LCP Locking Compression Plate.
Combine without compromise.

Instructions for Use
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### Key Tools
- 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.

Angular stable implant

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

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

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

LCP Locking Compression Plate

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
**Reduction maintained under a load**

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.

**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.

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.
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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>329.040</td>
<td>Bending Iron for Plates 2.4 to 3.5 (for use with 329.050)</td>
</tr>
<tr>
<td>329.050</td>
<td>Bending Iron for Plates 2.4 to 3.5 (for use with 329.040)</td>
</tr>
<tr>
<td>329.150</td>
<td>Bending Pliers for Plates 2.4 to 4.0</td>
</tr>
<tr>
<td>329.290</td>
<td>Bending Pliers for Reconstruction Plates 2.7 and 3.5</td>
</tr>
</tbody>
</table>

Large fragment

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>329.300</td>
<td>Bending Press</td>
</tr>
<tr>
<td>329.240</td>
<td>Bending Pliers for Plates 4.5</td>
</tr>
<tr>
<td>329.020</td>
<td>Bending Iron for LC-DCP 4.5 and DCP 4.5 (two required)</td>
</tr>
<tr>
<td>329.080</td>
<td>Bending Iron for Reconstruction Plates 3.5 and 4.5</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Small fragment</th>
<th>Large fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>323.360 Universal Drill Guide</td>
<td>323.460 Universal Drill Guide</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>310.230</td>
<td>Drill Bit Ø 2.5 mm, for 3.5 mm Cortex Screw and 4.0 mm Cancellous Bone Screw</td>
</tr>
</tbody>
</table>

**Large fragment**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>310.290</td>
<td>Drill Bit Ø 3.2 mm, for 4.5 mm Cortex Screw and 6.5 mm Cancellous Bone Screw</td>
</tr>
</tbody>
</table>

Predrill with an appropriate drill.

6  
**Determine screw length**

**Instruments**

**Small fragment**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>319.010</td>
<td>Depth Gauge</td>
</tr>
</tbody>
</table>

**Large fragment**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>319.100</td>
<td>Depth Gauge</td>
</tr>
</tbody>
</table>

Measure the screw length with the depth gauge.
7
Option: Tap the thread

Instruments
Small fragment
311.320 Tap for Cortex Screws Ø 3.5 mm
Large fragment
311.460 Tap for Cortex Screws Ø 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.
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

<table>
<thead>
<tr>
<th>Instruments</th>
<th>323.027</th>
<th>LCP Drill Sleeve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small fragment</td>
<td>323.027</td>
<td>LCP Drill Sleeve</td>
</tr>
<tr>
<td>Large fragment</td>
<td>323.042</td>
<td>LCP Drill Sleeve</td>
</tr>
</tbody>
</table>

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-epiphysial plates, the threaded hole is usually not perpendicular to the plate surface due to the anatomy.
5  
Option: Set Kirschner wire

Instruments

<table>
<thead>
<tr>
<th>Small fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>323.055 Centering Sleeve for Kirschner Wires</td>
</tr>
<tr>
<td>or 324.081 Centering Sleeve for Kirschner Wires</td>
</tr>
<tr>
<td>1,6 mm or 1,25 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>323.044 Centering Sleeve for Kirschner Wires</td>
</tr>
<tr>
<td>2,0 mm</td>
</tr>
</tbody>
</table>

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  
Predrill screw hole

Instruments

<table>
<thead>
<tr>
<th>Small fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>310.284 LCP Drill Bit 2,8 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Large fragment</th>
</tr>
</thead>
<tbody>
<tr>
<td>310.430 LCP Drill Bit 4,3 mm</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Instruments</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Small fragment</td>
<td></td>
</tr>
<tr>
<td>319.010</td>
<td>Depth Gauge</td>
</tr>
<tr>
<td>Large fragment</td>
<td></td>
</tr>
<tr>
<td>319.100</td>
<td>Depth Gauge</td>
</tr>
</tbody>
</table>

Determine the screw length with the depth gauge.
Set Self-tapping Locking Screws

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:

<table>
<thead>
<tr>
<th>Drive</th>
<th>Torque limiter (TLA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small fragment</td>
</tr>
<tr>
<td></td>
<td>511.770 (1.5 Nm)</td>
</tr>
<tr>
<td>Compact Air Drive</td>
<td>direct without attachment</td>
</tr>
<tr>
<td>Power Drive</td>
<td>direct without attachment</td>
</tr>
<tr>
<td>Colibri</td>
<td>attachment 532.013</td>
</tr>
<tr>
<td>Other power drives</td>
<td>AOVASIF quick coupling</td>
</tr>
<tr>
<td>Handle for TLA</td>
<td>397.705</td>
</tr>
<tr>
<td>Stardrive screwdriver shaft</td>
<td>314.116</td>
</tr>
<tr>
<td>Hexagonal screwdriver shaft</td>
<td>314.030</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>511.770 or</td>
<td>Torque Limiter, 1.5 Nm</td>
</tr>
<tr>
<td>511.115</td>
<td></td>
</tr>
<tr>
<td>314.116</td>
<td>Screwdriver Shaft T15, self-holding</td>
</tr>
<tr>
<td>314.030</td>
<td>Screwdriver Shaft</td>
</tr>
</tbody>
</table>

Large fragment

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>511.771 or</td>
<td>Torque Limiter, 4.0 Nm</td>
</tr>
<tr>
<td>511.774</td>
<td></td>
</tr>
<tr>
<td>314.119</td>
<td>Screwdriver Shaft T25, self-holding</td>
</tr>
<tr>
<td>314.150</td>
<td>Screwdriver Shaft or</td>
</tr>
<tr>
<td>314.152</td>
<td>Screwdriver Shaft, self-holding</td>
</tr>
<tr>
<td>397.705</td>
<td>Handle with Quick Coupling</td>
</tr>
<tr>
<td>511.701</td>
<td>Compact Air Drive II</td>
</tr>
<tr>
<td>530.100</td>
<td>Power Drive</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.091</td>
<td>Holding Sleeve for Screws, for LCP</td>
</tr>
<tr>
<td>314.041</td>
<td>Screwdriver T15</td>
</tr>
<tr>
<td>314.070</td>
<td>Screwdriver</td>
</tr>
</tbody>
</table>

Large fragment

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>314.281</td>
<td>Holding Sleeve for Screws, for LCP</td>
</tr>
<tr>
<td>314.164</td>
<td>Screwdriver T25</td>
</tr>
<tr>
<td>314.270</td>
<td>Screwdriver</td>
</tr>
<tr>
<td>324.052</td>
<td>Screwdriver</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Small fragment</strong></td>
</tr>
<tr>
<td>511.770 Screwdriver Shaft T15, self-holding</td>
</tr>
<tr>
<td>314.030 Screwdriver Shaft</td>
</tr>
</tbody>
</table>

**Large fragment**

| 511.771 Screwdriver Shaft T15, self-holding |
| 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).
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 \( \varnothing 2.8 \text{ mm} \); large fragments \( \varnothing 4.3 \text{ mm} \)).

## 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

<table>
<thead>
<tr>
<th>Instruments</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Titanium</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**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.
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.