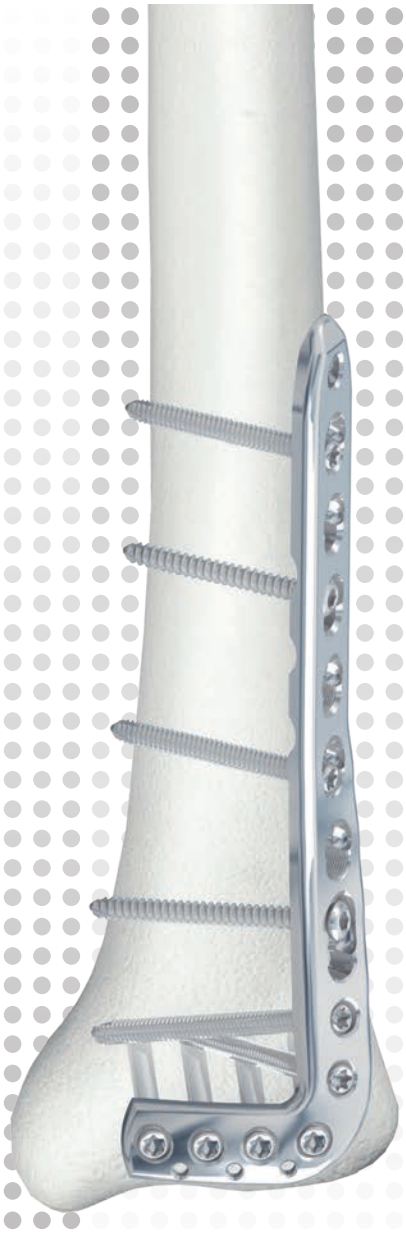
LCP Anterolateral Distal Tibia Plate 3.5

The low profile fixation system

Surgical Technique



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

Table of Contents

■ **Notes**
▲ **Precautions**
▲ **WARNINGS**

LCP Anterolateral Distal Tibia Plate 3.5

The low profile fixation system

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

The combi-holes in the LCP limited-contact plate shaft combine a dynamic compression unit (DCU) hole with a locking screw hole.

The head of the plate features four locking holes that accept locking screws ∅ 3.5 mm, cortex screws ∅ 2.7 mm and ∅ 3.5 mm or cancellous bone screws ∅ 4.0 mm.

The combi-holes in the plate shaft accept locking screws ∅ 3.5 mm, cortex screws ∅ 3.5 mm and cancellous bone screws ∅ 4.0 mm.

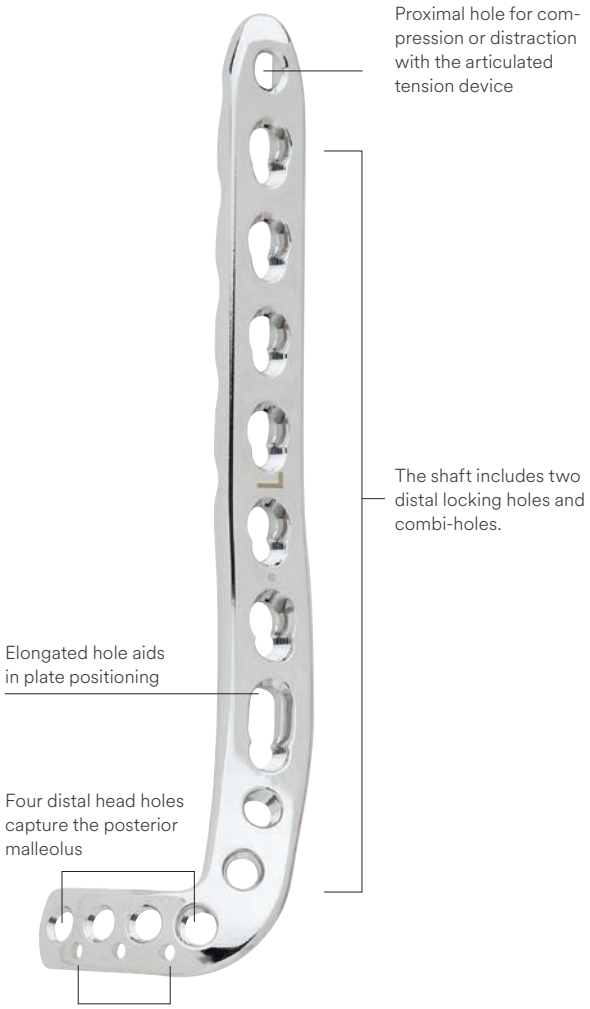
Locking screws provide the ability to create a fixed-angle construct while using standard AO plating techniques. These screws do not rely on plate-to-bone compression to resist patient load.

■ Note:

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

Overview

- Anatomically contoured
- Two different plate designs to fit right or left tibia (indicated with R or L on plate)
- Shaft holes accept locking screws ∅ 3.5 mm, cortex screws ∅ 3.5 mm and cancellous bone screws ∅ 4.0 mm
- Head holes accept locking screws ∅ 3.5 mm, cortex screws ∅ 2.7 mm and ∅ 3.5 mm and cancellous bone screws ∅ 4.0 mm
- 3.6 mm shaft thickness tapers to 2.5 mm distally
- Tapered tip for submuscular insertion
- Screw heads are recessed in the plate
- Shaft is contoured with a 60° twist for the distal tibia anatomy: less plate contouring is required.



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

The AO Principles of Fracture Management

Mission

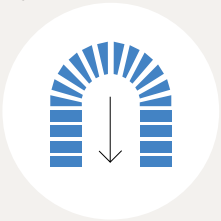
The AO's mission is promoting excellence in patient care and outcomes in trauma and musculoskeletal disorders.

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, M Allgöwer, R Schneider, H Willenegger. 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

1. Preparation

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

Required set (one of the following)

182.400	LCP Compact Small Fragment Instrument Set with Locking Screws Stardrive ∅ 3.5 mm and Implants (Pure Titanium) in Vario Case
182.405	LCP Compact Small Fragment Instrument Set with Locking Screws Stardrive ∅ 3.5 mm and Implants (Stainless Steel) in Vario Case
182.410	LCP Compact Small Fragment Instrument Set with Locking Screws ∅ 3.5 mm and Implants (Pure Titanium) in Vario Case
182.415	LCP Compact Small Fragment Instrument Set with Locking Screws ∅ 3.5 mm and Implants (Stainless Steel) in Vario Case

Optional sets

105.900	Bone Forceps Set
117.700	Instrument Set for Large Distractor
01.900.022	Extraction Module for Screws ∅ 3.5, 4.0 and 4.5 mm

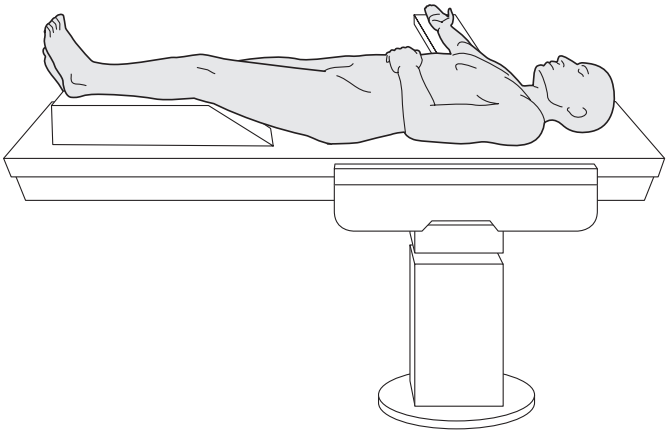
Optional instruments

X92.200	Kirschner Wire ∅ 2.0 mm with trocar tip
X92.710	Kirschner Wire ∅ 1.6 mm with threaded tip
309.520	Extraction Screw, conical
310.250	Drill Bit ∅ 2.5 mm
311.430	Handle with Quick Coupling
321.120	Tension Device, articulated
321.150	Socket Wrench ∅ 11 mm
323.360	Universal Drill Guide 3.5
324.024	Instrument for Temporary Reduction
324.031	Plate Holder with Thread ∅ 3.5 mm
324.214	Drill Bit ∅ 2.8 mm, with Scale, length 200/100 mm
329.040	Bending Iron for Plates 2.4 to 3.5
329.050	Bending Iron for Plates 2.4 to 3.5
329.300	Bending Press
394.350	Large Distractor
395.490	Medium Distractor

X=2: Stainless Steel
X=4: Titanium

Position patient

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



▲ WARNING:

The direction of locking screws is already determined for the anterolateral distal tibia plate. If manual contouring in the metaphyseal area is necessary, verify new screw trajectories using the Kirschner wire screw placement verification technique described in Step 5.

Reduction

2. Reduce articular surface

Optional instrument	
394.350	Large Distractor
395.490	Medium Distractor

Approach

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

■ Note:

The superficial peroneal nerve usually crosses the surgical incision proximal to the ankle joint and should be protected throughout the surgical procedure.

Reduce fracture/articular surface

■ Note:

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

The articular reduction is confirmed with image intensification. Temporary reduction can be obtained with multiple Kirschner wires. Multiple options exist for maintaining the reduction including:

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

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

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

■ Note:

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

Plate Insertion

3. Insert plate

Optional instrument

324.031	Plate Holder with Thread

Open the area as necessary to expose the metaphysis.

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

■ Note:

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

4. Position plate and fix provisionally

Optional instruments	
X92.200	Kirschner Wire ∅ 2.0 mm, with trocar tip
324.024	Instrument for Temporary Reduction

The plate may be temporarily held in place using any of the following options:

- Instrument for temporary reduction in a screw hole that will not immediately be used (as shown in this technique guide)
- Cortex screw ∅ 3.5 mm or cancellous bone screw ∅ 4.0 mm in a locking or combi-hole
- Standard plate holding forceps
- Kirschner wires through the plate
- Cortex screw ∅ 2.7 mm in one of the distal holes

These options also prevent plate rotation while inserting the first locking screw. To adjust the plate into final position, insert a Kirschner wire or partially insert a cortex screw or cancellous bone screw into the elongated hole or a combi-hole before inserting a locking screw.

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

■ Note:

This locking plate is contoured to fit the anterolateral distal tibia. If the plate contour is changed, it is important to check the position of the screws in relation to the joint, using the screw placement verification technique described in Step 5.

Optional instruments

324.214	Drill Bit ∅ 2.8 mm, with Scale, length 200/100 mm
324.024	Instrument for Temporary Reduction

324.024

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

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

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

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

Screw Insertion

5. Option: screw placement verification

Instruments	
X92.710	Kirschner Wire ∅ 1.6 mm with threaded tip
310.284	LCP Drill Bit ∅ 2.8 mm
323.027	LCP Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm
323.055	Centering Sleeve for Kirschner Wire ∅ 1.6 mm
323.060	Direct Measuring Device for Kirschner Wire ∅ 1.6 mm

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

With the LCP drill sleeve in the desired locking hole, insert the centering sleeve into the drill sleeve.

Insert a 1.6 mm threaded Kirschner wire through the centering sleeve and drill to the desired depth.

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

▲ Precaution:

The Kirschner wire position represents the final position of the locking screw. Confirm that the Kirschner wire does not enter the joint.

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

Remove the direct measuring device, Kirschner wire and centering sleeve, leaving the drill sleeve in place.

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

6. Insert screws in distal fragment

Instruments	
310.284	LCP Drill Bit ∅ 2.8 mm
323.027	LCP Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm
314.115	Screwdriver Stardrive
314.116	Screwdriver Shaft Stardrive
314.070	Screwdriver hexagonal
314.030	Screwdriver Shaft hexagonal
319.010	Depth Gauge for Screws
511.770 or 511.773	Torque Limiter

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

■ Note:

To secure the plate to the tibia prior to locking screw insertion, it is recommended to pull the plate to the bone using a cortex screw or the Instrument for Temporary Reduction (324.024).

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.

Locking screw insertion

- Insert the drill sleeve into a locking hole or combi-hole until fully seated.
- Use the 2.8 mm drill bit to drill to the desired depth.
- Remove the drill sleeve.
- Use the depth gauge to determine screw length.
- Insert screw.

Insert the locking screw under power, using the torque limiter and the screwdriver shaft, or insert it manually, using the screwdriver. Hold the plate securely on the bone to prevent plate rotation as the screw is locked to the plate.

■ Note:

When using the torque limiter, the screw is securely locked into the plate when a “click” is heard.

▲ WARNING:

Never use the screwdriver shaft directly with power equipment unless using a torque limiter.

Alternative

Instruments	
323.027	LCP Drill Sleeve 3.5, for Drill Bits ∅ 2.8 mm
324.214	Drill Bit ∅ 2.8 mm, with Scale, length 200/100 mm

Instead of using the LCP drill bit and depth gauge, the drill bit with scale can be used for drilling the hole and determining the required screw length.

7. Option: articulated tension device

Instrument	
321.120	Tension Device, articulated

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

■ Note:

The articulated tension device may facilitate anatomic reduction. This device may be used to generate either compression or distraction.

8. Insert screws in proximal fragment

A Non-locking screws

Instruments	
310.250	Drill Bit ∅ 2.5 mm
323.360	Universal Drill Guide 3.5
314.070	Screwdriver hexagonal
314.030	Screwdriver Shaft hexagonal
319.010	Depth Gauge

Use the 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 springloaded tip).

■ Note:

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

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

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

If used, remove the Instrument for Temporary Reduction (324.024).

B Locking screws

If using the threaded portion of the combi-holes, repeat the steps as described for distal locking screw insertion (step 6 Insert screws in distal fragment).

Implant Removal

Implant removal

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.

Problems with screw removal

Set	
01.900.022	Extraction Module for Screws ∅ 3.5, 4.0 and 4.5 mm

Instruments

309.520	Extraction Screw, conical
311.430	Handle with Quick Coupling

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 counter-clockwise direction.

Implants

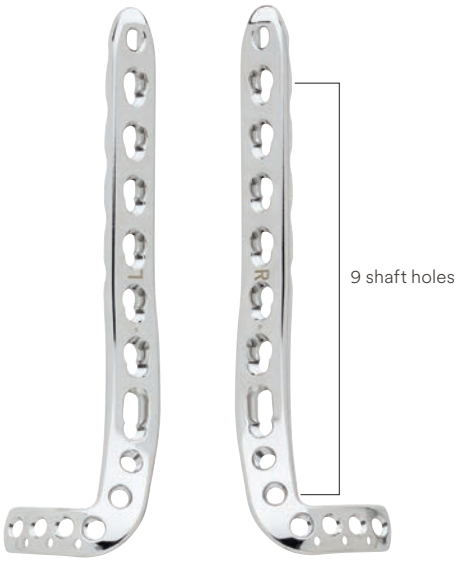
Plates and Trays

Plates

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

Trays

68.124.001	Tray for Implants, for LCP Anterolateral Distal Tibia Plates X41.440–X41.449
68.124.002	Tray for Implants, for LCP Anterolateral Distal Tibia Plates extra-long X41.450–X41.457
689.508	Vario Case Framing
689.507	Vario Case Lid



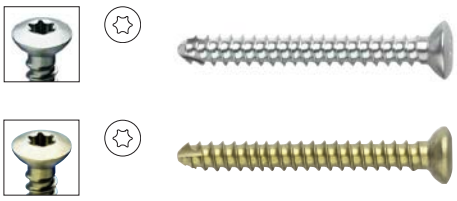
241.445 241.444

All plates are available sterile packed. For sterile implants add suffix “S” to article numbers (e.g. 241.440S).

Screws

Cortex Screws 2.7 mm

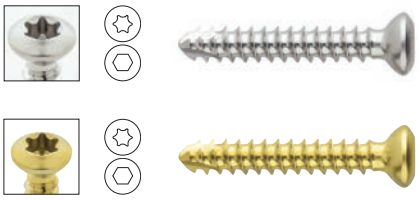
X02.870– X02.969	Cortex Screw Stardrive ∅ 2.7 mm, self-tapping, length 10–60 mm



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

Cortex Screws 3.5 mm

0X.200.010– 0X.200.060	Cortex Screw Stardrive ∅ 3.5 mm, self-tapping, length 10–60 mm
or	
X04.810– X04.860	Cortex Screw ∅ 3.5 mm, self-tapping, length 10–60 mm



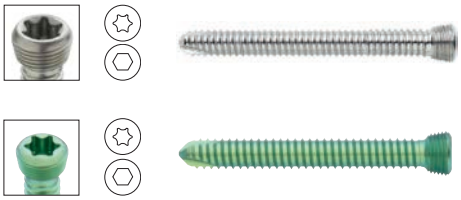
- May be used in the DCU portion of the combi-holes in the plate shaft
- Compresses the plate to the bone
- Fully threaded shaft

X=2 Stainless Steel
X=4 Titanium

All screws are available sterile packed. For sterile implants add suffix "S" to article number.

Locking Screws 3.5 mm

X12.101– X12.125	Locking Screw Stardrive ∅ 3.5 mm, self-tapping, length 10–65 mm
or	
X13.010– X13.060	Locking Screw ∅ 3.5 mm, self-tapping, length 10–60 mm



- Creates a locked screw/plate construct
- Fully threaded shaft
- Self-tapping tip
- Used in the locking portion of the combi-holes or in round locking holes

Cancellous Bone Screws 4.0 mm

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
- Compresses the plate to the bone or creates axial compression
- Fully or partially threaded shaft

X=2 Stainless Steel
X=4 Titanium

All screws are available sterile packed. For sterile implants add suffix "S" to article number.

Sets and Instruments

Required set (one of the following)

182.400	LCP Compact Small Fragment Instrument Set with Locking Screws Stardrive ∅ 3.5 mm and Implants (Pure Titanium) in Vario Case
182.405	LCP Compact Small Fragment Instrument Set with Locking Screws Stardrive ∅ 3.5 mm and Implants (Stainless Steel) in Vario Case
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329.300	Bending Press
394.350	Large Distractor
395.490	Medium Distractor

X=2: Stainless Steel
X=4: Titanium

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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