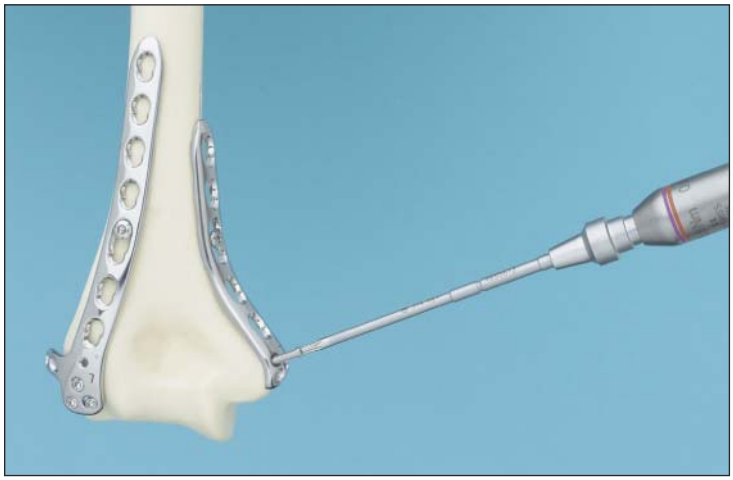
After reducing the fracture, apply the plate and insert a self-tapping 3.5 mm Cortex Screw through the DCU portion of the elongated Combi hole (see page 7).

Insert 3.5 mm Cortex Screw through DCU portion of Combi hole.

3 Fix the distal part of the plate to the bone

Use a procedure similar to that for the posterolateral plate to insert the locking or cortex screws (see page 8 for details).

Important: *Careful drilling is necessary, as interference with screws in the posterolateral plate is possible. In case of interference stop drilling and use a screw of appropriate length.*



Fix the shaft of the posterolateral plate

After fixing the distal portion of the posterolateral and medial plates, determine where locking or cortex screws will be used in the shaft of the posterolateral plate. Use 3.5 mm Locking Screws or 3.5 mm Cortex Screws to fix the proximal part of the plate to the bone.

Option: For 3.5 mm Locking Screws, insert Threaded Drill Guide [312.648]* into Combi hole until fully seated. Drill to desired depth using the 2.8 mm Drill Bit [310.288]* and remove the drill guide. Use the Depth Gauge [319.01]* to determine screw length. Insert locking screw under power using the Torque Limiting Attachment [511.770] or [511.773]* and StarDrive Screwdriver Shaft [314.116].

If compression is required, use the 3.5 mm Universal Drill Guide [323.36]* in compression mode and, with the 2.5 mm Drill Bit [310.25]*, predrill both cortices. Use the Depth Gauge [319.01]* to determine the cortex screw length. Insert the cortex screw.

Fix the shaft of the medial plate

Determine where locking or cortex screws will be used in the shaft of the medial plate. Insert these screws as described above.

Follow-up notes

Postoperative treatment

Postoperative treatment with locking compression plates does not differ from conventional internal fixation procedures.

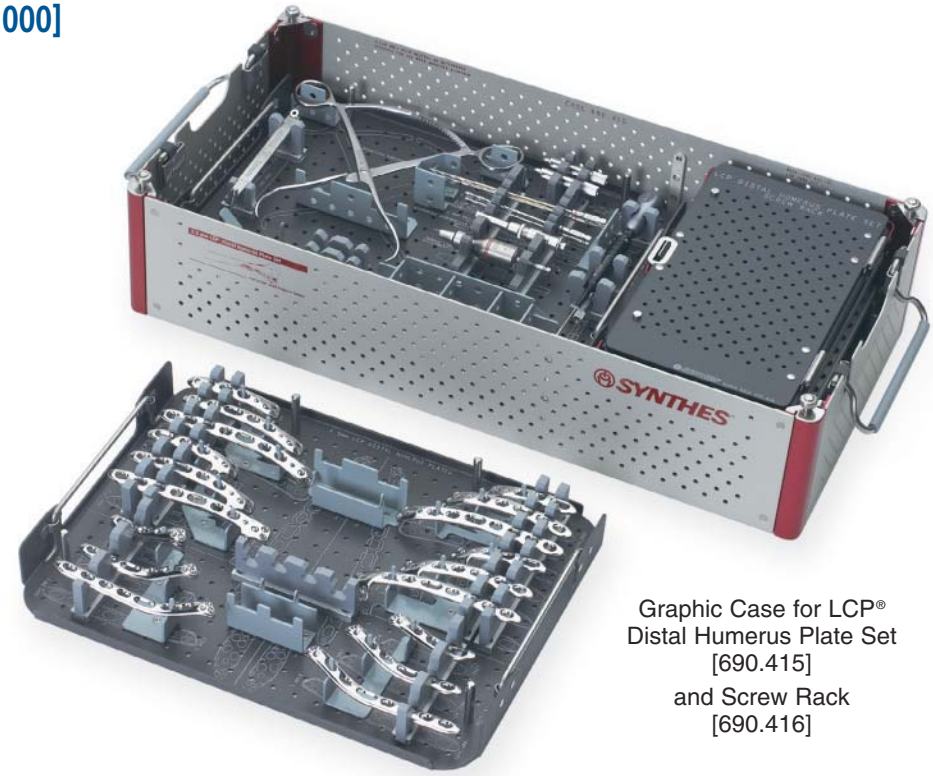
Implant removal

To remove locking screws, unlock all screws from the plate and then begin to remove the screws completely from the bone. This avoids rotation of the plate when loosening the last locking screw.

**Available in the Small Fragment LCP® Instrument and Implant Set*

3.5 mm LCP® Distal Humerus Plate Instrument and Implant Sets

Stainless Steel [01.104.000]
Titanium [01.104.004]



Graphic Case for LCP® Distal Humerus Plate Set [690.415]
and Screw Rack [690.416]

Instruments

314.467	StarDrive Screwdriver Shaft, T8, 105 mm
314.468	Holding Sleeve, for 314.467
323.061	2.0 mm Threaded Drill Guide, with Depth Gauge, 2 ea.
323.062	2.0 mm Drill Bit, with depth mark, quick coupling, 110 mm, 2 ea.
323.202	2.4 mm Universal Drill Guide
310.510	1.8 mm Drill Bit, quick coupling, 100 mm, 2 ea.
310.530	2.4 mm Drill Bit, quick coupling, 100 mm, 2 ea.
319.006	Depth Gauge, for 2.0 mm and 2.4 mm screws
511.776	Torque Limiting Attachment, 0.8 Nm quick coupling
399.98	Reduction Forceps, with points, ratchet, 205 mm length

Required additional set

105.434	Small Fragment LCP® Instrument and Implant Set
	or
145.434	Small Fragment LCP® Instrument and Titanium Implant Set

Graphic Cases

690.415	Graphic Case for LCP® Distal Humerus Plate Set
690.417	Graphic Case for Titanium LCP® Distal Humerus Plate Set

Screw Racks

690.416	Screw Rack for LCP® Distal Humerus Plate Set
690.418	Screw Rack for Titanium LCP® Distal Humerus Plate Set

Sterilization Parameters for Sets [01.104.000] and [01.104.004]

These Synthes sets with all additionally available items, as marked in the cases or modules, can be sterilized by the following parameters. For more information, please see graphic case package insert.

Method	Cycle	Temperature	Exposure Time
Steam	Gravity Displacement (Wrapped)	132°–135°C (270°–275°F)	22 Minutes
Steam	Prevacuum (Wrapped)	132°–135°C (270°–275°F)	8 Minutes

Implants

2.4 mm Cortex Screws, self-tapping, with T8 StarDrive recess, 2 ea.

STAINLESS STEEL	TITANIUM	
201.760	401.760	10 mm
201.762	401.762	12 mm
201.764	401.764	14 mm
201.766	401.766	16 mm
201.768	401.768	18 mm
201.770	401.770	20 mm
201.772	401.772	22 mm
201.774	401.774	24 mm
201.776	401.776	26 mm
201.778	401.778	28 mm
201.780	401.780	30 mm
201.782	401.782	32 mm
201.784	401.784	34 mm
201.786	401.786	36 mm
201.788	401.788	38 mm
201.790	401.790	40 mm

2.7 mm Locking Screws, self-tapping, with T8 StarDrive recess, 3 ea.

STAINLESS STEEL	TITANIUM		STAINLESS STEEL	TITANIUM	
202.210	402.210	10 mm	202.234	402.234	34 mm
202.212	402.212	12 mm	202.236	402.236	36 mm
202.214	402.214	14 mm	202.238	402.238	38 mm
202.216	402.216	16 mm	202.240	402.240	40 mm
202.218	402.218	18 mm	202.242	402.242	42 mm
202.220	402.220	20 mm	202.244	402.244	44 mm
202.222	402.222	22 mm	202.246	402.246	46 mm
202.224	402.224	24 mm	202.248	402.248	48 mm
202.226	402.226	26 mm	202.250	402.250	50 mm
202.228	402.228	28 mm	202.255	402.255	55 mm
202.230	402.230	30 mm	202.260	402.260	60 mm
202.232	402.232	32 mm			

3.5 mm LCP® Posterolateral Distal Humerus Plates

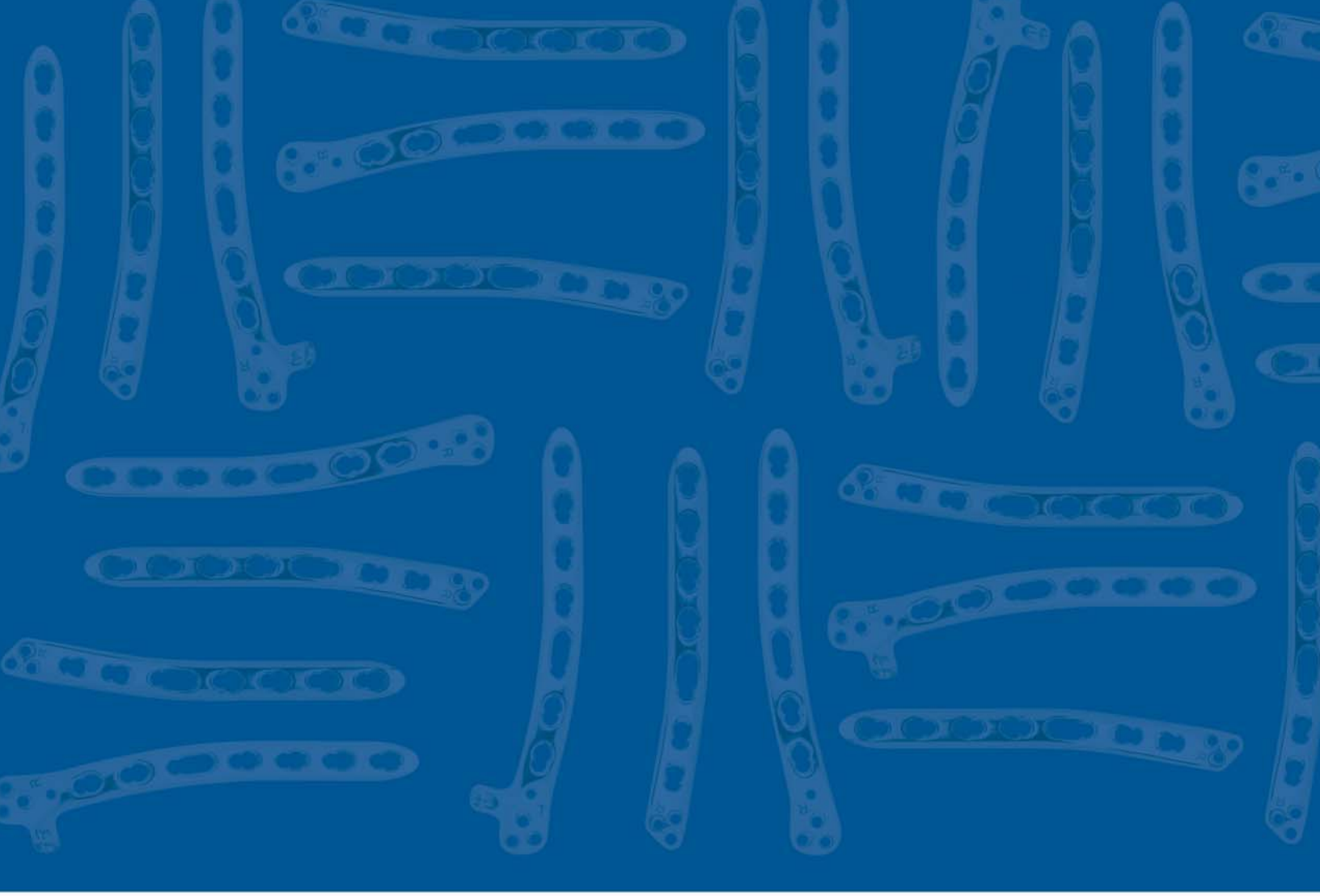
STAINLESS STEEL	TITANIUM		LENGTH
241.262	441.262	3 holes, right	55 mm
241.263	441.263	3 holes, left	55 mm
241.264	441.264	5 holes, right	90 mm
241.265	441.265	5 holes, left	90 mm
241.266	441.266	7 holes, right	116 mm
241.267	441.267	7 holes, left	116 mm

3.5 mm LCP® Medial Distal Humerus Plates

STAINLESS STEEL	TITANIUM		LENGTH
241.282	441.282	3 holes, right	58 mm
241.283	441.283	3 holes, left	58 mm
241.284	441.284	5 holes, right	83 mm
241.285	441.285	5 holes, left	83 mm
241.286	441.286	7 holes, right	110 mm
241.287	441.287	7 holes, left	110 mm

3.5 mm LCP® Posterolateral Distal Humerus Plates, with lateral support

STAINLESS STEEL	TITANIUM		LENGTH
241.272	441.272	3 holes, right	55 mm
241.273	441.273	3 holes, left	55 mm
241.274	441.274	5 holes, right	90 mm
241.275	441.275	5 holes, left	90 mm
241.276	441.276	7 holes, right	116 mm
241.277	441.277	7 holes, left	116 mm



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