

LCP Wrist Fusion Set. Anatomic plates for total wrist fusion.

Surgical Technique



This publication is not intended for distribution in the USA.

Instruments and implants approved by the AO Foundation.



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.depuyssynthes.com/hcp/reprocessing-care-maintenance>

For general information about reprocessing, care and maintenance of Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:

<http://emea.depuyssynthes.com/hcp/reprocessing-care-maintenance>

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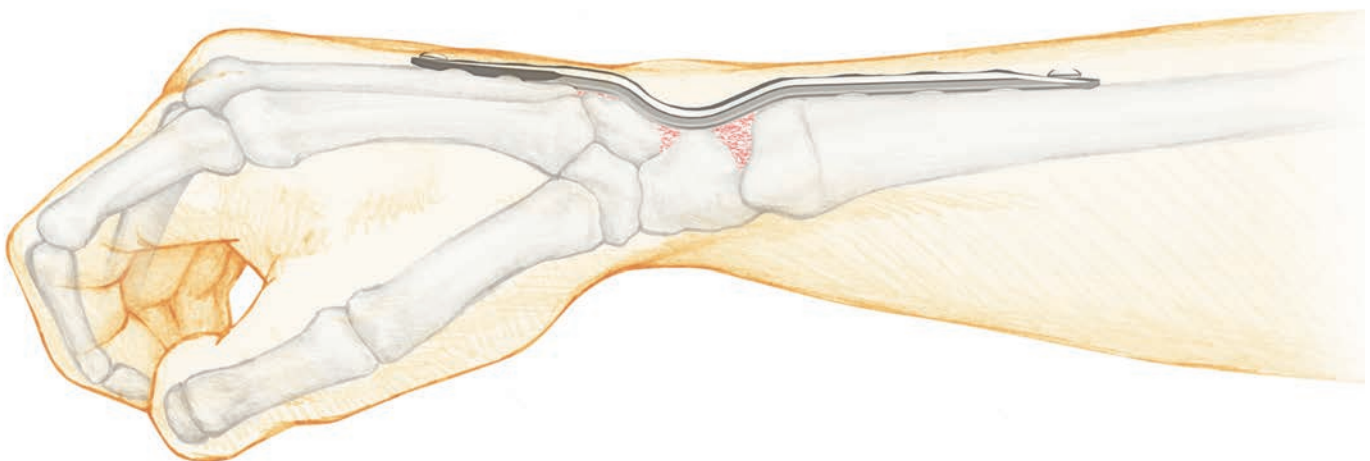
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LCP Wrist Fusion System

The LCP Wrist Fusion System consists of plates, locking screws and cortex screws. Implants are available in stainless steel and titanium.

Plates

- Standard bend plates for average-sized individuals
- Short bend plates for small-stature individuals or patients with previous proximal row carpectomy
- Straight plate for patients with unusual anatomy or a severely deformed wrist joint
- Precontoured plates reduce the need for intraoperative bending
- Low-profile plates minimize plate prominence
- Limited-contact design minimizes periosteal contact
- Fusion angle of 10° dorsiflexion provides optimum hand position
- Plates accept 2.7 mm locking and 2.4/2.7 mm cortex screws distally and 3.5 mm locking and cortex screws proximally
- Plate geometry is identical to the LC-DCP wrist fusion plates, except for overall length
- Combi hole dorsal to the capitate allows lagging or locking the capitate to the plate



Screws

- 2.7 mm and 3.5 mm locking screws
- 2.4/2.7/3.5 cortex screws
- Self-tapping for easy insertion
- Self-retaining Stardrive recess provides improved torque transmission and increased resistance to stripping
- Locking screws with threaded head are used in Combi holes to create a fixed-angle construct, particularly advantageous to osteopenic bone



2.7 mm Locking Screw



3.5 mm Locking Screw



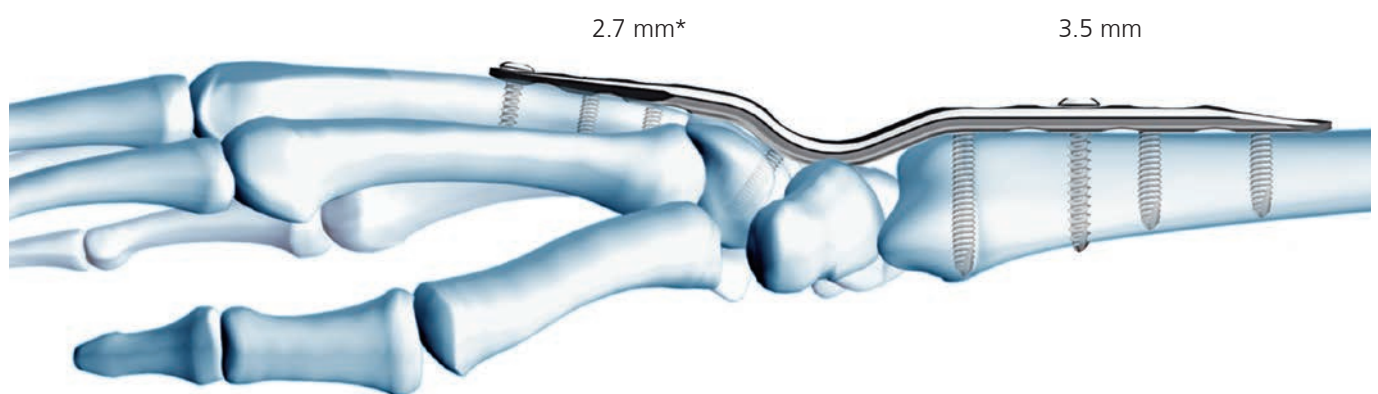
2.4 mm Cortex Screw



2.7 mm Cortex Screw



3.5 mm Cortex Screw



* Distal holes accept 2.4 mm cortex screws also

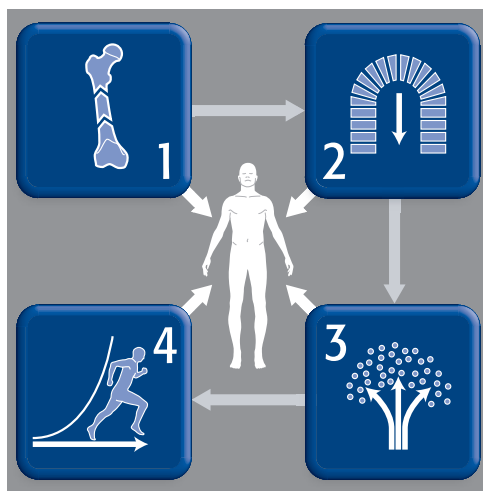
In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation^{1,2}.

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, M Allgöwer, R Schneider, H Willenegger. Manual of Internal Fixation. 3rd ed. Berlin, Heidelberg, New York: Springer. 1991

² Rüedi TP, RE Buckley, CG Moran. AO Principles of Fracture Management. 2nd ed. Stuttgart, New York: Thieme. 2007

Indications

The LCP Wrist Fusion System is indicated for wrist arthrodesis and fractures of other small bones of the carpus. Specific indications include:

- Posttraumatic arthrosis of the joints of the wrist
- Rheumatoid wrist deformities requiring restoration
- Complex carpal instability
- Postseptic arthritis of the wrist
- Severe unremitting wrist pain related to motion
- Brachial plexus nerve palsies
- Tumor resection
- Spastic deformities

Preoperative Planning

Evaluate the condition of the soft tissues. Compare the standard bend, short bend and straight plates to the patient's wrist, and determine which plate to use for fusion.

The standard bend plate is used for medium to large wrist fixation.

The short bend plate is used for smaller wrist fixation and for fusion following proximal row carpectomy.

The straight plate is used for wrist fixation when the standard and short bend plates do not fit the anatomy. This plate can be contoured to the anatomy of the patient's wrist.



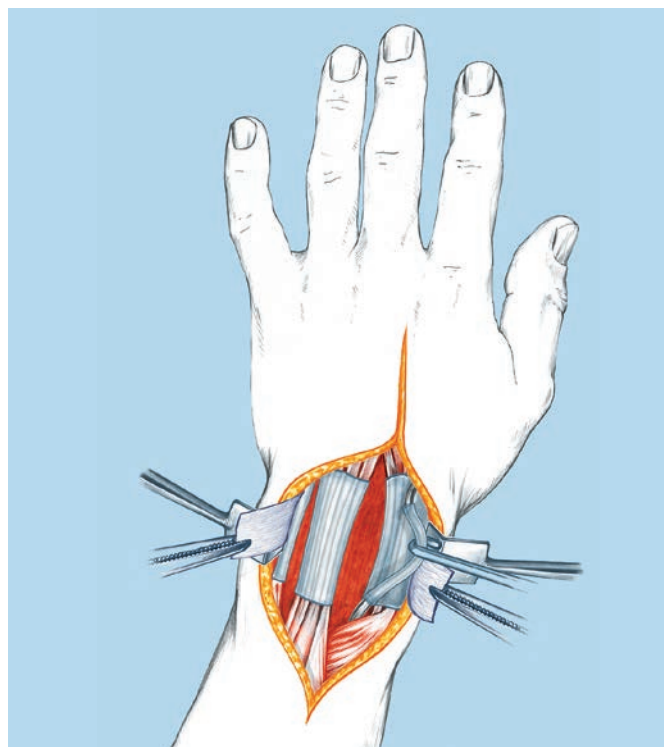
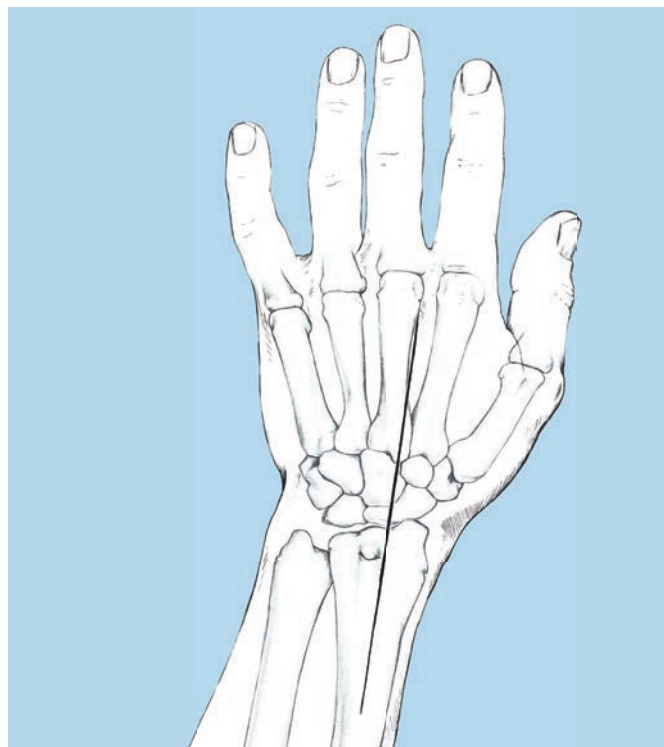
1

Approach

Place the patient in the supine position with the hand and arm on a hand table. Make a longitudinal incision from the radial aspect of the third metacarpal across Lister's tubercle to the dorsum of the distal radius.

Open the third dorsal compartment, and transpose the extensor pollicis longus (EPL) radially. Retract the digital extensors of the index and middle fingers to expose the dorsal aspect of the third metacarpal.

Make an incision through the wrist capsule and extend it proximally to the radius along its dorsal surface. Elevate the capsule and second dorsal compartment radially, and the capsule and fourth dorsal compartment ulnarly.



Prepare Joint and Optional Bone Void Filler Insertion

2

Prepare joint

Expose and decorticate the joint surfaces to be included in the fusion. These include the scaphocapitate joint, capitolunate joint, radioscaphoid joint and radiolunate joint. In some cases, the ulnar midcarpal, lunotriquetral and second and third carpometacarpal joints may be included.

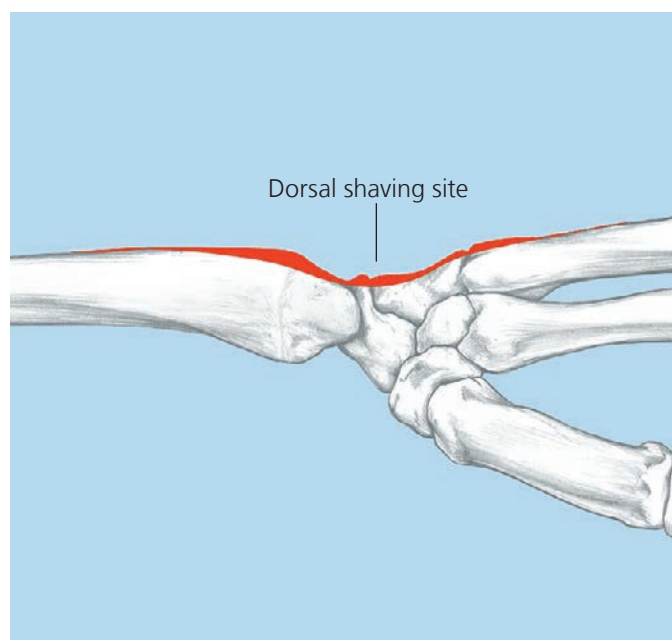
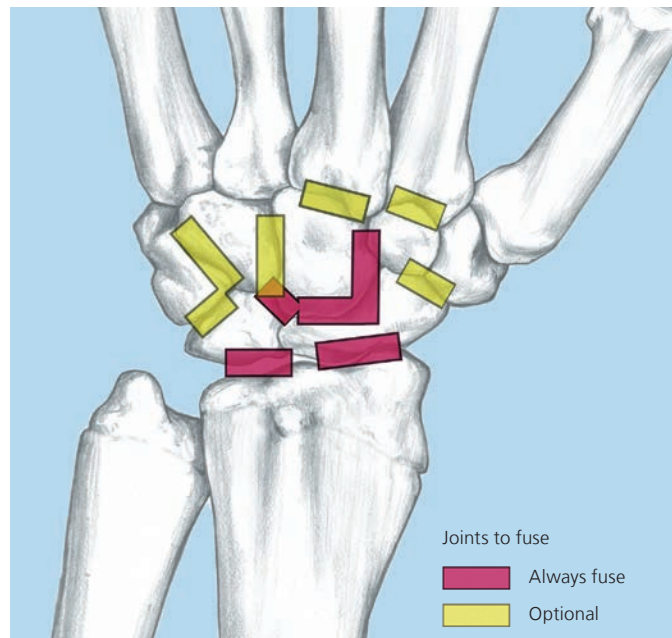
Remove Lister's tubercle and the dorsal distal aspect of the radius with an osteotome. Decorticate the dorsal surfaces of the scaphoid, lunate, and capitate.

The dorsal shavings can be saved for use as cancellous bone graft. Cancellous bone can also be harvested from the radius, radial to the most distal screw position. If more bone is needed, it may also be obtained from the olecranon or iliac crest.

Insert bone graft (optional)

Determine if there is a bone void that requires filling to maintain reduction and aid in bone healing. Use autogenous bone graft or a synthetic bone graft or allograft product (see page 28).

Pack all joints to be fused with cancellous bone before plate fixation.



Insert Distal Cortex Screws

3

Insert distal 2.4 or 2.7 mm cortex screws

Instruments

311.430	Handle with Quick Coupling
314.467	Screwdriver Shaft, Stardrive, T8, self-holding
319.005	Depth Gauge for Screws Ø 2.0 and 2.4 mm, measuring range up to 40 mm
319.010	Depth Gauge for Screws Ø 2.7 to 4.0 mm, measuring range up to 60 mm
310.509	Drill Bit Ø 1.8 mm, with marking, length 110/85 mm, 2-flute
310.534	Drill Bit Ø 2.0 mm, with marking, length 110/85 mm, 2-flute
323.202	Universal Drill Guide 2.4
323.260	Universal Drill Guide 2.7

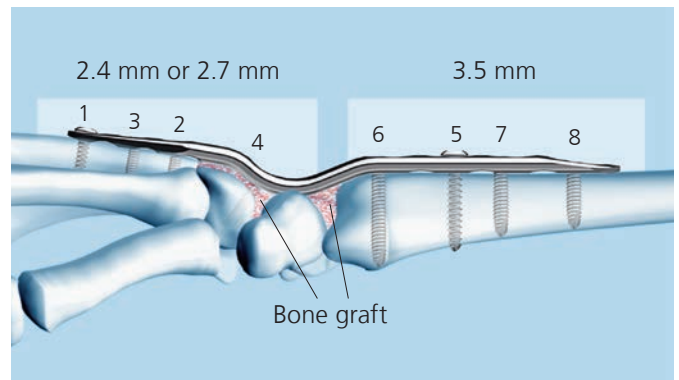
Fix the plate to the third metacarpal and then to the radius. Insert screws in the sequence shown. Position the plate directly over the dorsal aspect of the third metacarpal.

Note: Screw sequence may vary depending on patient anatomy and surgeon preference.

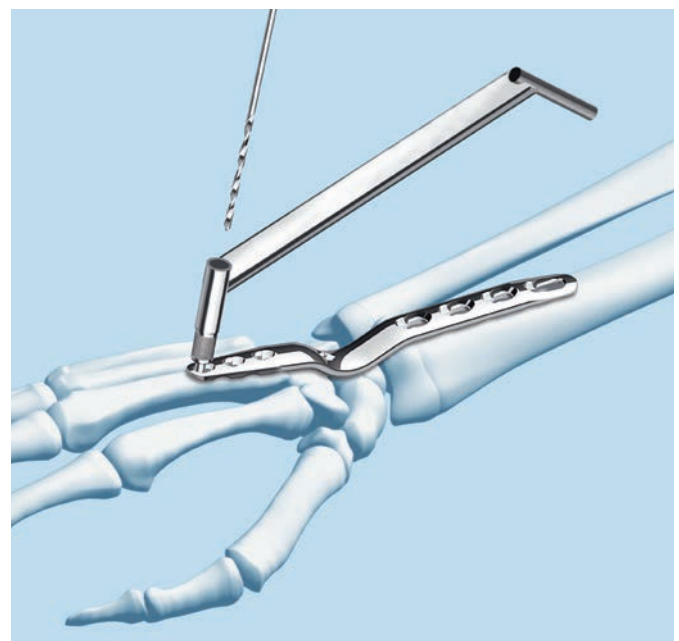
Place the drill guide in the nonlocking portion of the hole 1 in the neutral position.

Insert the 1.8 mm drill bit through the 2.4 mm drill guide to the bone for 2.4 mm cortex screws.

Insert the 2.0 mm drill bit through the 2.7 mm drill guide to the bone for 2.7 mm cortex screws.



Sequence of screw placement



Precaution: Do not start drilling until the drill bit touches the bone. Inserting the drill bit into the drill guide while the drill is running may cause damage to the drill bit or drill guide.

Drill to the desired depth, being sure to drill precisely in the  midline, dorsal to volar. Verify drill depth using image intensification.

Remove the drill and drill guide. Use the depth gauge to measure for screw length.

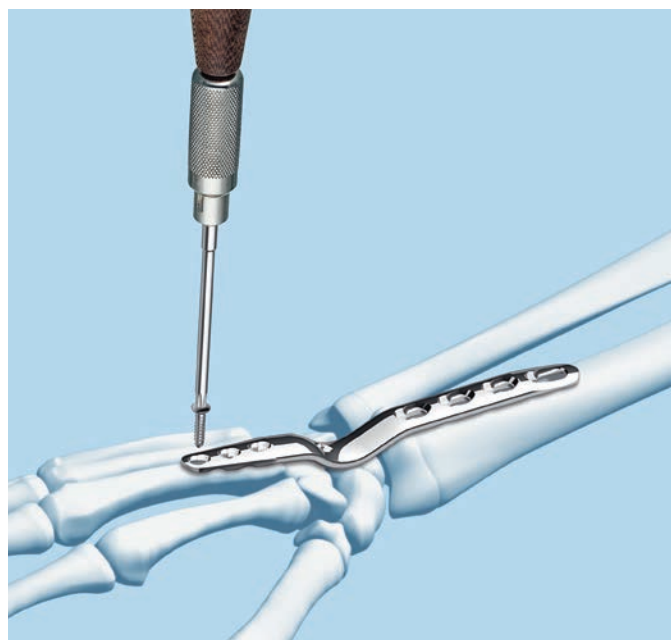
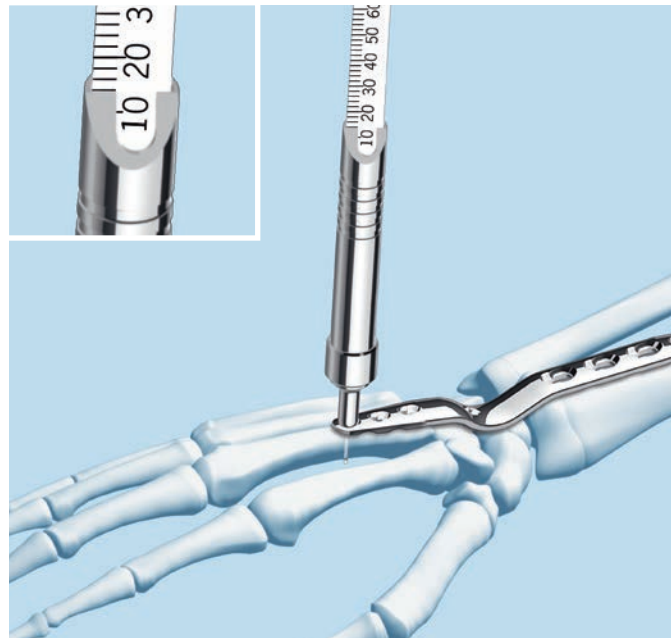
Insert the cortex screw, using the self-retaining StarDrive screwdriver shaft and handle, and tighten carefully.

Alternative technique: Insert distal locking screw

A unicortical locking screw can be inserted in the threaded portion of the distal hole instead of the cortex screw.

This unicortical locking screw can limit fracture propagation at the end of the plate.

The technique for inserting a locking screw is described on page 11.



Insert Distal Locking Screws

4

Insert distal 2.7 mm locking screws

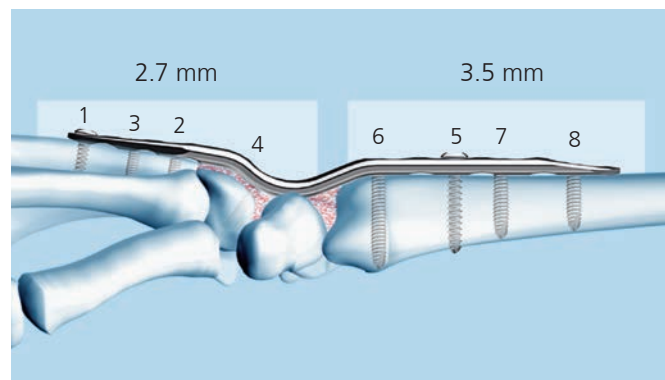
Instruments

311.430	Handle with Quick Coupling
314.467	Screwdriver Shaft, Stardrive, T8, self-holding
323.033	LCP Drill Sleeve for LCP Screws Ø 2.7 mm (head LCP 2.4), with Scale up to 30 mm, for Drill Bits Ø 2.0 mm
310.534	Drill Bit Ø 2.0 mm, with marking, length 110/85 mm, 2-flute
511.776	Torque Limiter, 0.8 Nm, for AO/ASIF Quick Coupling

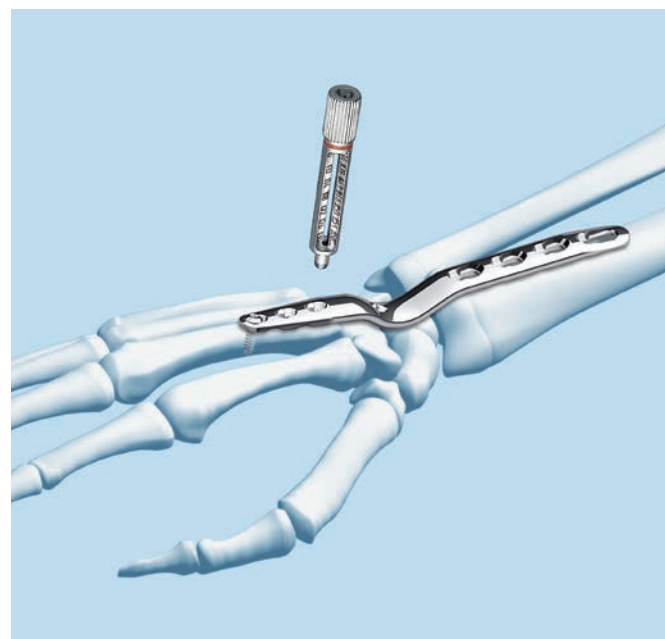
Insert locking screw in the sequence shown (2, 3, 4).

Screw the threaded drill guide into the locking portion of the LCP hole.

For 2.7 mm locking screws use the 2.0 mm drill bit and the 2.7 mm LCP drill sleeve.



Sequence of screw placement



Insert the drill bit through the drill guide to the bone.

Precaution: Do not start drilling until the drill bit touches the bone. Inserting the drill bit into the drill guide while the drill is running may cause damage to the drill bit or drill guide.

- 1 Drill to the desired depth. Verify drill depth using image intensification.

Determine the screw length directly from the mark on the drill bit and the scale on the threaded drill guide, or use the corresponding depth gauge.

Alternative instrument

319.010	Depth Gauge for Screws $\varnothing$ 2.7 to 4.0 mm, measuring range up to 60 mm
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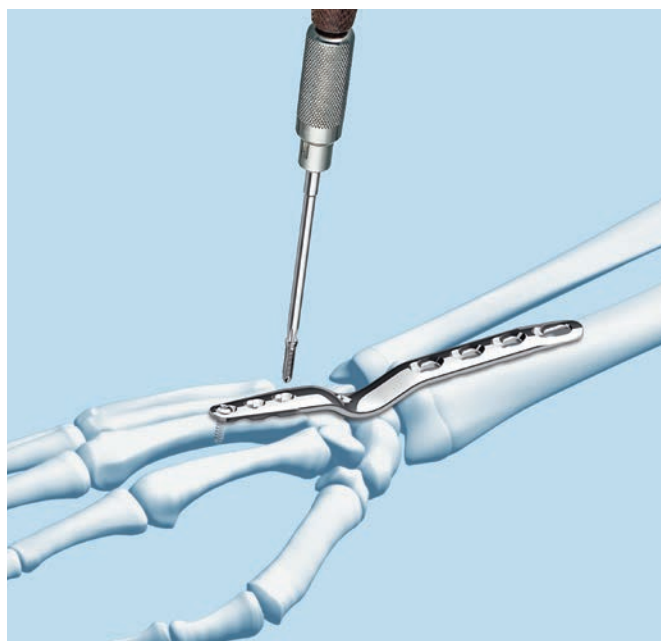
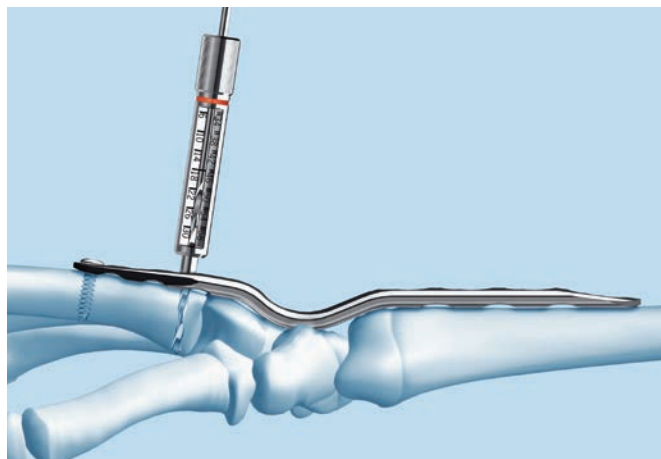
Screw length can be checked by removing the drill guide and using the depth gauge.

Insert the locking screw using the self-retaining StarDrive screwdriver shaft and handle, and tighten carefully. Excessive force is not necessary to lock the screw to the plate. Repeat for the remaining locking screws.

Fix the plate to the capitate in a similar manner.

Precaution: If the plate sits off of the dorsal capitate, be careful not to lag the capitate up to the plate. This would distort the carpal canal and lead to volar screw prominence.

Note: insert the self-tapping 2.7 mm locking screws with the 0.8 Nm torque limiting attachment.



Insert Proximal Cortex Screws

5

Insert 3.5 mm cortex screws

Instruments

310.250	Drill Bit Ø 2.5 mm, length 110/85 mm, 2-flute, for Quick Coupling
311.430	Handle with Quick Coupling
314.116	Screwdriver Shaft Stardrive 3.5, SD15, self-holding
319.010	Depth Gauge for Screws Ø 2.7 to 4.0 mm, measuring range up to 60 mm
323.360	Universal Drill Guide 3.5

Also available

311.420	Handle, large, with Quick Coupling, length 155 mm
314.030	Screwdriver Shaft, hexagonal, small, Ø 2.5 mm

In aligning the plate over the radius, a small amount of ulnar deviation may be preferred.

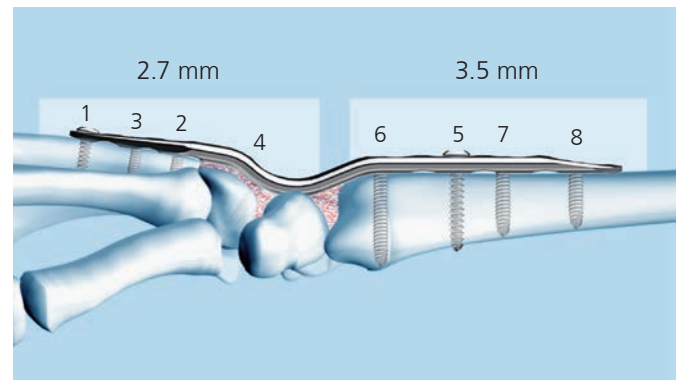
With the plate aligned and the hand properly positioned, begin fixation to the radius with hole 5.

Place the drill guide in the nonlocking portion of hole 5 in the load position.

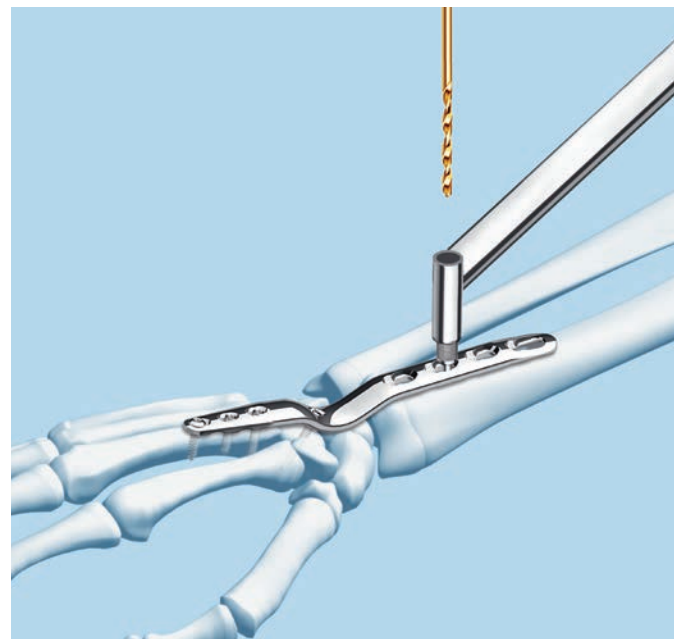
Insert the 2.5 mm drill bit through the drill guide to the bone.

Precaution: Do not start drilling until the drill bit touches the bone. Inserting the drill bit into the drill guide while the drill is running may cause damage to the drill bit or drill guide.

- ① Drill to the desired depth. Verify drill depth using image intensification.



Sequence of screw placement



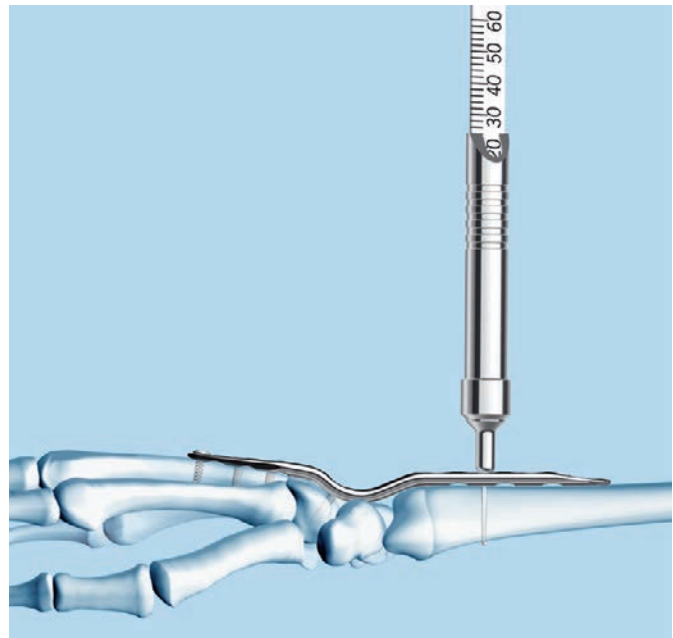
Remove the drill and drill guide. Measure for screw length using the depth gauge.

Insert a 3.5 mm cortex screw, using the self-retaining Stardrive screwdriver shaft and handle, and tighten carefully.

Alternative technique: Insert 3.5 mm locking screw

A unicortical locking screw can be inserted in the threaded portion of the hole instead of the cortex screw.

The technique for inserting a 3.5 mm locking screw is described on page 15.



Insert Proximal Locking Screws

6

Insert proximal 3.5 mm locking screws

Instruments

310.288	Drill Bit Ø 2.8 mm, length 165 mm
311.430	Handle with Quick Coupling
323.027	LCP Drill Sleeve 3.5, for Drill Bits Ø 2.8 mm
314.116	Screwdriver Shaft Stardrive 3.5, SD15, self-holding
319.010	Depth Gauge for Screws Ø 2.7 to 4.0 mm, measuring range up to 60 mm
511.773	Torque Limiter, 1.5 Nm, for AO/ASIF Quick Coupling

Also available

311.420	Handle, large, with Quick Coupling, length 155 mm
314.030	Screwdriver Shaft, hexagonal, small, Ø 2.5 mm

Insert screws in the sequence shown (6, 7, 8).

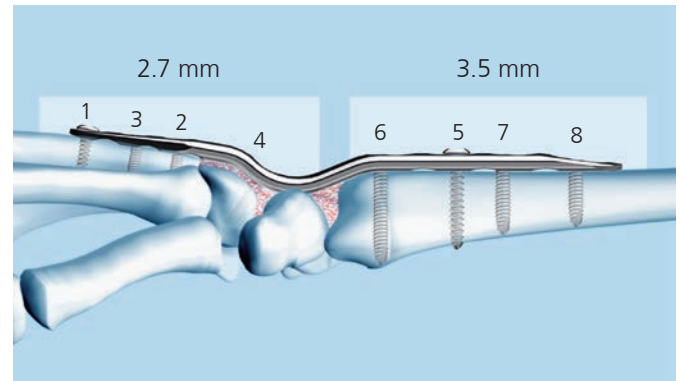
Screw the drill guide into the locking portion of the LCP hole.

Insert the 2.8 mm drill bit through the drill guide to the bone.

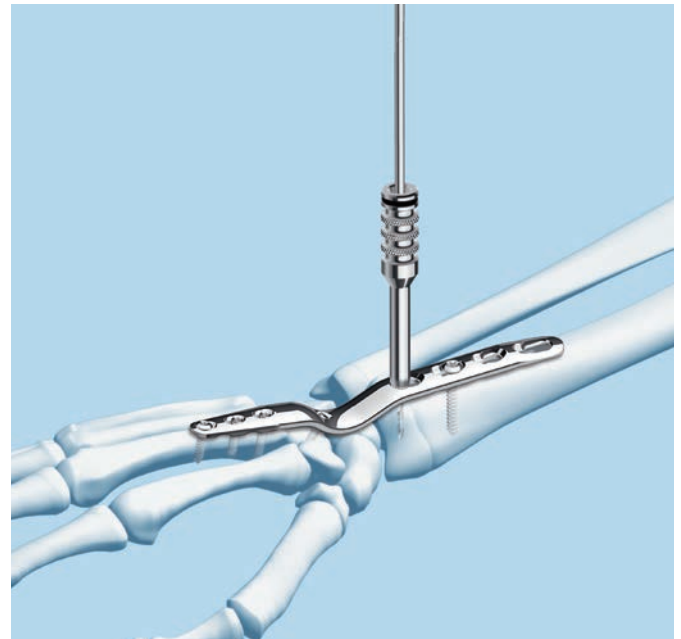
Precaution: Do not start drilling until the drill bit touches the bone. Inserting the drill bit into the drill guide while the drill is running may cause damage to the drill bit or drill guide.

Note: Use of the 1.5 Nm torque limiting attachment required for 3.5 mm locking screws.

- ① Drill to the desired depth. Verify drill depth using image intensification.

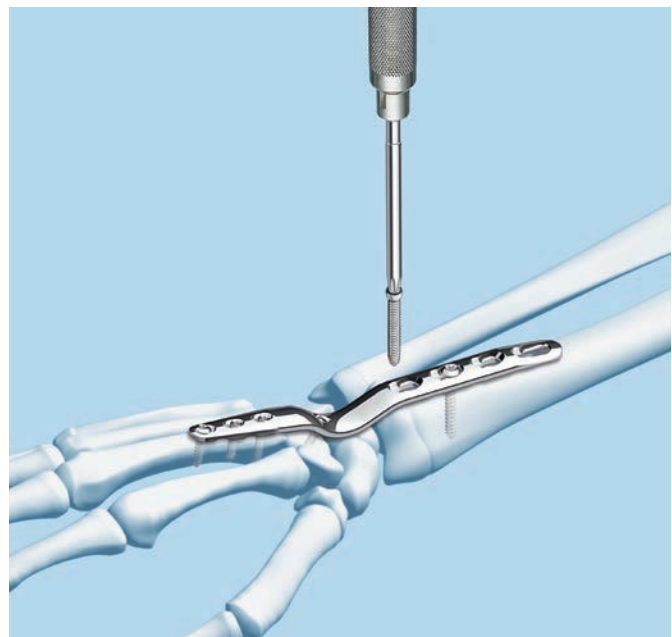
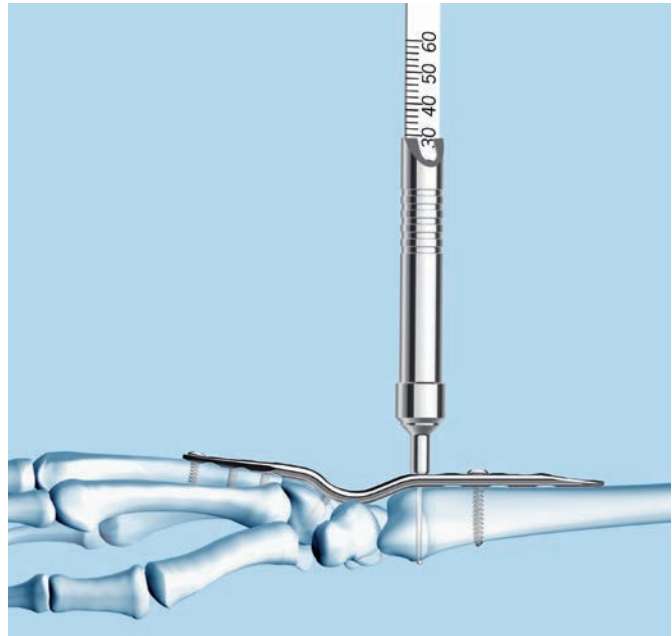


Sequence of screw placement



Remove the drill and drill guide. Measure for screw length using the depth gauge.

Insert a 3.5 mm locking screw, using the self-retaining Stardrive screwdriver shaft and handle, and tighten carefully. Excessive force is not necessary to lock the screw to the plate. Repeat for the remaining 3.5 mm locking screws.

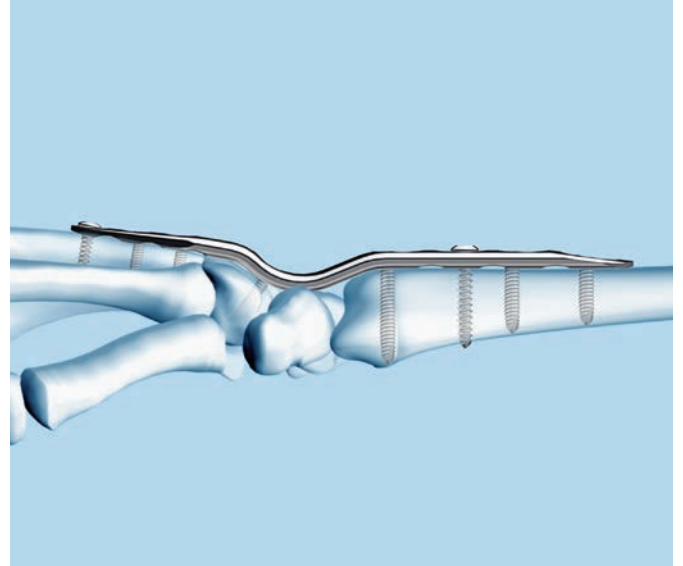


Close and Optional Implant Removal

7

Close

Close the wound in a routine fashion. Close the capsule over the plate as completely as possible. Leave the EPL radially transposed and check that it does not rub against the plate. Apply a soft, bulky dressing and/or splint to protect the wrist



Implant removal (optional)

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 removing the last locking screw.

Screws Used with the LCP Wrist Fusion Plates

Stainless Steel and Titanium

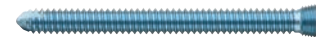
2.4 mm Cortex Screws (X01.760–X01.774)*

- For use in the nonlocking portion of combi-holes in the distal plate shaft
- Provide compression or neutral fixation
- T8 StarDrive recess
- Self-tapping
- 10 mm–24 mm lengths (2 mm increments)



2.7 mm Locking Screws (X02.210–X02.224)*

- For use in the locking portion of combi-holes in the distal plate shaft
- Threaded, conical head
- T8 StarDrive recess
- Self-tapping
- 10 mm to 24 mm lengths (2 mm increments)



2.7 mm Cortex Screws (X02.870–X02.884)*

- For use in the nonlocking portion of combi-holes in the distal plate shaft
- Provide compression or neutral fixation
- T8 StarDrive recess
- Self-tapping
- 10 mm–24 mm lengths (2 mm increments)



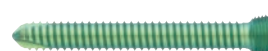
* X=2: Stainless Steel

* X=4: Titanium Alloy (TAN)

All implants are available non-sterile or sterile packed. Add suffix “S” to article number to order sterile product.

3.5 mm Locking Screws (SD15 StarDrive recess X12.102–X12.110, Hex recess X13.012–X13.028)*

- For use in the locking portion of combi-holes in the proximal plate shaft
- Threaded, conical head
- Self-tapping
- 12 mm–28 mm lengths (2 mm increments)



3.5 mm Cortex Screws (SD15 StarDrive recess 0X.200.012–0X.200.028, Hex recess X04.812–X04.828)*

- For use in the nonlocking portion of combi-holes in the proximal plate shaft
- Provide compression or neutral fixation
- Self-tapping
- 12 mm–28 mm lengths (2 mm increments)



* X=2 Stainless Steel

* X=4 Titanium Alloy (TAN)

All implants are available non-sterile or sterile packed. Add suffix "S" to article number to order sterile product.

LCP Wrist Fusion Plates

Stainless Steel and Titanium

Standard bend*

Stainless Steel	Titanium**	Length
02.110.150	04.110.150	118 mm



Short bend*

Stainless Steel	Titanium**	Length
02.110.151	04.110.151	118 mm



Straight*

Stainless Steel	Titanium**	Length
02.110.152	04.110.152	112 mm



* All implants are available non-sterile or sterile packed. Add suffix “S” to article number to order sterile product.
** Pure Titanium (TiCP)

Instruments

310.250	2.5 mm Drill Bit, quick coupling, 110 mm	
310.288	2.8 mm Drill Bit, quick coupling, 165 mm	
310.509	Drill Bit Ø 1.8 mm, with marking, length 110/85 mm, 2-flute	
310.534	Drill Bit Ø 2.0 mm, with marking, length 110/85 mm, 2-flute, for Quick Coupling	
311.430	Handle, with quick coupling	
311.420	Handle, large, with Quick Coupling, length 155 mm	
323.027	2.8 mm Threaded Drill Guide, for 3.5 mm locking screws	
314.116	Stardrive Screwdriver Shaft, SD15, self-retaining, quick coupling	
314.030	Screwdriver Shaft, hexagonal, small, Ø 2.5 mm	

314.467 StarDrive Screwdriver Shaft, T8



319.005 Depth Gauge for Screws Ø 2.0 and 2.4 mm, measuring range up to 40 mm



319.010 Depth Gauge, for 2.7 mm and 3.5 mm screws up to 60 mm



323.033 LCP Drill Sleeve for LCP Screws Ø 2.7 mm (head LCP 2.4), with Scale up to 30 mm, for Drill Bits Ø 2.0 mm



323.202 Universal Drill Guide 2.4



323.260 Universal Drill Guide 2.7



323.360 Universal Drill Guide 3.5



511.773

Torque Limiter, 1.5 Nm, for AO/ASIF
Quick Coupling



511.776

Torque Limiter, 0.8 Nm, for AO/ASIF
Quick Coupling



LCP Wrist Fusion Implant Module Sets

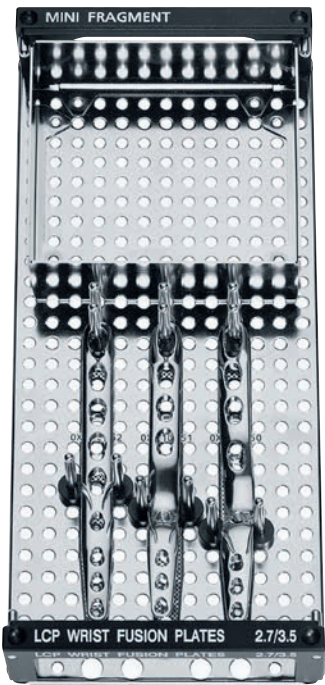
Titanium (01.111.433) and Stainless Steel (01.111.434)

Vario Case

68.111.423	Tray for LCP Wrist Fusion Plates 2.7/3.5, size 1/4, without Lid, without Contents
68.000.102	Lid for Instrument Tray, size 1/4

Implants

LCP Wrist Fusion Plates		
Stainless Steel	Titanium	Description
02.110.150	04.110.150	standard bend
02.110.151	04.110.151	short bend
02.110.152	04.110.152	straight



LCP Wrist Fusion Instrument Set (01.110.080)

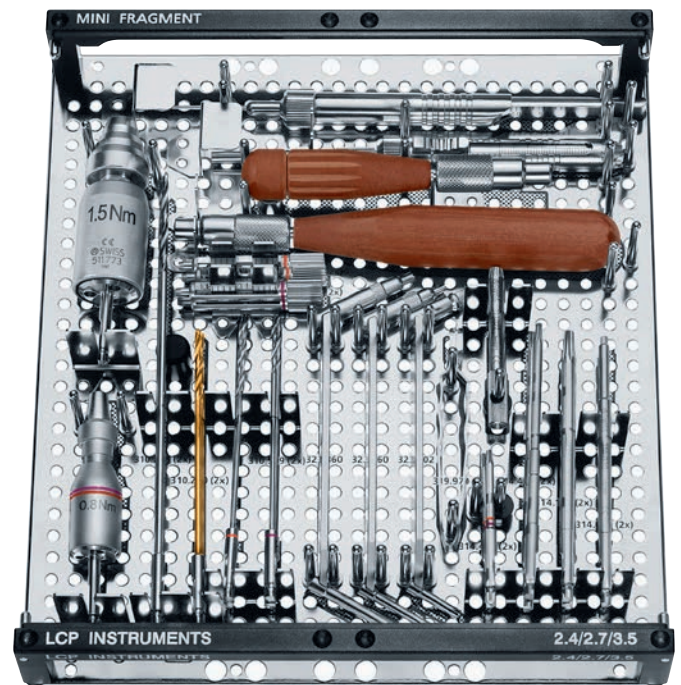
Vario Case

68.111.422 Tray for Instrument Set,
for LCP Plates 2.4/2.7/3.5, size 1/2,
without Lid, without Contents

684.060 Lid for Instrument Tray (without Labelling)

Instruments

310.509	Drill Bit Ø 1.8 mm
310.534	Drill Bit Ø 2.0 mm
310.250	Drill Bit Ø 2.5 mm
310.288	Drill Bit Ø 2.8 mm
319.005	Depth Gauge for Screws Ø 2.0 and 2.4 mm
319.010	Depth Gauge for Screws Ø 2.7 to 4.0 mm
323.202	Universal Drill Guide 2.4
323.260	Universal Drill Guide 2.7
323.360	Universal Drill Guide 3.5
323.029	LCP Drill Sleeve 2.4, with Scale up to 30 mm, for Drill Bits Ø 1.8 mm
323.033	LCP Drill Sleeve for LCP Screws Ø 2.7 mm (head LCP 2.4), with Scale up to 30 mm, for Drill Bits Ø 2.0 mm
323.027	LCP Drill Sleeve 3.5, for Drill Bits Ø 2.8 mm
314.116	Screwdriver Shaft Stardrive 3.5, SD15, self-holding
314.467	Screwdriver Shaft, Stardrive, T8, self-holding
314.030	Screwdriver Shaft, hexagonal, small, Ø 2.5 mm
314.453	Screwdriver Shaft Stardrive 2.4, short, self-holding
311.420	Handle, large, with Quick Coupling, length 155 mm
311.430	Handle with Quick Coupling
319.970	Screw Forceps, self-holding, length 85 mm
511.773	Torque Limiter, 1.5 Nm, for AO/ASIF Quick Coupling
511.776	Torque Limiter, 0.8 Nm, for AO/ASIF Quick Coupling



LCP Wrist Fusion Instrument and Implant Sets

Titanium

01.110.082*	Instruments and Implant Set with 2.7 Stardrive/3.5 Hex, for LCP Wrist Fusion Plates
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01.110.080	LCP Instrument Set 2.4/2.7/3.5
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01.111.433	LCP Wrist Fusion Implant Set 2.7/3.5, Pure Titanium
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01.110.083*	Instruments and Implant Set with 2.7/3.5 Stardrive, for LCP Wrist Fusion Plates
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01.110.080	LCP Instrument Set 2.4/2.7/3.5
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01.111.433	LCP Wrist Fusion Implant Set 2.7/3.5, Pure Titanium
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Stainless Steel

01.110.092*	Instruments and Implant Set with 2.7 Stardrive/3.5 Hex, for LCP Wrist Fusion Plates
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01.110.080	LCP Instrument Set 2.4/2.7/3.5
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01.111.434	LCP Wrist Fusion Implant Set 2.7/3.5, Stainless Steel
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01.110.093*	Instruments and Implant Set with 2.7/3.5 Stardrive, for LCP Wrist Fusion Plates
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01.110.080	LCP Instrument Set 2.4 / 2.7 / 3.5
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01.111.434	LCP Wrist Fusion Implant Set 2.7/3.5, Stainless Steel
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Also included in the set

68.111.464	Labelling Clip for LCP Wrist Fusion Plate Set
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* each set contains a modular screw rack containing the appropriate screws

Modular Screwrack

68.111.442	Lid for Modular Screw Rack for screws 2.0 mm–3.5 mm
68.000.103	Screw Rack Frame, size 1/4, height 35
68.111.439	Screw Rack Module, 1/3, for 2.4 mm screws, for 1/4 frame
68.111.440	Screw Rack Module, 1/3, for 2.7 mm screws, for 1/4 frame
68.111.441	Screw Rack Module, 1/3, for 3.5 mm screws, for 1/4 frame

Synthes Biomaterials Overview

Synthetic and allogenic bone replacement materials have the advantage of uniform quality, unlimited availability and absence of potential complications at a donor site.

Additionally, the application of synthetic and allogenic bone graft substitutes reduces the duration of the surgery.

Synthes offers a wide range of synthetic biomaterial products in different application forms and with distinct biological properties:

chronOS



Osteoconductive, resorbable, synthetic

chronOS Perfusion Concept



Enhancing chronOS with biological factors

chronOS Inject



Injectable remodelling

Norian SRS



Injectable stability

DBX*



Osteoinductive power

MTF Musculoskeletal
Transplant
Foundation
THE ALLOGRAFT LEADER*
*Facilitated through Synthes

Furthermore a comprehensive portfolio of allograft products is available in selected countries.

For more detailed information about a specific product or availability of allografts please contact your local Synthes representative.

Torque, Displacement and Image Artifacts according to ASTM F 2213-06, ASTM F 2052-06e1 and ASTM F 2119-07

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 2182-11a

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.
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