

LCP Locking Compression Plate.

Combine without compromise.




Instructions for Use



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-
-  Stardrive
 -  Hex drive
 -  Image intensifier

Warning

This description is not sufficient for immediate application of the instrumentation. Instruction by a surgeon experienced in handling these instruments is highly recommended.

LCP Locking Compression Plate.

Combine without compromise.

LCP Locking Compression Plate

Angular stable support of fragments regardless of bone quality

Reduces the risk of primary and secondary loss of reduction even under high dynamic loading

Reduced impairment of periosteal blood supply due to limited plate-periosteum contact

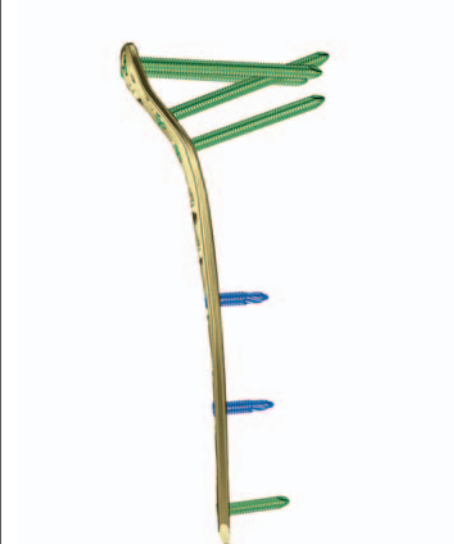
Favorable hold also in osteoporotic bone and in multiple fragment fractures

Angular stable implant



Stability of the implant regardless of bone quality; supply stability slightly dependent on bone quality

Locking screws can be placed in each hole of the plate



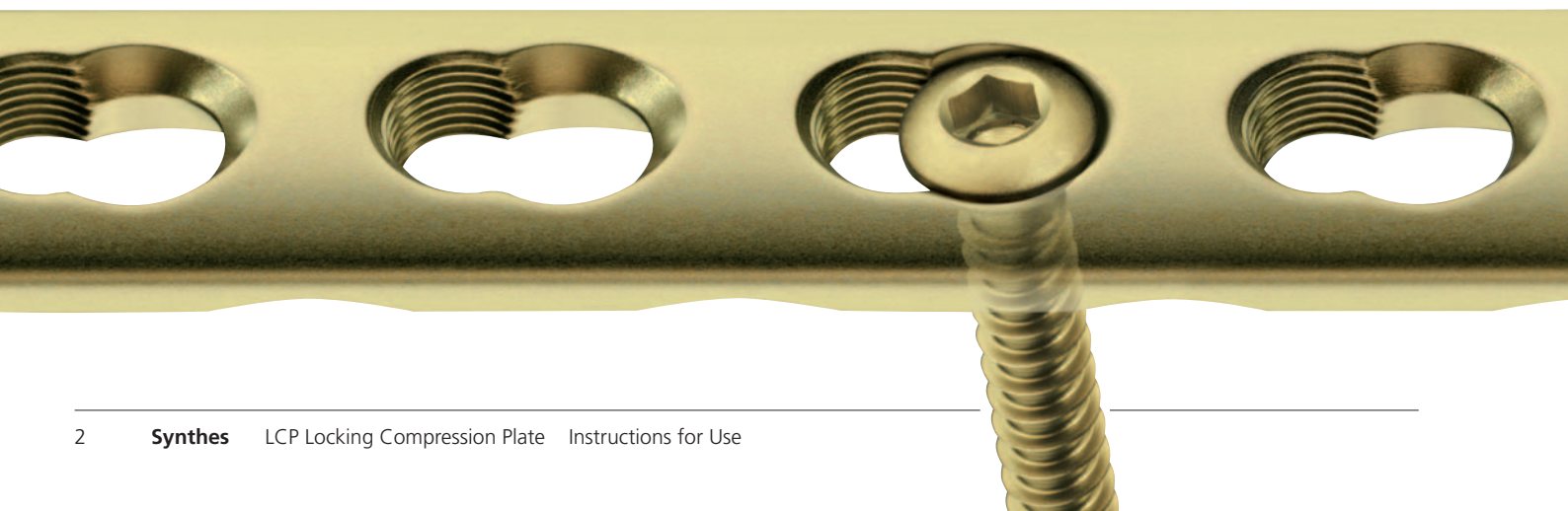
Because the screws are tightly locked in the plate:

- There is no tension on the bone
- Compression is eliminated between the plate and bone
- The periosteum is undamaged and circulation is retained

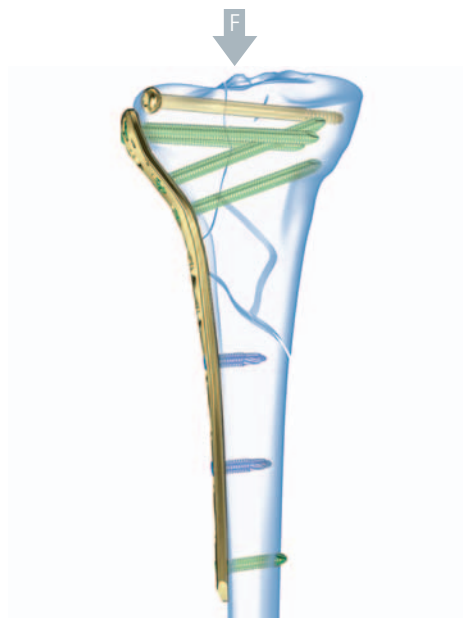
The plate does not have to be precisely shaped to the bone to provide stability

Minimally invasive surgery (MIS) is easy to perform:

- The soft tissue and the wound hematoma are treated gently
- Optimum circulation is maintained



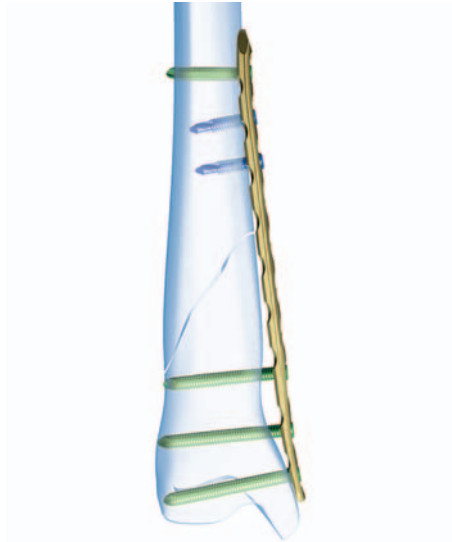
Reduction maintained under a load



Stable bridging of comminuted fractures

The stable plate-screw connection decreases secondary loss of reduction in the epiphyseal and metaphyseal regions

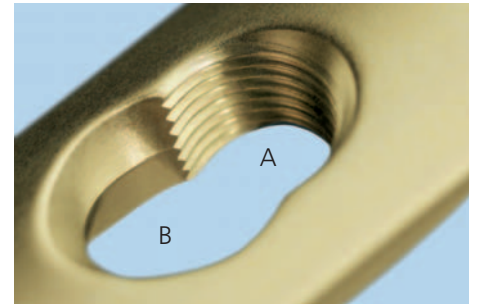
The screws are locked in the plate, and the physiological load (F) is transferred from the bone to the plate



The fragments are fixed in their reduced position without regard to the plate model (internal fixator)

The bone fragments are reliably fixed in the position assumed at the time the screws are locked

LCP combi-hole



A Stable plate-screw connection

- Locking screws reduce screw loosening
- Excessive torque is not applied to the cortical bone
- The conical screw head makes it easy to insert the screw

B Compatibility

- The proven dynamic compression hole allows the use of all standard screws

Self-tapping locking screws



- Use after precisely measuring the length (metaphysis)
- Monocortical or bicortical use
- Not necessary to separately tap thread

Self-drilling locking screws



- Use without having to precisely measure the length (diaphysis)
- Only for monocortical use
- Tapping and predrilling are unnecessary

Standard screws



- Dynamic compression is created by the eccentric insertion of the standard screws (analogous to LC-DCP)



The aim of fracture operations is to reconstruct the anatomy and restore function. According to the AO Foundation, the basic principles of osteosynthesis are anatomical reduction, stable fixation, maintenance of the blood supply, and early functional mobilisation.¹

Plate and screw osteosynthesis has been an established procedure for a long time and is clinically recognized. In the case of metaphyseal fractures and osteoporotic bone, the clinical results have been improved by the use of angular stable systems, or internal fixators.^{2,3}

The Locking Compression Plate (LCP) of the AO is based on the wealth of experience with standard plates and screws and the internal fixator. It enables the use of the standard plate technique, the internal fixator approach, and the specific combination of both methods. An indication can therefore be treated with the technique that achieves the best results without having to make compromises.

1 Rüedi T.P., Murphy W.M. et al. (2000) AO Principles of Fracture Management. Stuttgart / New York.

2 Tepic S., Perren SM (ed.) (1995). PC-Fix. Injury: Volume 26, Supplement 2.

3 Kregor P (ed.). (2001). LISS. Injury: Volume 32, Supplement 3.

Indications and Contraindications

Different types of small and large fragment plates with LCP combination holes are available. The existing designs of the Synthes small and large fragment plates (standard plates) have been retained. The same indications apply for LCP plates as for the corresponding standard plates.

In the case of metaphyseal fractures, comminuted fractures and osteoporotic bone, the clinical results can be improved by the angular stable screw/plate connection.

Because Synthes offers a wide variety of LCP plates, a correspondingly large variety of indications are covered. For this reason, this technical guide does not cover specific indications and the selection of the plate type. For a treatment of these subjects, please refer to "AO Principles of Fracture Management", courses offered by AO (www.aofoundation.org), and the corresponding professional literature.

The following techniques for handling the implants and instruments will be explained with reference to a straight 3.5 mm LCP plate. The handling method is the same for small and large fragment plates.

Standard Plate Technique

1

Reduce the fracture

- Reduce the fracture under the image intensifier. As needed, provide fixation with Kirschner wire or reducing forceps.

Alternative

Reduce the fracture indirectly using the plate by means of standard screws (for lag screw technique, see page 23).

2

Bend the plate

Instruments

Small fragment

329.040	Bending Iron for Plates 2.4 to 3.5 (for use with 329.050)
329.050	Bending Iron for Plates 2.4 to 3.5 (for use with 329.040)
329.150	Bending Pliers for Plates 2.4 to 4.0
329.290	Bending Pliers for Reconstruction Plates 2.7 and 3.5

Large fragment

329.300	Bending Press
329.240	Bending Pliers for Plates 4.5
329.020	Bending Iron for LC-DCP 4.5 and DCP 4.5 (two required)
329.080	Bending Iron for Reconstruction Plates 3.5 and 4.5

Precisely contour the LCP plate to the anatomy using the appropriate bending instruments (as for standard plates), especially in the case of joint fractures.

Notes

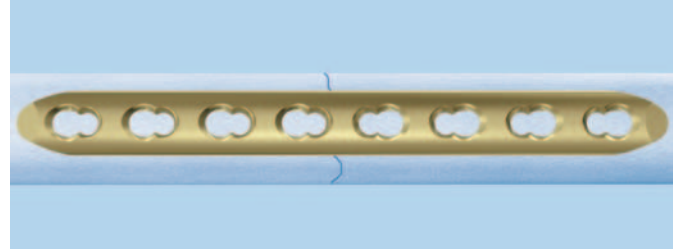
- Do not bend back and forth.
- The LCP combi-holes are asymmetrical in the plate. In straight plates, the hole alignment changes in the middle of the plate. This asymmetry enables unidirectional dynamic compression to be exerted.



3

Position plate

Position the plate on the bone, and preliminarily fix it. If axial dynamic compression is used, make sure that the middle of the plate is above the fracture line.



4

Select the drill guide position

Instruments

Small fragment

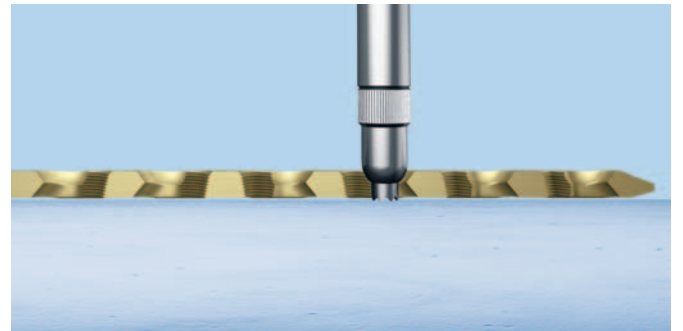
323.360	Universal Drill Guide
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Large fragment

323.460	Universal Drill Guide
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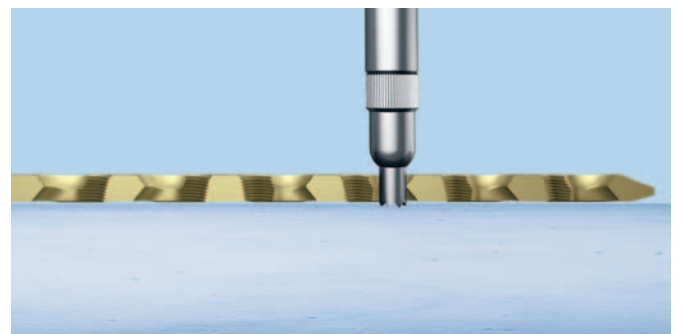
a. Select the neutral position

Press the spring-loaded guide against the bone in the DC part of the LCP hole. The inner sleeve retracts. The rounded end of the outer sleeve slides along the hole angle into neutral position. This enables neutral predrilling.



b. Select eccentric position (dynamic compression)

Place the universal drill guide on the edge of the DC part of the LCP hole without exerting any pressure. The inner sleeve remains in its original state. The dynamic compression is generated by setting and tightening the cortex screw.



Note: The LC-DCP Drill Guide (small fragment: 323.350; large fragment: 323.450) and the DC Drill Guide (small fragment: 323.320; large fragment: 322.440) are unsuitable for LCP plates.

5

Predrill screw hole

Instruments

Small fragment

310.230	Drill Bit Ø 2.5 mm, for 3.5 mm Cortex Screw and 4.0 mm Cancellous Bone Screw
---------	--

Large fragment

310.290	Drill Bit Ø 3.2 mm, for 4.5 mm Cortex Screw and 6.5 mm Cancellous Bone Screw
---------	--

Predrill with an appropriate drill.

6

Determine screw length

Instruments

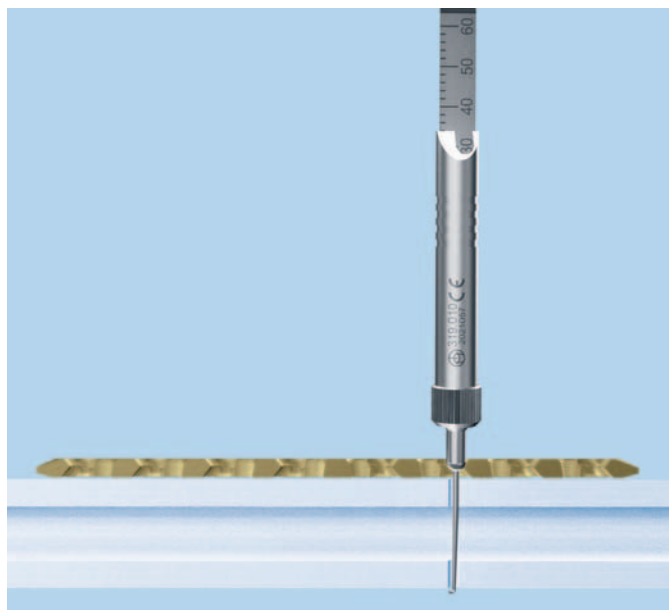
Small fragment

319.010	Depth Gauge
---------	-------------

Large fragment

319.100	Depth Gauge
---------	-------------

Measure the screw length with the depth gauge.



7

Option: Tap the thread

Instruments

Small fragment

311.320 Tap for Cortex Screws \varnothing 3.5 mm

Large fragment

311.460 Tap for Cortex Screws \varnothing 4.5 mm

If self-tapping screws are not used, tap a thread manually.

8

Insert standard screw

Instruments

311.440 T-Handle with Quick Coupling

Small fragment

314.070 Screwdriver, hexagonal

Large fragment

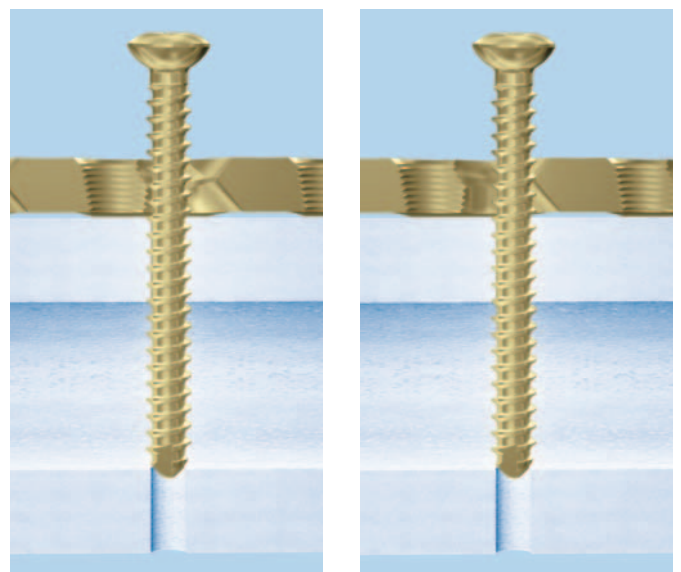
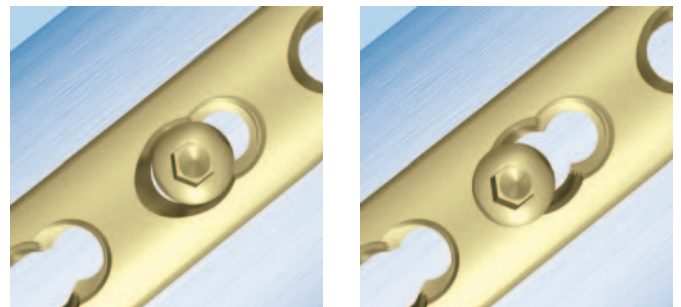
314.270 Screwdriver, hexagonal

Using the screwdriver, manually insert and tighten a standard screw with the measured length. Depending on the selected type of predrilling, no compression (a) or dynamic compression (b) may be generated.

Option: Insert a 2.7 mm cortex screw in a small fragment plate

Place an LCP Washer 2.7/3.5 (X19.981) in the DC hole part of the 3.5 mm LCP plate. In this case, predrill with a Drill Bit with a 2.0 mm diameter (310.190).

Note: The holes in the straight LCP plates are larger at the two ends to allow the insertion of cancellous bone screws.



(a) no compression

(b) dynamic compression

Set Self-tapping Locking Screws

1

Reduce the fracture and preliminarily fix it

- Reduce the fracture under the image intensifier, and fix it with Kirschner wires or reducing forceps.
-

2

Bend the plate

Approximately adapt the plate to the anatomy using the appropriate bending instruments.

3

Position the plate and preliminarily fix it

Position the plate on the bone, and preliminarily fix it (for preliminary fixation using an LCP centering sleeve for Kirschner wires, see step 5).

Before setting the first locking screw, make sure that the plate is provisionally fixed well since it could otherwise rotate when locking the screw and damage soft tissue.

4

Set LCP drill sleeve

Instruments

Small fragment

323.027	LCP Drill Sleeve
---------	------------------

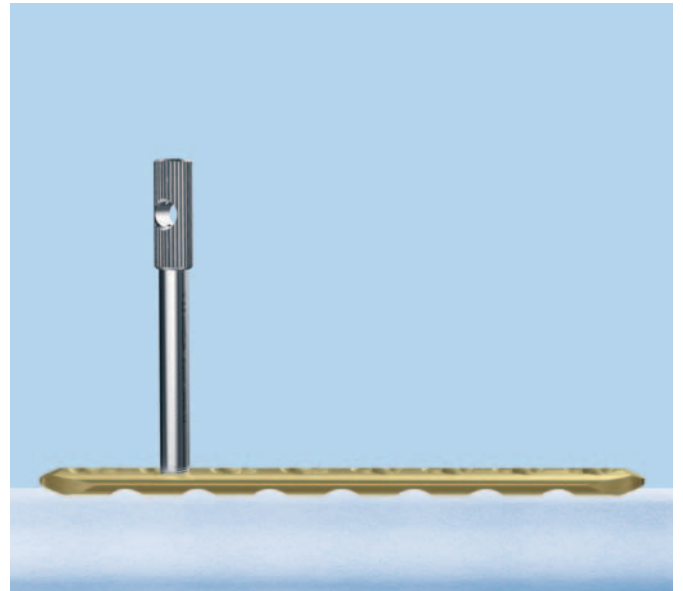
Large fragment

323.042	LCP Drill Sleeve
---------	------------------

Carefully screw the LCP drill sleeve into the desired LCP hole until it is gripped completely by the thread. The LCP drill sleeve ensures that the locking screw is correctly locked in the plate. The angular stability is reduced if a locking screw is inserted obliquely.

Tip: To make it easier for the drill sleeve to grip the thread, it may be useful to slightly rotate it to the left (back).

Note: In the case of meta-epiphyseal plates, the threaded hole is usually not perpendicular to the plate surface due to the anatomy.



5

Option: Set Kirschner wire

Instruments

Small fragment

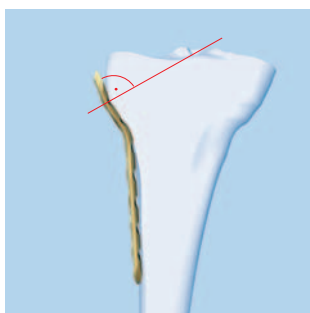
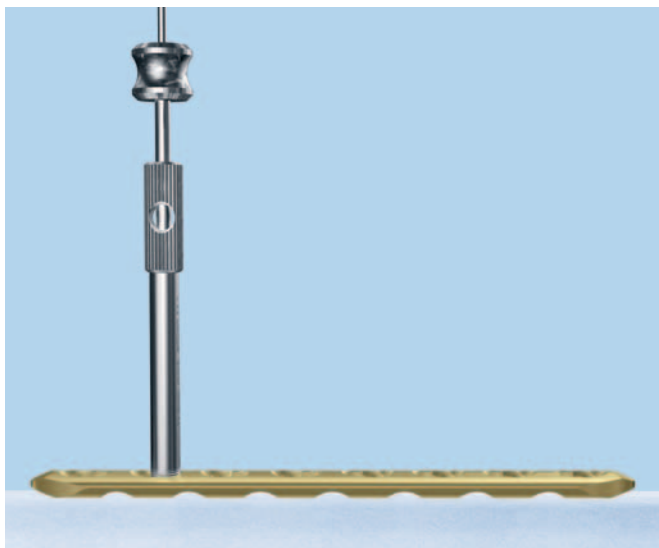
323.055	Centering Sleeve for Kirschner Wires Ø 1,6 mm
324.081	Centering Sleeve for Kirschner Wires Ø 1,25 mm

Large fragment

323.044	Centering Sleeve for Kirschner Wires Ø 2,0 mm
---------	--

Insert the centering sleeve for Kirschner wires into the LCP drill sleeve. To allow the locking screw alignment to be checked later, use a power tool to insert a Kirschner wire and check its position under the image intensifier. This check is especially recommendable in the metaphyseal region. Remove the Kirschner wire and the centering sleeve for Kirschner wires.

Note: If the angle of the locking screw is not optimal, it can be easily corrected. Bend the plate as needed, or move it in a proximal or distal direction. This technique is also suitable to preliminarily fix the plate to the bone.



6

Pre-drill screw hole

Instruments

Small fragment

310.284	LCP Drill Bit Ø 2,8 mm
---------	------------------------

Large fragment

310.430	LCP Drill Bit Ø 4,3 mm
---------	------------------------

Carefully drill the screw hole using an appropriate drill.

Shove the stop ring down to the drill sleeve to make reading easier. Remove the drill sleeve.

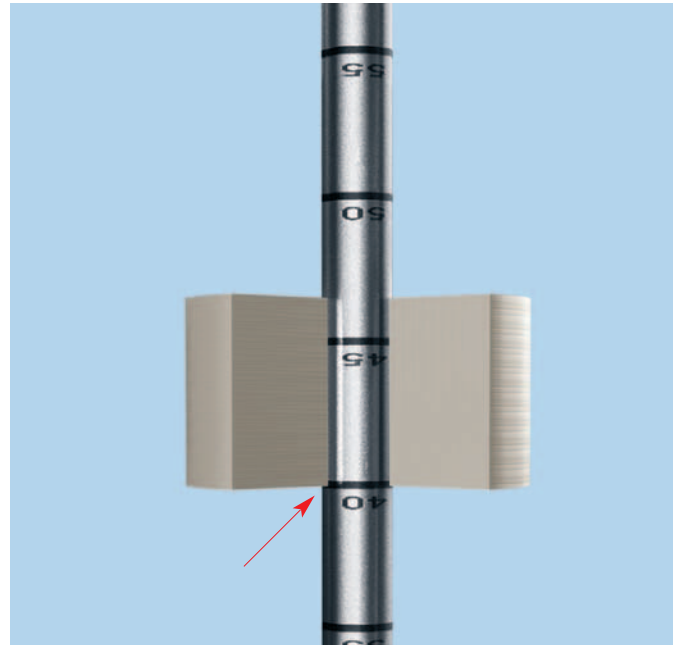
Note: Replacement stop rings can be ordered from the local Synthes representative.



7

Determine screw length

Read the drilled depth directly from the laser mark on the drill bit.



Alternative

Instruments

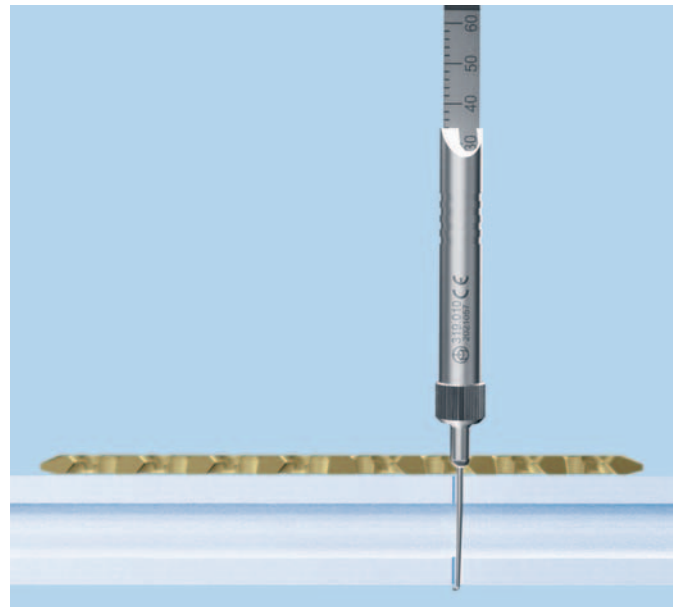
Small fragment

319.010 Depth Gauge

Large fragment

319.100 Depth Gauge

Determine the screw length with the depth gauge.



8**Insert locking screw****Instruments****Small fragment**

511.770 or

511.115 Torque Limiter, 1.5 Nm


 314.116 Screwdriver Shaft T15, self-holding

 314.030 Screwdriver Shaft
Large fragment

511.771 Torque Limiter, 4.0 Nm

 314.119 Screwdriver Shaft T25, self-holding or

314.163 Torque-limiting Screwdriver T25

 314.150 Screwdriver Shaft or

314.152 Screwdriver Shaft, self-holding or

324.052 Torque-limiting Screwdriver

397.705 Handle for Torque Limiter

Nos. 511.770 and 511.771

311.431 Handle with Quick Coupling for 511.115

511.701 Compact Air Drive

530.100 Power Drive

Before setting the first locking screw, anatomical reconstruction must have occurred and, where necessary, fixed with lag screws. After setting the locking screws, additional reduction can no longer occur without removing the locking screws. The locking screws can either be inserted with a power tool without locking or manually.

a. Insertion with a power tool



To insert the locking screw using a power tool, fit a torque limiter to the power tool. Then insert the screwdriver shaft into the torque limiter.

Pick up the locking screw and insert it into the plate hole. To insert the screw, start the power tool slowly, increase the speed and then reduce it again before the screw is fully tightened. Uncouple the power tool, and mount the handle with the CAD coupling or the handle with the quick coupling, and manually tighten the screw. After one click, the optimum torque is reached.

**Notes**

- Do not lock the screws at full speed to reduce the risk of stripping the head. This can make it difficult to remove the implant.
- For long screws and thick cortical bone, ensure sufficient cooling during insertion.

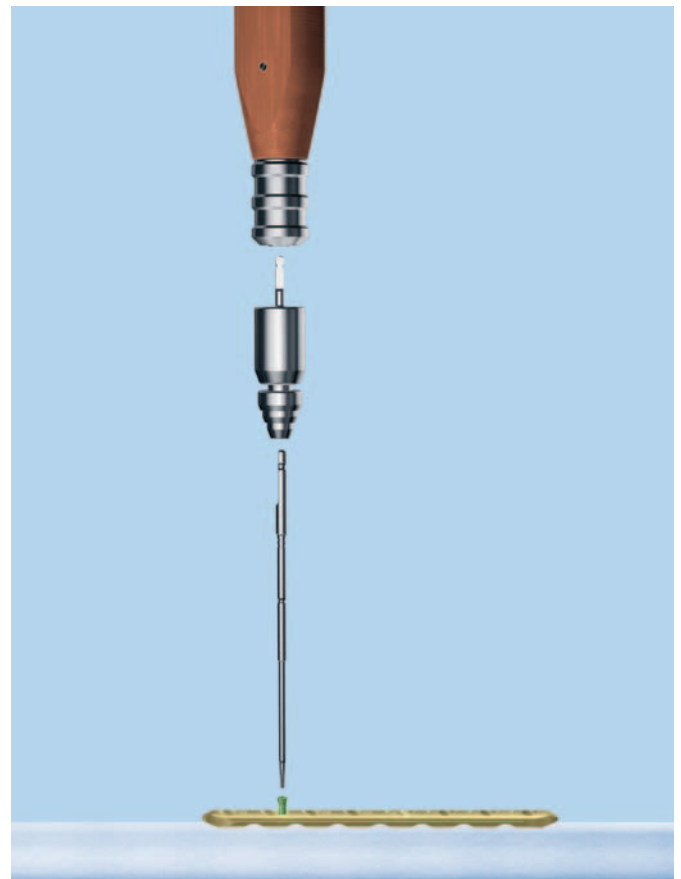
The following table shows combinations of various drives and torque limiters, and the associated attachments:

Drive	Torque limiter (TLA)				
	Small fragment 511.770 (1.5 Nm)	Small fragment 511.773 (1.5 Nm)	Small fragment 511.115 (1.5 Nm)	Large fragment 511.771 (4.0 Nm)	Large fragment 511.774 (4.0 Nm)
Compact Air Drive	direct without attachment	attachment 511.750	attachment 511.750	direct without attachment	attachment 511.785
Power Drive	direct without attachment	attachment 511.750	attachment 511.750	direct without attachment	attachment 511.785
Colibri		attachment 532.013	attachment 532.013		attachment 532.017
Other power drives		AO/ASIF quick coupling	AO/ASIF quick coupling		AO/ASIF quick coupling for reamer
Handle for TLA	397.705	311.431	311.431	397.705	397.706
 Stardrive screwdriver shaft	314.116	314.116	314.116	314.119	314.119
 Hexagonal screwdriver shaft	314.030	314.030	314.030	314.150 314.152	314.150 314.152

b. Manual insertion

To insert the locking screw manually, attach the torque limiter handle to the torque limiter and insert a screwdriver shaft. Screw in the locking screw, and lock it in the plate.

Only for locking screws large fragment: Alternatively, the Torque-limiting Screwdriver can be used (Hex 324.052, Stardrive 314.163).



Set Self-drilling, Self-tapping Locking Screws

1

Preliminary fixation

Provisionally fix the LCP locking plate to the bone.

Note: The self-drilling screws are primarily inserted in bone regions where a precise determination of length is not required (diaphysis). They can only be set monocortically. Do not insert the drill tip into the opposite cortical bone since this can make removal difficult.

2

Set locking screw

Instruments

Small fragment

511.770 or 511.115	Torque Limiter, 1.5 Nm
★ 314.116	Screwdriver Shaft T15, self-holding
● 314.030	Screwdriver Shaft

Large fragment

511.771 or 511.774	Torque Limiter, 4.0 Nm
★ 314.119	Screwdriver Shaft T25, self-holding
● 314.150	Screwdriver Shaft or
314.152	Screwdriver Shaft, self-holding
397.705	Handle with Quick Coupling
511.701	Compact Air Drive II
530.100	Power Drive

For additional combinations, see the table on page 15.

Insert a self-drilling locking screw of the desired length using a power tool with the torque limiting attachment and the screwdriver shaft along the thread axis of the hole and screw it in. Stop the power tool before the screw is locked. Remove the power tool and mount the handle. Lock the screw and tighten it until a click can be heard.

Notes

- Especially when the cortical bone is thick and the locking screw is set perpendicular, predrilling with the LCP Universal Drill Guide (small fragment: 323.505; large fragment: 323.500) is recommended. The universal drill guide is also used when inserting self-tapping screws in the diaphyseal region. For further information, see page 20.
 - You can alternatively follow steps 4–7 on pages 11–13.
 - Cooling is recommended for longer screws.
-

Indirect Reduction with Locking Screws

1

Shove the screw holding sleeve over the torque-limiting screwdriver

Instruments

Small fragment

314.091 Holding Sleeve for Screws, for LCP

★ 314.041 Screwdriver T15

● 314.070 Screwdriver

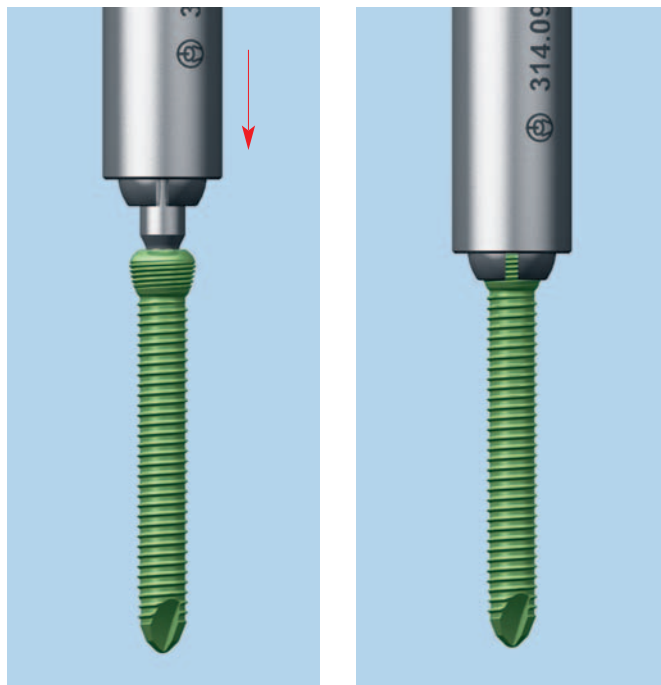
Large fragment

314.281 Holding Sleeve for Screws, for LCP

★ 314.164 Screwdriver T25

● 314.270 or
324.052 Screwdriver

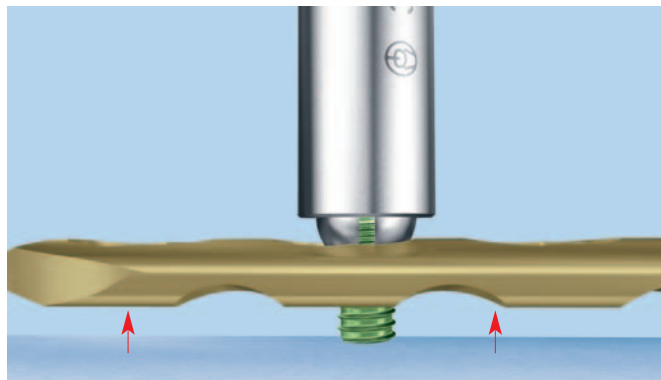
Mount the screw holding sleeve on the screwdriver. Hold the locking screw by placing the screw holding sleeve over the head of the screw.



2

Insert screw

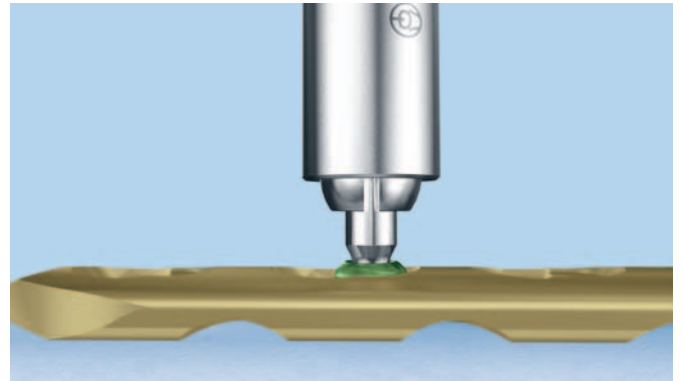
Insert the screw. The screw holding sleeve prevents the screw from locking in the plate. As soon as the screw holding sleeve reaches the plate, the bone is approached by continuing to screw the screw in the plate.



3

Retract the screw holding sleeve

After the desired reduction is attained, retract the screw holding sleeve from the head of the locking screw.



4

Lock the screw

Instruments

Small fragment

511.770 Torque Limiter, 1.5 Nm

★ 314.116 Screwdriver Shaft T15, self-holding

● 314.030 Screwdriver Shaft

Large fragment

511.771 Torque Limiter, 4.0 Nm

★ 314.119 Screwdriver Shaft T25 or

314.163 Torque-limiting Screwdriver T25

● 314.150 Screwdriver Shaft or

314.152 Screwdriver Shaft, self-holding or

324.052 Torque-limiting Screwdriver

397.705 Handle for Torque Limiter

For additional combinations, see the table on page 15.

Remove the screwdriver and holding sleeve. Place the torque limiter handle on the torque limiter, and insert a screwdriver shaft. Screw in the locking screw, and lock it in the plate.

Only for locking screws large fragment: Alternatively, the Torque-limiting Screwdriver can be used (Hex 324.052, Stardrive 314.163).

Note: This technique is only suitable for pulling the bone to the plate. To generate interfragmentary compression, use cancellous bone or cortical bone screws (lag screw principle).

Predrilling with the LCP Universal Drill Guide

- The LCP universal drill guide is only available with a Hex drive.

Instruments

Small fragments

323.505 LCP Universal Drill Guide 3.5

314.030 Hexagonal Screwdriver Shaft

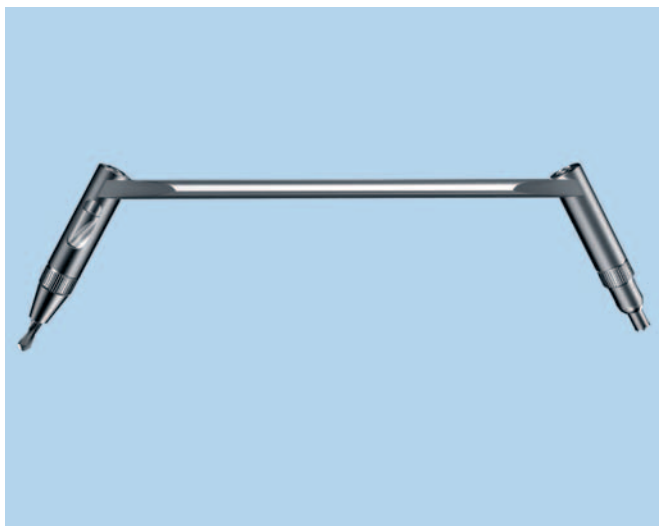
Large fragments

323.500 LCP Universal Drill Guide 4.5/5.0

314.150 Hexagonal Screwdriver Shaft, or

314.152 Screwdriver Shaft, hexagonal, self-holding

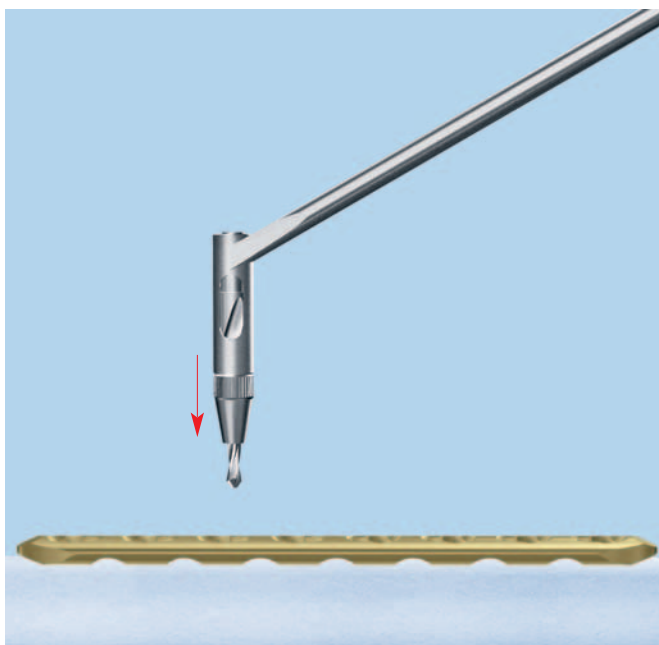
The LCP universal drill guide can alternatively be used for predrilling. The universal drill guide has a drill guide on one side that enables centric and eccentric predrilling; a short drill bit is on the other side (small fragments \varnothing 2.8 mm; large fragments \varnothing 4.3 mm).



1

Set the LCP universal drill guide

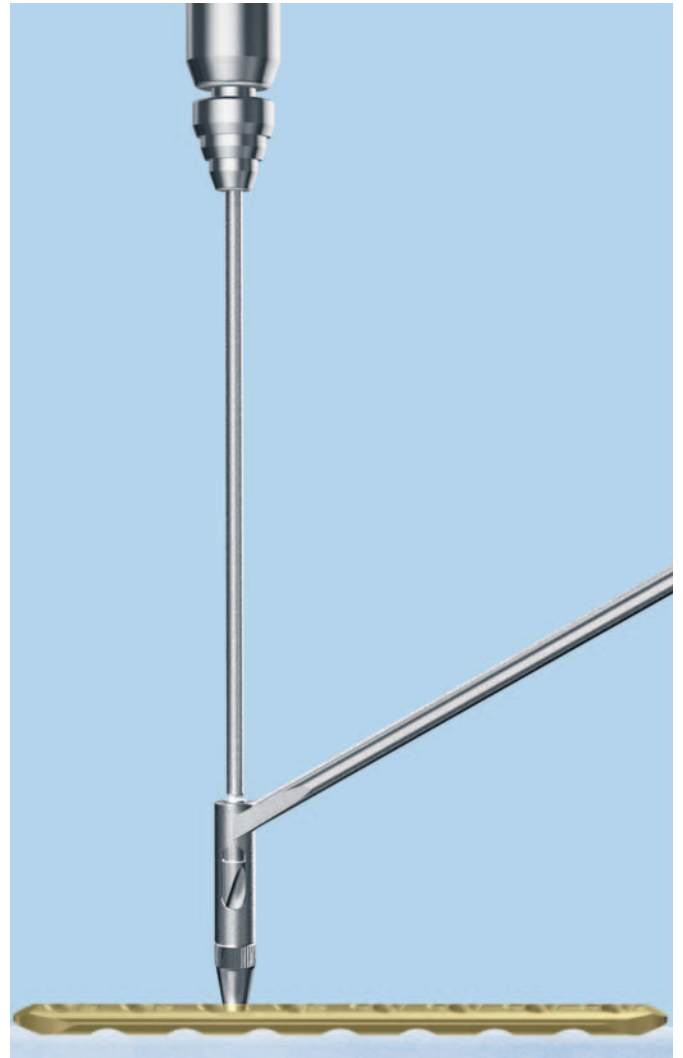
Insert the universal drill guide into the threaded part of the LCP hole.



2

Drill through the cortical bone

Use a power tool to drill through the proximal cortical bone with the screwdriver shaft in the drill guide.



3

Remove the LCP universal drill guide

Remove the drill guide.

4

Set locking screw

Set the self-drilling, self-tapping locking screw as described on page 16.

Set LCP Spacers

Instruments

Steel	Titanium
-------	----------

Small fragment

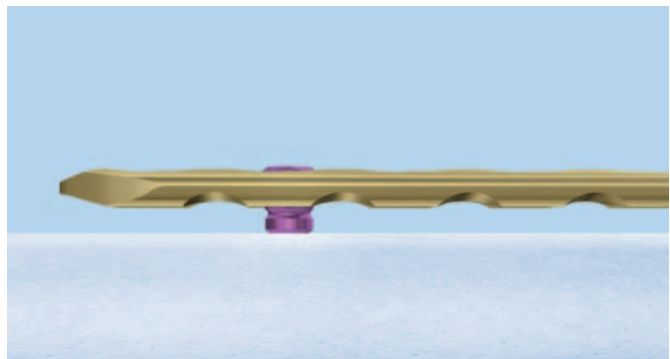
222.476	422.476	Spacer Ø 3.5 mm
213.009	413.009	Spacer Ø 3.5 mm

Large fragment

222.477	422.477	Spacer Ø 5.0 mm
213.309	413.309	Spacer Ø 5.0 mm

To reduce the plate-to-bone contact to a minimum, screw an LCP spacer in the plate before positioning the plate. The spacer ensures that a distance of 2 mm will be maintained between the plate and the bone when the screws are later inserted.

The spacer can be removed after setting the locking screws.

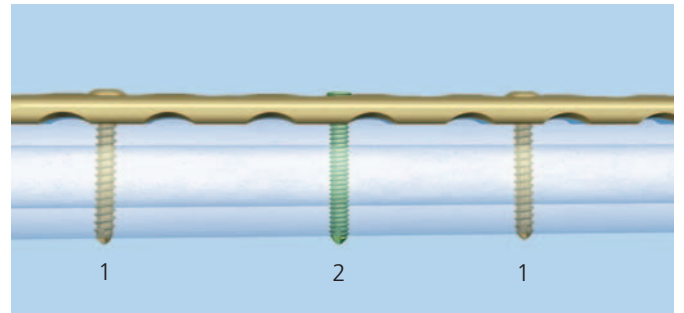


Examples of the Combination Technique

Standard screws and angular-stable locking screws can be easily combined.

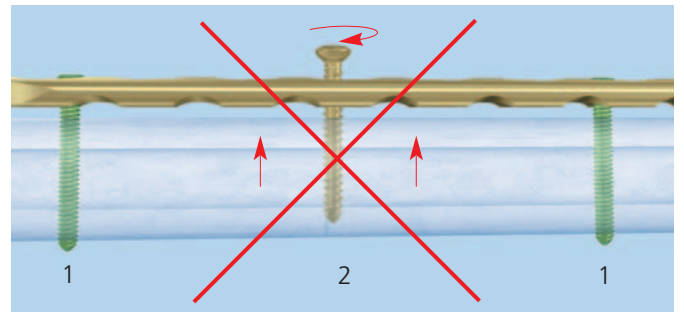
Example A

If a plate is first fixed with standard screws (1), locking screws can be introduced later (2) to fix the fragments at a stable angle.



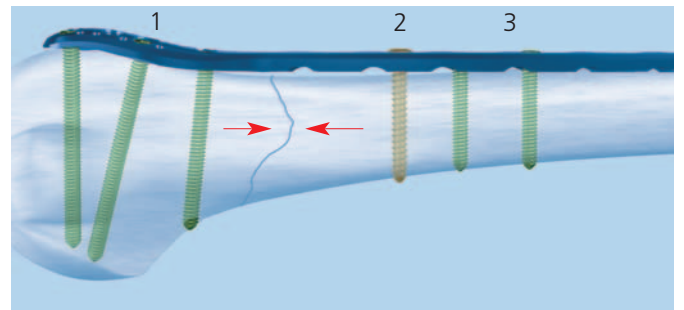
Example B

If a plate is first fixed to a fragment with locking screws (1), it is not recommendable to later insert standard screws in the same fragment (2). In this case, the locking screws must be removed first before inserting the standard screws.



Example C

If the metaphyseal fragment is fixed with locking screws (1), the fracture can be dynamically compressed with standard screws (2). To increase the stability of fixation, insert additional locking screws into the diaphyseal fragment (3).



Example D

In the case of a diaphyseal fracture, standard screws can be inserted after the locking screws to draw the opposing fragments closer to the plate.

Remove the Implant

To remove the plate, first remove the tissue and bone from all screw heads and drives. Insert a screwdriver that is in good condition in the screw recess and unlock all screws manually. In a second step, completely remove all the screws.

If the screws cannot be removed with the screwdriver, please consult the separate Synthes publication "Screw Extraction Set: Instruments for removing Synthes screws" (Art. No. 036.000.918), which explains in detail how screws with damaged recess as well as broken and jammed screws can be removed.



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Presented by:

