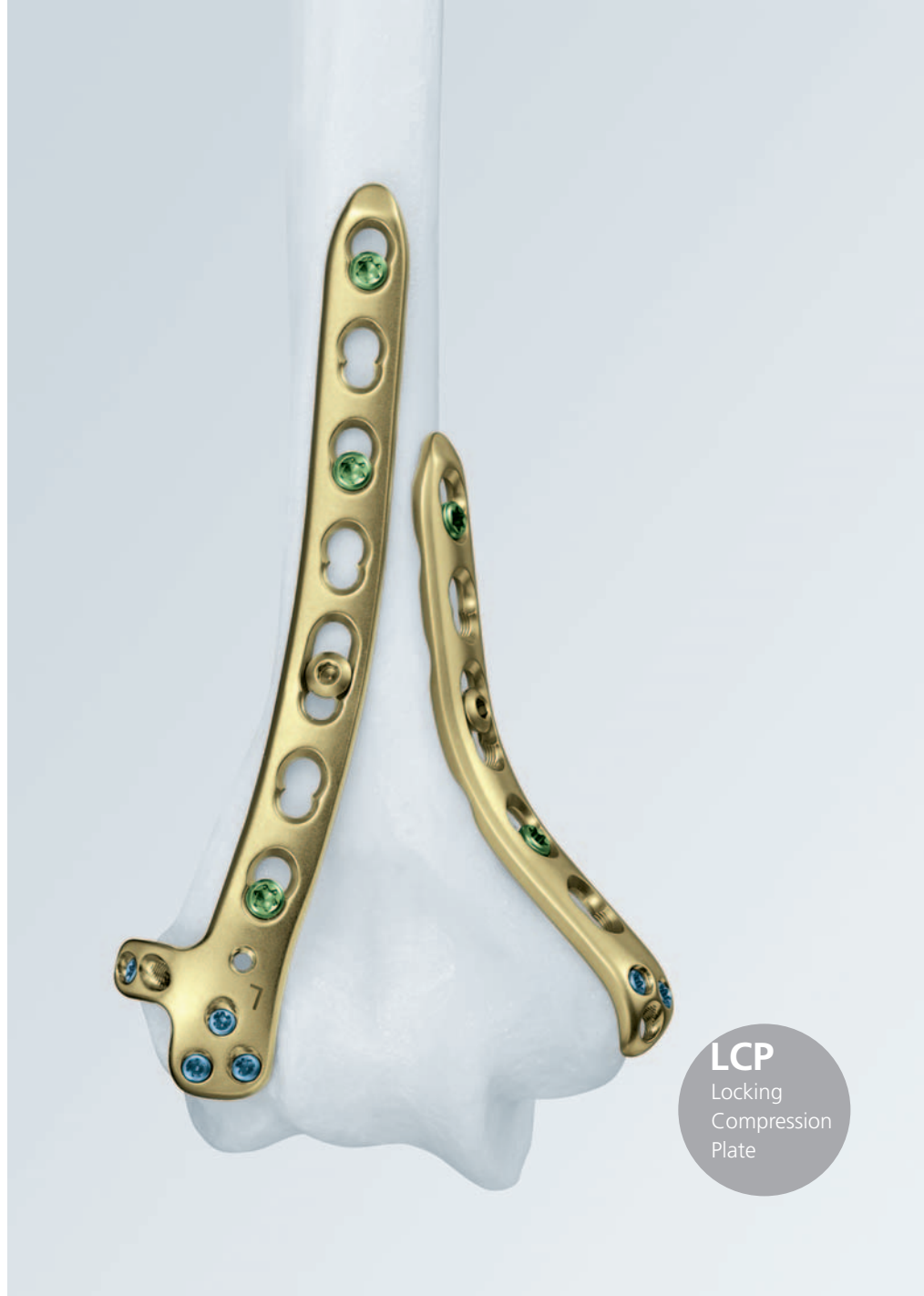


## LCP Distal Humerus Plates

The anatomic fixation system for the distal humerus with angular stability

Surgical technique



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### **Warning**

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

## Indications and contraindications

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### **Indications**

- Intraarticular fractures of the distal humerus
- Supracondylar fractures of the distal humerus
- Non-unions of the distal humerus

### **Contraindications**

- Acute infections
- Children in the growth phase

# Implants

## Distal humerus plates

### Distal Humerus Plate, dorsolateral, right

Art. No.	Holes
X41.262	3
X41.264	5
X41.266	7
X41.268	9
X41.300	14



### Distal Humerus Plate, dorsolateral, left

Art. No.	Holes
X41.263	3
X41.265	5
X41.267	7
X41.269	9
X41.301	14



### Distal Humerus Plate, dorsolateral with support, right

Art. No.	Holes
X41.272	3
X41.274	5
X41.276	7
X41.278	9
X41.302	14



### Distal Humerus Plate, dorsolateral with support, left

Art. No.	Holes
X41.273	3
X41.275	5
X41.277	7
X41.279	9
X41.304	14



### Distal Humerus Plate, medial, right

Art. No.	Holes
X41.282	3
X41.284	5
X41.286	7
X41.288	9
X41.304	14



### Distal Humerus Plate, medial, left

Art. No.	Holes
X41.283	3
X41.285	5
X41.287	7
X41.289	9
X41.305	14



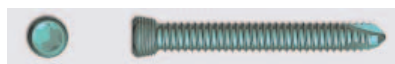
## Implants

### LCP locking screws

X02.214–260 LCP Locking Screw  $\varnothing$  2.7 mm  
(head LCP 2,4), length 14–60 mm,  
self-tapping, with Stardrive® recess



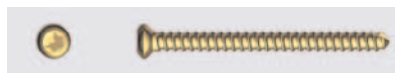
X12.102–124 LCP Locking Screw  $\varnothing$  3.5 mm,  
length 12–60 mm, self-tapping,  
with Stardrive® recess



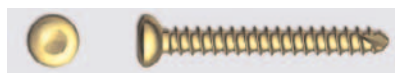
X13.012–060 LCP Locking Screw  $\varnothing$  3.5 mm,  
length 12–60 mm, self-tapping  
with hexagonal recess

### Standard screws

X01.764–790 Cortex Screw  $\varnothing$  2.4 mm, length 14–40 mm,  
self-tapping with Stardrive® recess



X02.814–860 Cortex Screw  $\varnothing$  3.5 mm, length 14–60 mm,  
self-tapping, with hexagonal recess



## Instruments

### Torque Limiters

511.776 Torque Limiter 0.8 Nm, for LCP locking screws  $\varnothing$  2.4/2.7 mm with AO/ASIF quick coupling for power tool/handle



511.773 Torque Limiter 1.5 Nm, for LCP locking screws  $\varnothing$  3.5 mm with AO/ASIF quick coupling for power tool/handle



511.770 Torque Limiter 1.5 Nm, for LCP locking screws  $\varnothing$  3.5 mm with CAD coupling for power tool/handle

**Important:** always use TLA when inserting LCP screws, otherwise plate and/or screws might be damaged

### Drilling instruments for LCP locking screws $\varnothing$ 2.7 mm

323.061 LCP Drill Sleeve 2.7 (head LCP2.4), with scale up to 60 mm

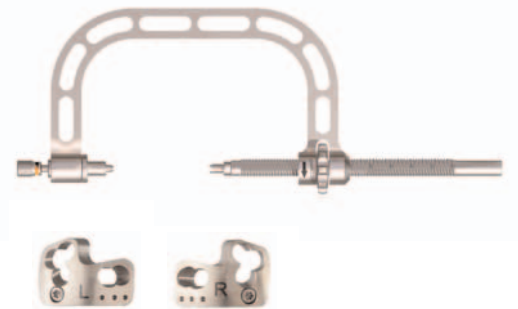


323.062 Drill Bit  $\varnothing$  2.0 mm, with double markings, L 140/115



313.351– Positioning and Compression Device (PCD) for the  
313.357 dorso-lateral plate with support, with length markings

**Note:** The PCD can also be used without plate to implement 3.5mm cortex screws.



### Length measurement devices

319.005 Depth Gauge for Screws  $\varnothing$  2.0 and 2.4 mm, measuring range up to 40 mm



319.010 Depth Gauge for Screws  $\varnothing$  2.7 to 4.0 mm, measuring range up to 60 mm



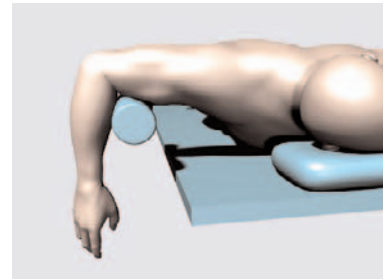
## Preparation

**Note:** Experience in the use of the Locking Compression Plate System LCP (see surgical technique 036.000.019) or instruction by a surgeon with corresponding experience is recommended.

### 1

#### Position patient

The lateral decubitus position is usually chosen. In severe C3 fractures, the fully prone position can be used, if the patient is otherwise fit. The arm is rested on a padded bar allowing elbow flexion of 120°. In rare cases bone graft may be needed and it is wise to prepare a donor site. The use of a tourniquet, preferably sterile, is not essential, but can make it easier to identify the ulnar nerve.



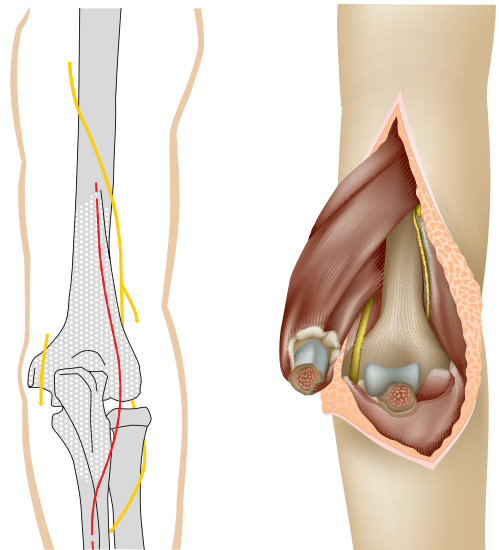
### 2

#### Surgical approach

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

For supracondylar fractures or simple articular fractures it may be sufficient to expose the nerves on both sides of the triceps. For comminuted fractures a distally pointed chevron olecranon osteotomy exposes the fracture best.

When using longer plates the radial nerve has to be carefully identified.



---

### 3

#### Reduce fracture and fix temporarily

For C-type fractures, reduce the articular fragments of the distal block under direct vision or image intensifier and fix them temporarily, using Kirschner wires and/or pointed reduction forceps.

Fix the distal block temporarily to the shaft using K-wires in both columns and/or forceps and make sure that the anatomy of the distal humerus is restored.

**Note:** LCP locking screws are not suitable for reduction, since they cannot effect compression. The fracture must therefore be reduced before inserting locking screws.

When using longer plates the radial nerve has to be carefully identified.



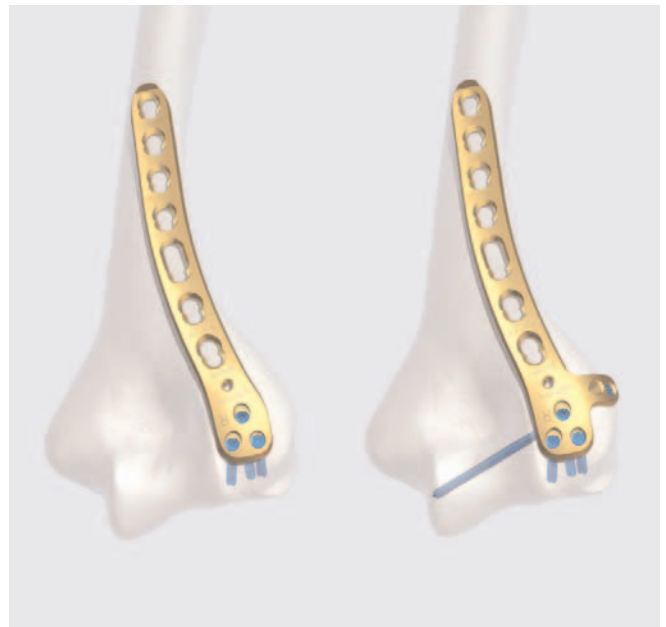
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### 4

#### Choose dorsolateral plate (with or without support)

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

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



## 5

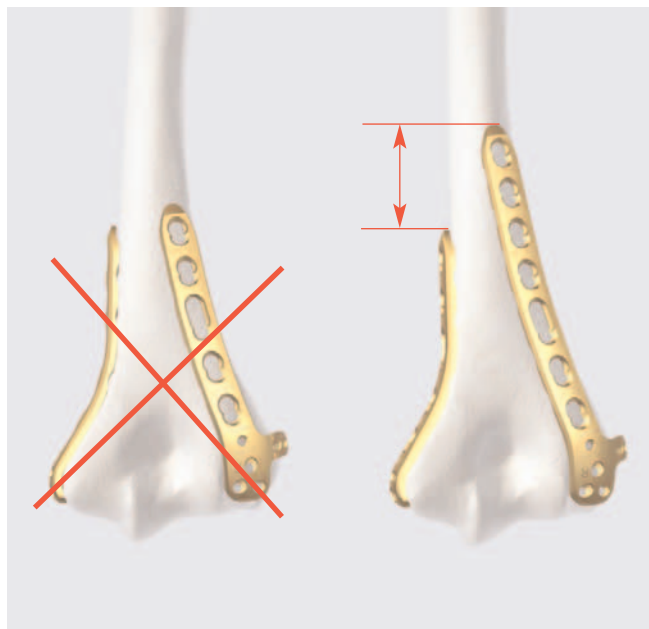
### Determine the length of the plates

Choose plate lengths that offer sufficient fixation proximal to the fracture lines. To prevent extensive diaphyseal stress, the medial and dorsolateral plates may not have the same length.

Sample: medial 5 holes, dorsolateral 7 holes.

**Important:** To reach sufficient stability for early mobilization both plates dorsolateral and medial have to be used in case of severe fractures. Application of single plates should be limited to simple fractures where one column is still intact.

**Important:** For fractures extending into the shaft always use both dorsolateral and medial plates to have sufficient strength, especially when using 9 or 14 hole plates.



## 6

### Prepare plates, bending

#### Required instruments

Bending Pliers for Plates 2.4 to 4.0, length 230 mm	329.150
Bending Iron for Plates 2.4 to 3.5, length 145 mm	329.040/329.050
LCP Drill Sleeve 2,7 (head LCP 2,4), with scale up to 60 mm	323.061

The form of the distal humerus can vary between individuals. Bending might be required to adapt the plate form. Use bending pliers and irons to shape the plates.

Be careful to observe the LCP locking screw direction of the distal screws during the bending. Use drill guide to check.

**Note:** If only cortex screws are used, the plates need to be congruent with the surface of the bone and bending or torquing may be required. Normally only minimal bending is necessary when using LCP locking screws.



## Dorsolateral plate with support

### Position and fix the dorsolateral plate with support

Normally a transolecranon approach is used and the plate fixation starts on the dorsolateral side of the distal humerus.

## 1

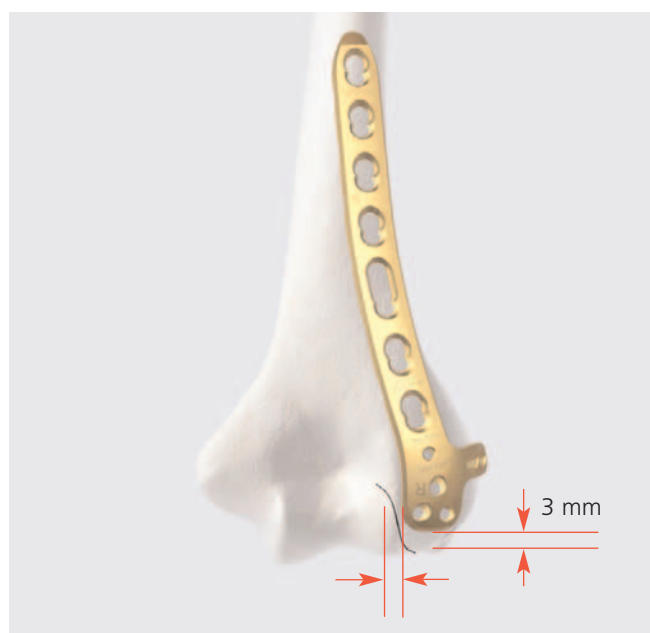
### Position the plate

The plate is to be positioned on the dorsolateral aspect of the distal humerus, with its distal spoon-shape portion covering the non-articulating part of the capitellum, and with the lateral support reaching over the most protruding tip of the lateral epicondyle, just proximal to the lateral collateral ligament insertion. Make sure that the shaft portion of the plate is positioned at safe distance from the olecranon fossa.

The position of the plate should allow for distal screw insertion through the lateral support to reach through the articular block to the medial side. The direction of the screw to be used can be visualised with the LCP Drill Sleeve 2.7 and a K-Wire or with the Positioning and Compression Device, PCD.

**Important:** The plate distal position has to be carefully chosen to ensure no impingement of the radius head and thus loss of extension. The distance between the plate and the cartilage should normally not be less than 3 mm.

**Note:** In contrast to conventional plating, plating with LCP locking screws do not rely on a congruent contact of plate-to-bone.



## 2

### Preliminary fixation of the plate

#### Required instruments

Universal Drill Guide 3.5	323.360
Drill Bit $\varnothing$ 2.5 mm, length 110/85 mm, for Quick Coupling	310.250

After correct placement of the plate use the drill guide and the drill bit  $\varnothing$  2.5 mm to pre-drill both cortices.



## 3

### Determine screw length

#### Required instruments

Depth Gauge for Screws $\varnothing$ 2.7 to 4.0 mm	319.010
--	---------

Determine the required length of the cortex screw with the depth gauge.



## 4

### Insert cortex screw

#### Required instruments

Screwdriver Shaft, hex small, Ø 2.5 mm	314.030
--	---------

Use the screwdriver shaft mounted on a power tool or on a handle to insert the self-tapping cortex screw Ø 3.5 mm. Do not tighten the screw.



## 5

### Pre-drill distal hole

#### Required instruments

LCP Drill Sleeve 2.7 (head LCP 2.4), with scale up to 60 mm	323.061
Drill Bit Ø 2.0 mm, with double markings	323.062

Screw the LCP Drill Sleeve into one of the threaded holes of the distal part of the plate and pre-drill a hole with the drill bit Ø 2.0 mm. Check the depth of the drill bit under image intensifier.



## 6

### Determine length of screw

#### Required instruments

LCP Drill Sleeve 2.7 (head LCP 2.4), with Scale up to 60 mm, for Drill Bits $\varnothing$ 2.0 mm	323.061
Drill Bit $\varnothing$ 2.0 mm, with double marking, length 140/115 mm, 3-flute, for Quick Coupling	323.062
Depth Gauge for Screws $\varnothing$ 2.0 and 2.4 mm, measuring range up to 40 mm	319.005
Depth Gauge for Screws $\varnothing$ 2.7 to 4.0 mm, measuring range up to 60 mm	319.010

Determine the required length of the screw by using the scale on the drill guide. If a single marking is visible on the drill bit, the scale from 0–30 mm applies; if a double marking is visible, the scale from 30–60 mm applies.

**Option:** Use a Depth Gauge 319.005 to check length.

**Note:** For all screw types: using the exact length indication will lead to a screw which ends exactly at the exit point of the bone for all measuring devices contained in the set. Thus for bicortical screws (shaft) the screw has to be chosen little longer than the indication, for screws in the joint they have to be little shorter.

If Depth Gauge 319.010 is used for 2.7 mm screws, subtract 4 mm from the indication to obtain a correctly comparable screw length.



## 7

### Insert distal screws LCP 2,7 mm

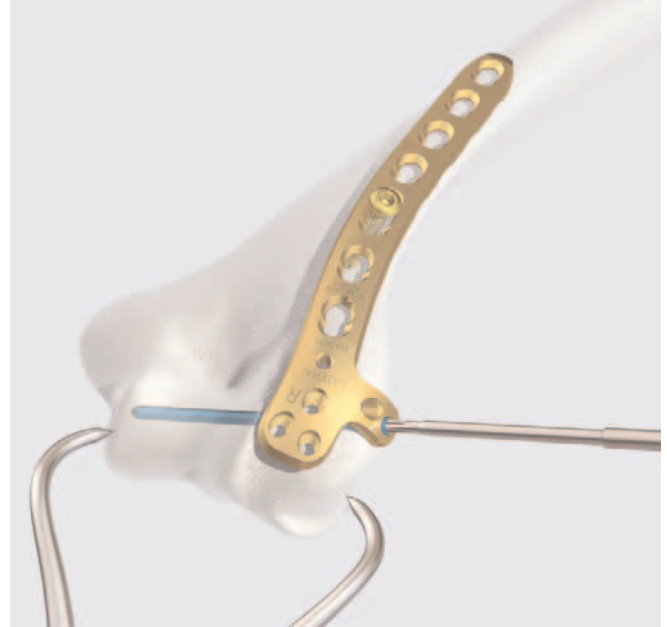
#### Required instruments

Holding Sleeve for LCP Screw Stardrive Ø 2.4/2.7 mm	313.301
Screwdriver Shaft Stardrive, T8, cylindrical, with groove	313.304
Torque Limiter, 0.8 Nm, with AO/ASIF Quick Coupling	511.776

The LCP locking screw can be inserted manually or by power tool.

Use the screwdriver shaft, attached to the torque limiter. Use the holding sleeve if necessary.

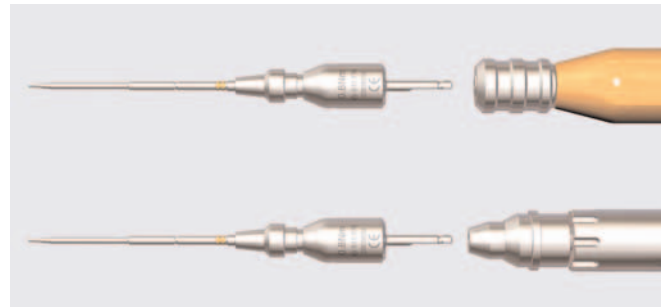
A "click" indicates that the screw is locked into the plate.



**Important:** always use TLA when inserting LCP locking screws, otherwise plate and/or screws might be damaged

#### Option:

Use cortex screw Ø 2.4 mm

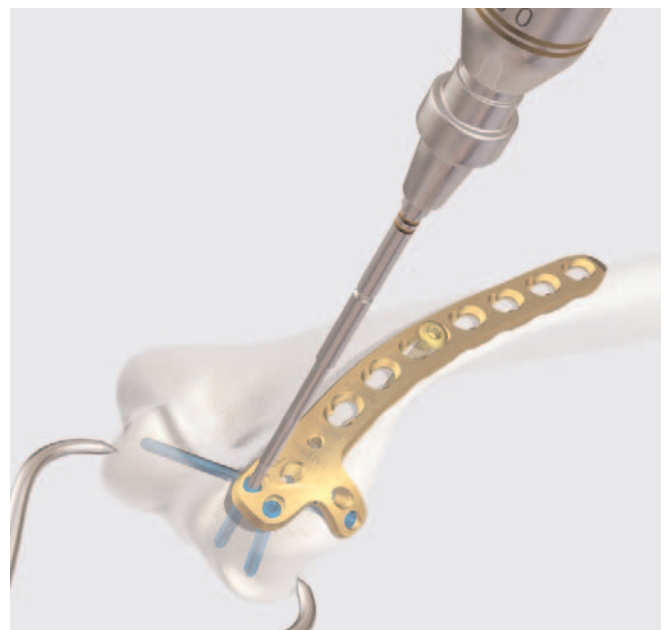


Repeat the above steps for all distal holes to be used.

**Important:** It is recommended to use minimum one screw on the lateral side which crosses the distal block. Screw length should be 40–60mm depending on the size of the humerus.

The recommended screw length for the capitellum is 16–24 mm.

**Important:** Be careful when inserting the screws for the capitellum to not damage the joint surface due to too long screws. It is recommended to check the position of the screws with the image intensifier during movement of the elbow.



## Medial Plate

### 1

#### Position and adaption of the plate

##### Required instruments

Bending Pliers for Plates 2.4 to 4.0, length 230 mm	329.150
Bending Iron for Plates 2.4 to 3.5, length 145 mm	329.040/329.050
LCP Drill Sleeve 2,7 (head LCP 2,4), with scale up to 60 mm	323.061

The position of the medial plate is on the medial ridge and on, or slightly dorsal to, the inter-muscular septum, with the distal tip reaching down to the insertion of the medial collateral ligament.



Use the drill guide with double scale and a Kirschner wire to determine the optimal position of the plate.

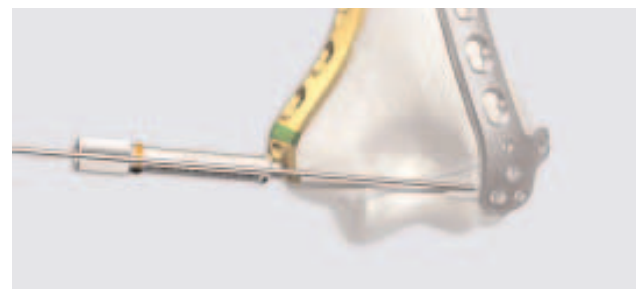
If needed, check the position under image intensifier.

Distal screws should reach as far as possible into the bone, therefore choose a plate position that allows for longest possible screws.

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



Situation after bending.



## 2

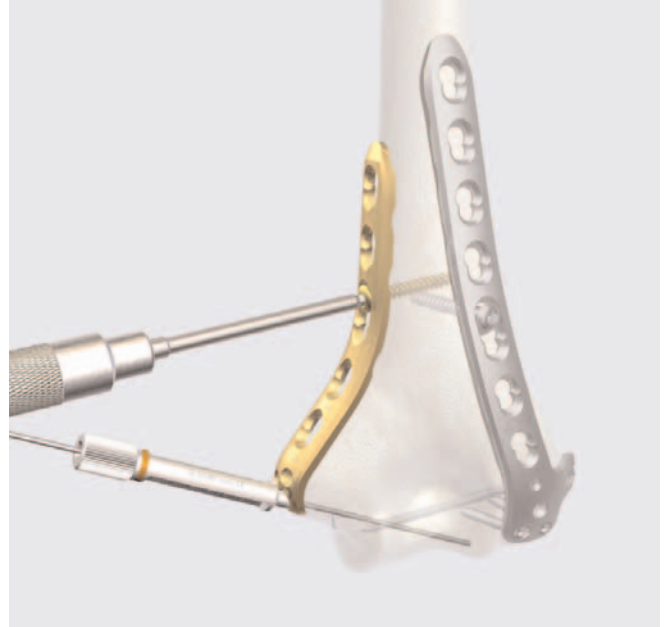
### Preliminary fixation of the plate to the bone

#### Required instruments

Drill Bit Ø 2,5 mm, length 110/85 mm, for Quick Coupling	310.250
Universal Drill Guide 3.5 (2.5/3.5)	323.360
LCP Drill Sleeve 2.7 (head LCP 2.4), with scale up to 60 mm	323.061

Use a K-wire through the drill sleeve in the distal hole to fix the distal plate position. Make sure no collision with the already implemented screws occurs.

Use the drill guide and the drill bit Ø 2.5 mm to pre-drill both cortices. Insert a 3.5 mm cortex screw through the long hole of the plate.



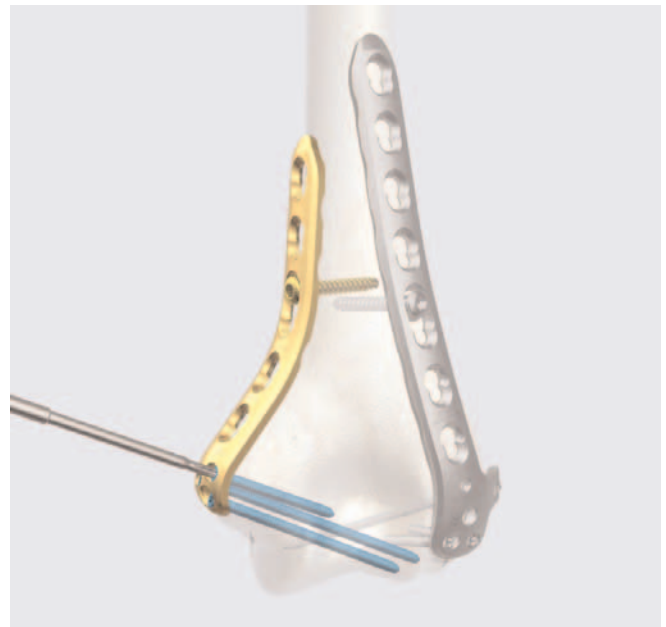
## 3

### Fix the distal part of the plate to the bone

Use a similar procedure as for the dorsolateral plate to insert the LCP locking or cortex screws (see dorsolateral plate with support).

**Important:** Careful drilling is necessary as collision with the screws of the dorsolateral plate may occur. In case of collision stop drilling and use adequate screw for fixation. Use other available holes for application of more screws.

**Important:** It is recommended to use minimum one screw on the medial side and one screw on the lateral side which cross the distal block. Screw length should be 40–60mm depending on the size of the humerus.



## Fixing the shaft

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### Fix the shafts of the dorsolateral and medial plate

Use LCP locking screws  $\varnothing$  3.5 mm to fix the proximal part of the plate to the bone.

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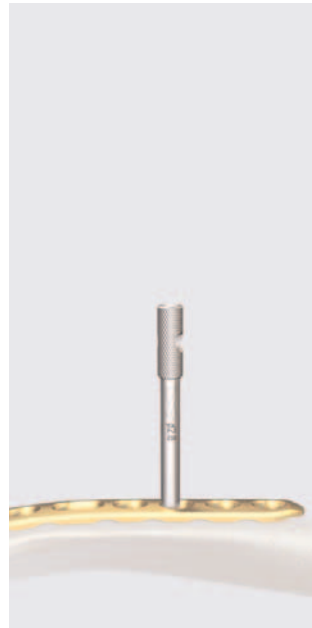
## 1

### Attach LCP drill sleeve

#### Required instruments

LCP Drill Sleeve 3.5 for Drill Bits $\varnothing$ 2,7	323.027
---	---------

Carefully screw the LCP drill sleeve (323.027) into the threaded central hole of the plate.



## 2

### Predrill the screw hole

#### Required instruments

LCP Drill Bit $\varnothing$ 2.8 mm, length 165 mm	310.284
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Predrill the screw hole with a LCP drill bit  $\varnothing$  2.8 mm through both cortices. Read the required screw length directly from the drill bit.

**Option:** Use depth gauge to check length of screw.



### 3

#### Insert LCP locking screw

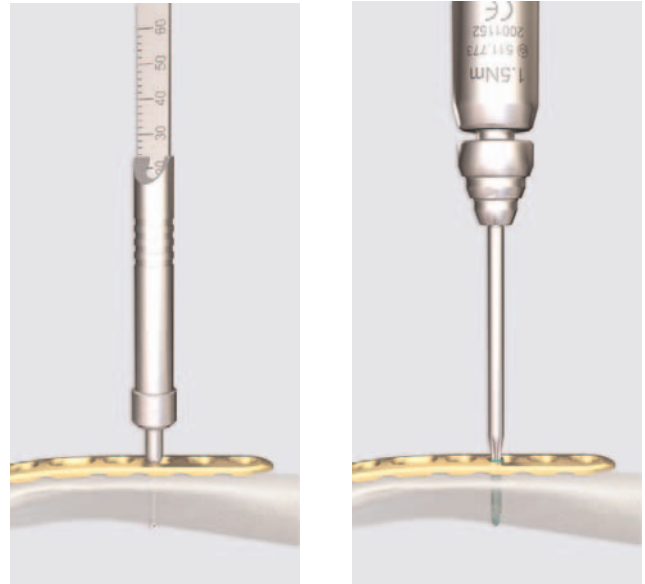
##### Required instruments

Screwdriver Shaft, hex, small, Ø 2.5 mm	314.030
Screwdriver Shaft Stardrive 3.5 T15	314.116
Handle for Torque Limiter 1.5 Nm (511.770/511.773)	397.705
Handle with Quick Coupling	311.431

Insert the LCP locking screw with the screwdriver for hexagonal or for Stardrive® recess, mounted on torque limiter 1.5 Nm. Insert the screw manually or by machine until a click is heard. If a power tool is used, reduce speed when screwing the head of the locking screw into the plate.

Repeat the procedure until all required shaft holes are used.  
Final check the locking of the screws.

**Note:** Use 3 screws bicortical per plate for optimal fixation to the shaft.



## Option: Dorsolateral plate without support

### 1

#### Position the plate

Fix the distal part of the bone temporarily to the shaft with Kirschner wires and reduction forceps.

Fix and compress it with minimum one 3.5 mm cortex screw according to the AO Manual.

Position the plate on the dorsolateral aspect of the distal humerus, with its distal spoon shape portion covering the non-articulating part of the capitellum.

**Note:** The positioning and compression device (PCD) can be used for easy insertion of the 3.5 mm cortex screw.



### 2

#### Preliminary fixation of the plate to the bone

##### Required instruments

Universal Drill Guide 3.5 (2.5/3.5)	323.360
Drill Bit $\varnothing$ 2,5 mm, length 110/85 mm, for Quick Coupling	310.250
Depth Gauge for Screws $\varnothing$ 2.7 to 4.0 mm	319.010

After determining the correct position of the plate, fix it to the bone with a 3.5 mm cortex screw through the long hole in the shaft portion of the plate.



### 3

#### Fix the distal part of the plate to the bone

##### Required instruments

Drill Bit $\varnothing$ 2.0 mm, with double markings	323.062
Holding Sleeve for LCP Screw Stardrive $\varnothing$ 2.4/2.7 mm	313.301
Screwdriver Shaft Stardrive, T8, cylindrical, with groove	313.304
Torque Limiter, 0.8 Nm, with AO/ASIF Quick Coupling	511.776

Use the 3 distal screws to fix the plate to the capitellum.  
Use a similar procedure as for the dorsolateral plate to insert the LCP or cortex screws.

The recommended screw length is 16–24 mm.

**Important:** Be careful when inserting the screws for the capitellum to not damage the joint surface due to too long screws. It is recommended to check the position of the screws with the image intensifier during movement of the elbow.



### 4

#### Continue the procedure

Continue the procedure according to “Medial plate”.

## Option: Positioning and compression device PCD

Positioning and Compression Device PCD with lengths markings for guided positioning of the dorsolateral plate with support.

The PCD with length markings (313.351–357) assists in finding an optimal plate position to allow for the insertion of longest possible screws across the distal articular block.

### 1

#### Fix aiming block to the plate

##### Required instruments

Screwdriver Shaft Stardrive 3.5, T15	314.116
--------------------------------------	---------

Fix the aiming block and PCD to the dorsolateral plate with support.



### 2

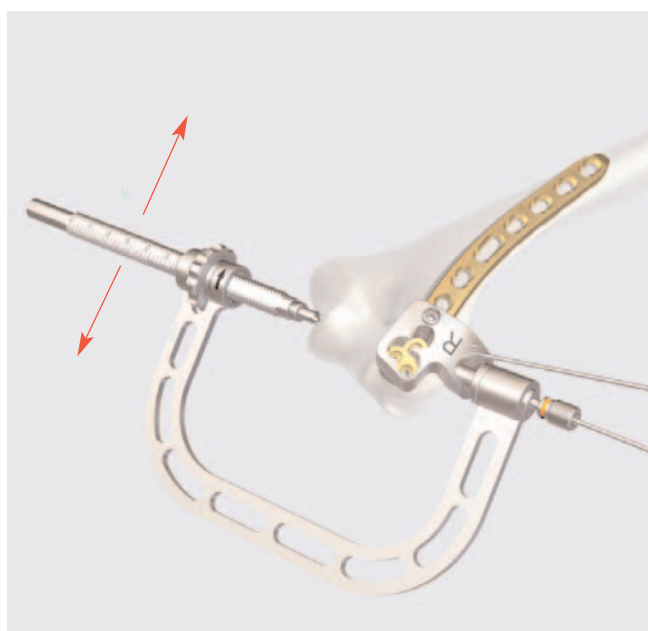
#### Position dorsolateral plate

##### Required instruments

Aiming Block, left, for Aiming Arm No. 313.354, for DHP	313.351
Aiming Block, right, for Aiming Arm No. 313.354, for DHP	313.352
Drill Sleeve 2.7, for Aiming Arm No. 313.354, for DHP	313.353
Aiming Arm for DHP	313.354
Insert for Drill Sleeve 2.7	313.355

Position the dorsolateral plate in approximate position. The point of bone contact on the medial side marks the exit point of the screw inserted through the hole of the plate and thus shows the exact direction of the screw.

Use K-wires through the aiming block for temporary fixation.



### 3

#### Fix the plate with cortex screw

##### Required instruments

Universal Drill Guide 3.5	323.360
Drill Bit $\varnothing$ 2,5 mm, length 110/85 mm, for Quick Coupling	310.250
Screwdriver Shaft, hex, small, $\varnothing$ 2.5 mm	314.030

Use a 3.5mm cortex screw for preliminary fixation of the plate to the bone.



### 4

#### Use the PCD to choose the screw length

Read the screw length on the scale of the PCD and choose the required length.

Account a safety margin to the articulating surface (2–10 mm depending on position).



## 5

### Insert the LCP 2.7mm screw

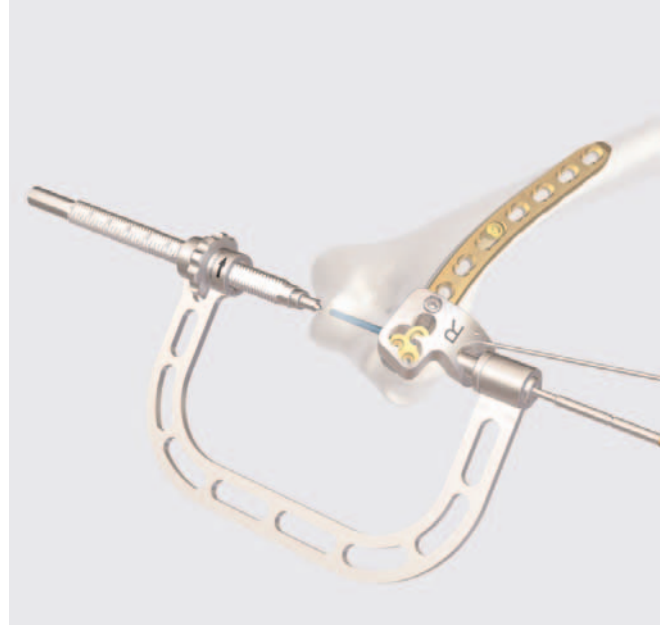
#### Required instruments

Drill Bit $\varnothing$ 2.0 mm, with double markings	323.062
Screwdriver Shaft Stardrive, T8, cylindrical, with groove	313.304
Torque Limiter, 0.8 Nm, with AO/ASIF Quick Coupling	511.776

Drill the hole with the drill bit  $\varnothing$  2.0 mm. The drill will exit the bone at the medial point of contact of the PCD.

Use a K-wire instead of the drill bit if you need to check correct position of the plate and screw first.

Take out the drill sleeve and insert the LCP 2.7 mm screw with 2.4 head through the PCD.



## 6

### Insert additional screws

#### Required instruments

LCP Drill Sleeve 2.7 (head LCP 2.4), with scale up to 60 mm	323.061
Drill Bit Ø 2.0 mm, with double markings	323.062
Screwdriver Shaft Stardrive, T8, cylindrical, with groove	313.304
Torque Limiter, 0.8 Nm, with AO/ASIF Quick Coupling	511.776

Use the LCP drill sleeve and the drill bit Ø 2.0 mm to drill additional holes.

Insert additional LCP locking or cortex screws as needed.

**Important:** Be careful when inserting the screws into capitellum to not damage the joint due to too long screws.



## 7

### Continue the procedure

Continue the procedure according to "Dorsolateral plate with support"

The PCD may stay in place and serve as an indicator for the position of the screw in order to avoid collision with the medial distal screws.

**Note:** the PCD can also be used to position a 3.5 mm cortex screws through the articular block.

## Implant removal

---

### Implant removal

#### Required instruments

Screwdriver Shaft, hex, small, Ø 2.5 mm	314.030
Screwdriver Shaft Stardrive 3.5, T15	314.116
Extraction Screw for Screws Ø 3.5 mm	309.521
Extraction Screw for Screws Ø 1.5 mm and 2.0 mm	309.510

To remove the implants, unlock all LCP locking screws before removing them completely. The plate may otherwise rotate while the last screw is being removed, which can damage the soft tissue.

If the LCP locking screws cannot be removed with the screw driver (e.g. the recess of the screw is damaged or the locking screw is stuck in the plate), use an Extraction Screw with left-handed thread. Loosen the screw by turning the handle counter-clockwise.

**Important:** It is very important that the correct instrumentation is available to ensure trouble free implant removal.

The correct screw drivers (hex or Stardrive®) and the extraction screws are of special importance. Be aware that all LCP locking screws in the DHP set are equipped with Stardrive® recess.



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[www.synthes.com](http://www.synthes.com)

Presented by:



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