



## **Surgical Technique**

### ***3.5mm Wise-Lock Distal Humerus Plate***

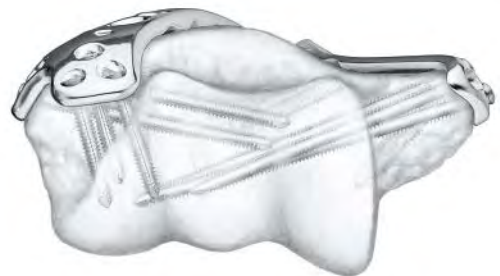
## 3.5 mm Wise-Lock Distal Humerus Plates

### Plate features

- Thirty (30) posterolateral and medial plates allow implant placement to address the individual fracture pattern.
- Plates are precontoured for anatomical fit.
- Combi holes allow fixation with locking screws in the threaded section for angular stability, and cortex screws in the dynamic compression unit (DCU) section for compression. A fixed-angle construct provides advantages in osteopenic bone or multifragment fractures where traditional screw purchase is compromised.
- Choice of five lengths of each plate type eliminates the need to cut plates.
- Posterolateral plates offer fixation of the capitulum with three distal screws.

### Two-plate technique for distal humerus fractures

Increased stability can be gained from two-plate fixation of distal humerus fractures. The two-plate construct creates a girder-like structure which strengthens the fixation. The posterolateral plate functions as a tension band during elbow flexion, and the medial plate supports the medial side of the distal humerus.



### 3.5 mm Wise-Lock Distal Humerus Plates

#### Additional features

- Limited-contact design shaft with 3, 5, 7, 9, and 14 Combi holes
- The shaft holes accept 3.5 mm locking screws in the threaded portion or 3.5 mm cortex screws, 4.0 mm cortex screws or 4.0 mm cancellous bone screws in the compression portion
- Available for left and right humeri
- Made of 316L stainless steel or commercially pure titanium
- Three distal locking holes accept 2.7 mm locking screws or 2.4 mm cortex screws
- Posterolateral plate with lateral support offers the option for two additional screws placed lateral to medial

3.5 mm Wise-Lock® Extra-articular Distal Humerus Plates are also available.

3.5 mm Wise-Lock Posterolateral Distal

3.5 mm Wise-Lock Posterolateral Distal

Humerus Plates, with support Humerus Plates



3.5 mm Wise-Lock Medial Distal Humerus Plates    3.5 mm Wise-Lock Extra-articular Humerus Plates



## Indications

### **The 3.5 mm Wise-Lock Distal Humerus Plates**

The 3.5 mm Wise-Lock Distal Humerus Plates are indicated for intra-articular fractures of the distal humerus, comminuted supracondylar fractures, osteotomies, and nonunions of the distal humerus.

### **The 3.5 mm Wise-Lock Extra-articular Distal Humerus Plates**

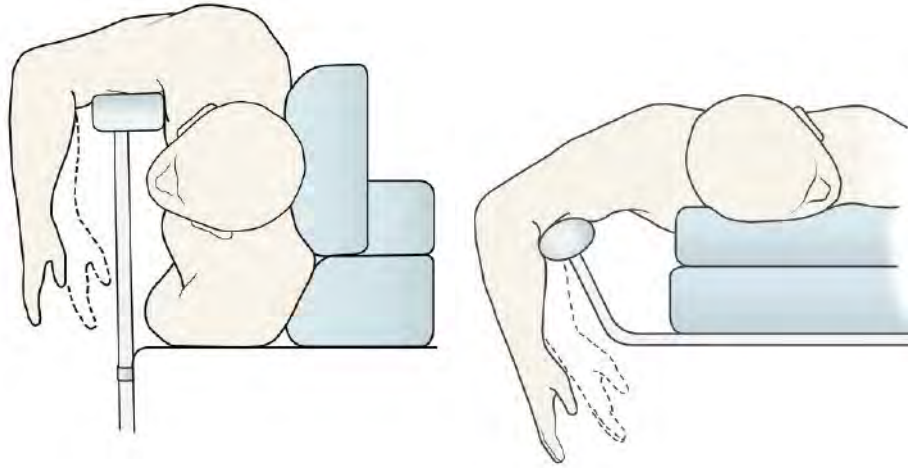
The 3.5 mm Wise-Lock Extra-articular Distal Humerus Plates are indicated for fractures of the distal humerus.



## Preparation

### Patient position

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°.

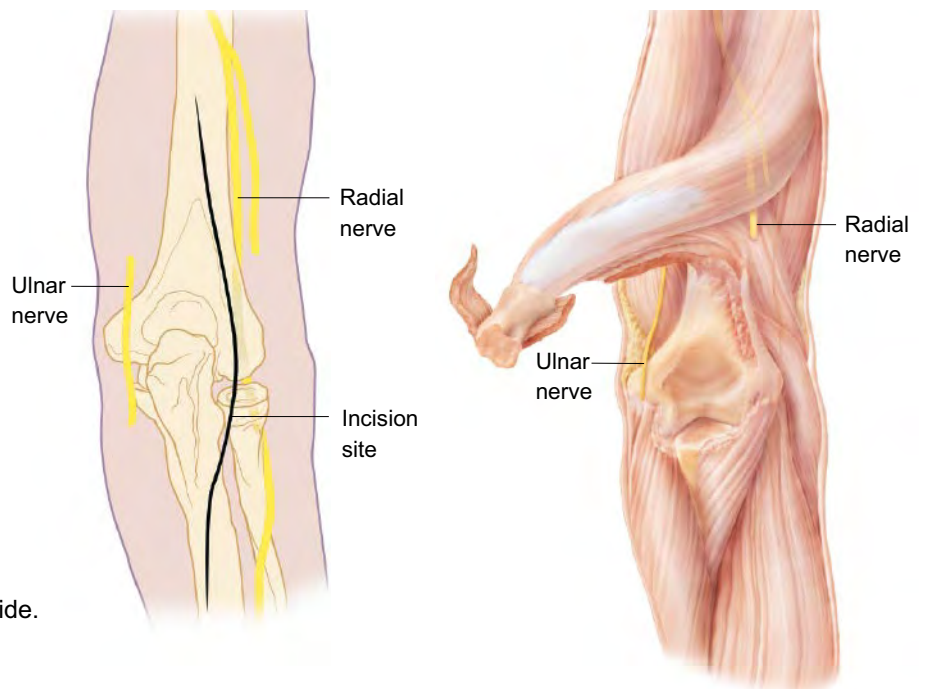


### Approach

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

For comminuted fractures, a distally pointed chevron olecranon osteotomy exposes the fracture best and allows stable fixation.

**Note: For information on fixation principles using conventional and locked plating techniques, please refer to the Small Fragment Locking Compression Plate (Wise-Lock) System Technique Guide.**



## Reduce Fracture

### Reduce fracture and fix temporarily

For C-type fractures, reduce the articular fragments of the distal block under image intensification and use K-wires and/or pointed reduction forceps for temporary fixation. Temporarily fix the distal block to the shaft using K-wires and/or forceps in both columns to ensure that the anatomy of the distal humerus is restored. Ensure that K-wires or forceps will not interfere with subsequent plate placement. If necessary, reduce the articular surface using lag screws.

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

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**Precaution: If the plate is long, the radial nerve needs to be** elevated off the back of the humerus and the plate placed underneath. Otherwise, the radial nerve rarely needs to be identified by more than palpation and almost never needs to be isolated or elevated with these fractures.

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### Determine plate length

Choose plate lengths that offer sufficient fixation proximal to the fracture lines. To prevent extensive diaphyseal stress, it is recommended that the medial and lateral plates are not the same length. For example, use a 5-hole medial plate with a 7-hole posterolateral plate.

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**Note:** To achieve sufficient stability for early mobilization, use the two-plate technique described on page 2.

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**Precaution: 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.

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**Note:** Use the AO preoperative planner template to determine appropriate plate length. Templates are available for all three plates: 3.5 mm Wise-Lock Posterolateral Distal Humerus Plate with lateral support, 3.5 mm Wise-Lock Posterolateral Distal Humerus Plate without support, and 3.5 mm Wise-Lock Medial Distal Humerus Plate.

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## Select Posterolateral Plate

### Select 3.5 mm Wise-Lock Posterolateral Plate with or without support

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

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

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### Bend the plate

Due to varying patient anatomy, slight bending may be necessary for the posterolateral and medial plates. Contour plates as needed using the bending irons. Alternatively, bending pliers may be used.

Bending the lateral support flange of the posterolateral plate is not recommended since it may alter the screw trajectory or prevent the use of a screw in the distal part of the lateral plate, due to screw collision.

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**Precaution:** If only cortex screws are used, the plates must be congruent with the surface of the bone and bending may be required. Bending should be limited to the region of the Combi holes.



## Apply Posterolateral Plate with Lateral Support

### Determine placement of posterolateral plate

Position the plate on the posterolateral aspect of the distal humerus with the distal spoon-shape portion covering the nonarticulating part of the capitulum, and with the lateral support extending over the most protruding tip of the lateral epicondyle, just proximal to the lateral collateral ligament insertion. Ensure that the shaft portion is positioned at a safe distance from the olecranon fossa.

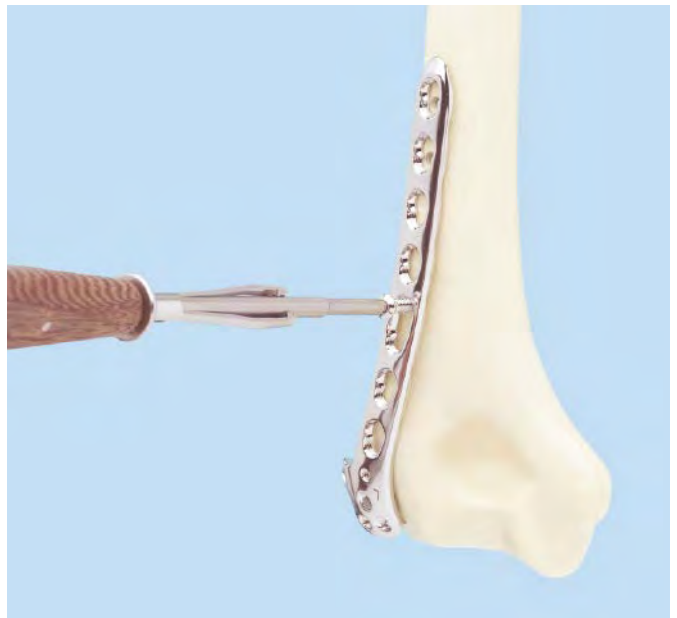
The position of the plate should allow distal screw insertion through the lateral flange to reach far into the trochlea. Screw trajectory may be visualized with the 2.0 mm threaded drill guide and a K-wire.



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

After reducing the fracture, apply the plate and insert a 3.5 mm cortex screw through the DCU portion of the elongated Combi hole using the universal drill guide and the 2.5 mm drill bit to predrill both cortices.

Insert the screw using the small hexagonal screwdriver for manual insertion or the small hexagonal screwdriver shaft with a power drive or a handle. **Do not tighten the screw.**





### Insert distal screws

**Note: If a combination of cortex and locking screws is used, a cortex screw should be inserted first to pull the plate to the bone.**

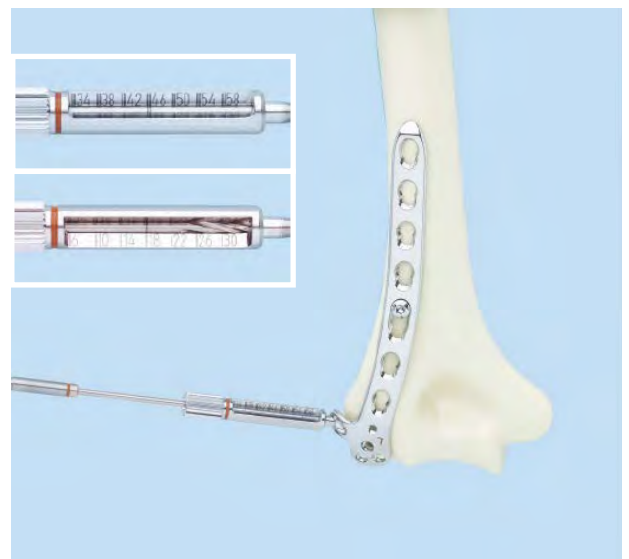
Use the 2.4 mm universal drill guide with the 1.8 mm drill bit for the threaded hole and the 2.4 mm drill bit for the gliding hole. Determine the length of the screw by using the depth gauge.

Screw the 2.0 mm threaded drill guide into one of the threaded holes of the distal part of the plate and predrill a hole with the 2.0 mm drill bit. Check the depth of the drill bit under image intensification. Determine the 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 mm–30 mm applies; if a double marking is visible, the scale from 34 mm–60 mm applies.

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**Precaution: Screws directed towards the joint must be a little shorter than the measured length.**

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## Apply Posterolateral Plate with Lateral Support

The depth gauge may also be used to establish approximate screw length.

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**Note: Whenever possible, locking screws should be inserted** under power using the torque limiting attachment. The audible “click” will notify the surgeon that the maximum torque value has been reached and that power insertion is completed.

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After screw insertion using the torque limiting attachment, always check that the screws are fully inserted by hand tightening them.

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**Warning: Never insert locking screws under power unless** using a torque limiting attachment.

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Use the holding sleeve, for StarDrive Screwdriver Shaft, if necessary. Repeat for all distal holes to be used.

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### **Precautions:**

- In the distal portion of the posterolateral plate, pay close attention to the posterior to anterior screw holes during drilling and screw insertion. Confirm screw placement and length with image intensification during movement of the elbow to ensure screws are not exiting through the joint.
  - When inserting screws under power, final tightening should be done using manual screwdriver and Torque Limiter.
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## Alternative Technique: Apply Posterolateral Plate Without Support

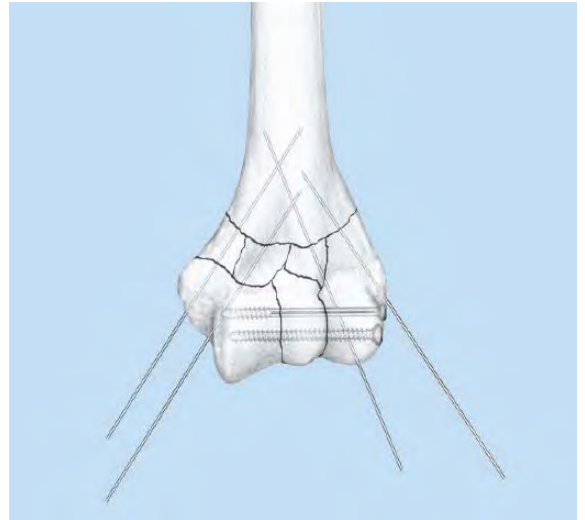
### Determine plate placement

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**Note:** When using the posterolateral plate without support, it is important to reduce and fix the distal block with lag screws according to the AO Principles of Fracture Management.

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Reduce the distal block to the shaft using K-wires and reduction forceps for temporary fixation.



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

After reducing the fracture, apply the plate and insert a 3.5 mm cortex screw through the DCU portion of the elongated Combi hole (see page 10).

### Insert distal screws (see page 11)

## Apply Medial Plate

### Position the plate

Position the medial plate on the medial ridge and slightly dorsal to the intermuscular septum, with the distal tip reaching down to the insertion of the medial collateral ligament.

Distal screws should reach as far as possible into the bone. Choose a plate position that allows the longest possible screws.

If necessary, bend the distal part of the plate to ensure optimal position of the long screws through the articular block.

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**Note: Small adjustments in the position of the medial plate** impact the final direction of the screws and will influence the choice of screw lengths.

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Use the 2.0 mm threaded drill guide with depth gauge and a K-wire to determine the optimal position of the plate.

### Preliminary fixation of the plate to the bone

After reducing the fracture, apply the plate and insert a self-tapping 3.5 mm cortex screw through the DCU porti of the elongated Combi hole (see page 10).

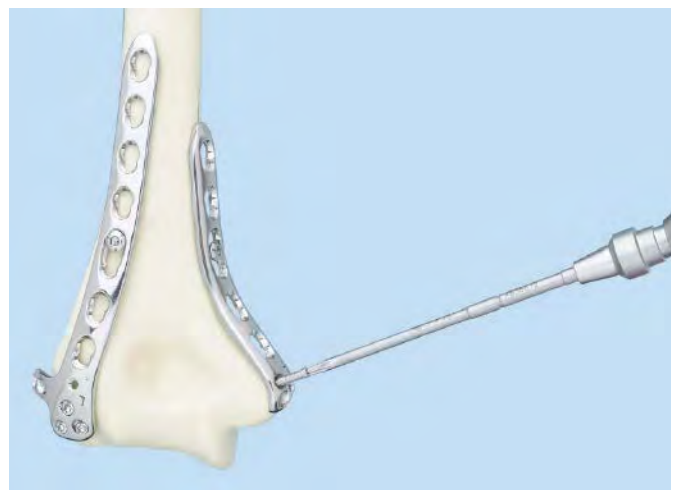
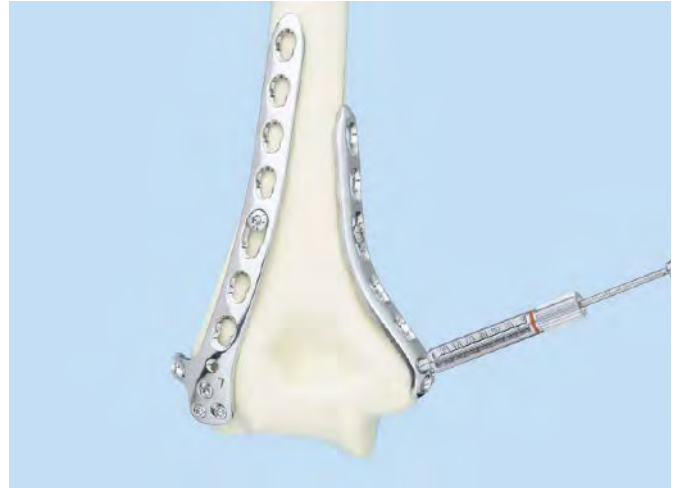


### Fix the distal part of the plate to the bone

Use a procedure similar to that for the posterolateral plate to insert the locking or cortex screws (see page 11 for details).

#### Precautions:

- Careful drilling is necessary as collision with the screws of the posterolateral plate may occur. In case of collision stop drilling and use adequate screw for fixation. Use other available holes for application of more screws.
- 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 40–60 mm depending on the size of the humerus.



## Insert Screws in Plate Shafts

### Fix the shaft of the posterolateral plate

After fixing the distal portion of the posterolateral and medial plates, determine where locking or cortex screws will be used in the shaft of the posterolateral plate. Use 3.5 mm locking screws or 3.5 mm cortex screws to fix the shaft of the plate to the bone.

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**Note: If a combination of cortex and locking screws is used,** a cortex screw should be inserted first to pull the plate to the bone.

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#### **3.5 mm cortex screws**

If compression is required, use the 3.5 mm universal drill guide in compression mode and, with the 2.5 mm drill bit, predrill both cortices. Use the depth gauge to determine the cortex screw length. Insert the cortex screw.

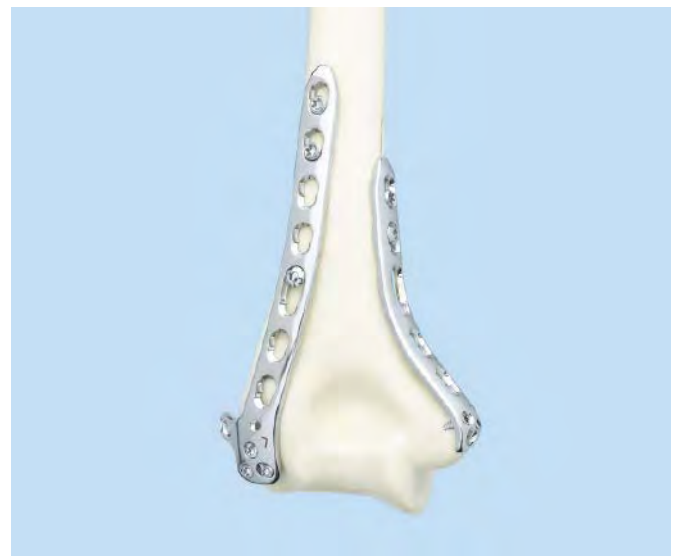
#### **3.5 mm locking screws**

For 3.5 mm locking screws, screw the 2.8 mm threaded drill guide into a Combi hole until fully seated. Drill to desired depth using the 2.8 mm drill bit and remove the drill guide. Use the depth gauge to determine screw length. Insert locking screw.

### Fix the shaft of the medial plate

Determine where locking or cortex screws will be used in the shaft of the medial plate. Insert these screws as described on page 14.

**Note: In the surgical report, please mention the StarDrive Recess** in both the 2.7 mm locking screw and 2.4 mm cortex screw. This will remind the surgeon to have a StarDrive Screwdriver available if the implants are removed.



## Optional Techniques with Position and Compression Device

### Position and compression device (PCD), for 3.5 mm Wise-Lock Distal Humerus Plates

- For easy application of distal screws
- Clear indication of exit point of screws
- Allows compression across the articular surface
- Includes length measurement
- Additionally available instrument
- For use with posterolateral plate
- Can be used to insert independent 3.5 mm cortex screws on distal humerus

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**Note:** For easier insertion of the drill sleeve, loosen the connection screw in the aiming block, thread the drill sleeve into the plate hole and tighten the connection screw.

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### Use the PCD to place a locking screw through the plate

Using the T15 StarDrive Screwdriver, screw the insertion guide to the posterolateral plate with support.

Place the posterolateral plate in its approximate position on the bone and fix it with a 3.5 mm cortex screw inserted through the DCU portion of the elongated hole.





Place the 2.7 mm insert into the PCD (as shown).

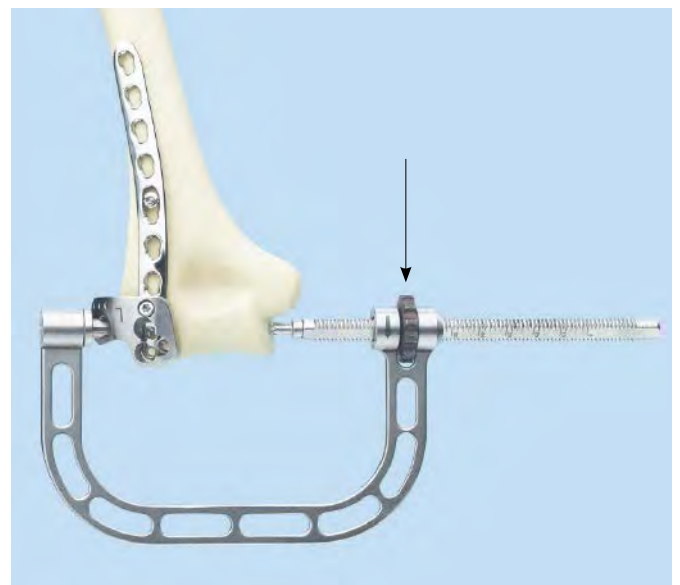
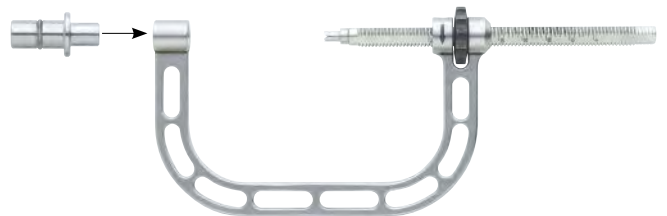
Orient the PCD on the bone so that the insert can be placed through the holes in the insertion guide, and advance the medial spindle to secure it to the bone.

Place the 2.0 mm drill sleeve through the 2.7 mm insert and secure it into the threaded plate hole. Use the 2.0 mm drill bit to drill through the drill sleeve.

**Option**

K-wires through the insertion guide may be used for temporary fixation.

Tighten the spindle to compress the distal block. The point of bone contact marks the exit point of the screw inserted through the plate.



Check the trajectory of the screw to ensure good fixation in the bone. Read screw length from the spindle to choose the appropriate screw length. Using a screw 2 mm to 5 mm shorter than the indicated length will provide a safety margin to the articular surface. Remove the drill sleeve.

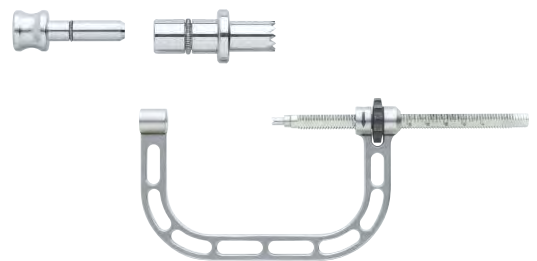
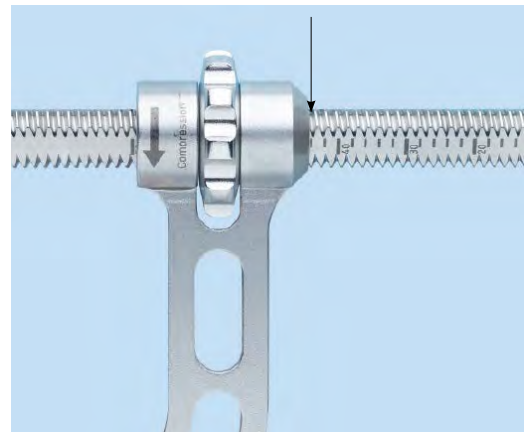
Insert the 2.7 mm locking screw through the 2.7 mm insert. Remove the PCD.

### Use the PCD to place an independent 3.5 mm cortex screw

Place the 3.5 mm insert into the PCD. Place the drill sleeve for 2.5 mm drill bit through the insert.

Position the spindle of the PCD on the medial side of the trochlea and tighten the spindle to compress. The point of bone contact marks the exit point of the screw inserted through the hole of the plate.

Use the 2.5 mm drill bit to drill through the drill sleeve. Read screw length from the spindle. The depth gauge may also be used to determine screw length. Remove the drill sleeve and insert a 3.5 mm cortex screw through the 3.5 mm insert. Remove the PCD.



## Postoperative Treatment and Implant Removal

### Postoperative treatment

Postoperative treatment with locking plates does not differ from conventional internal fixation procedures.

### Implant removal

To remove locking screws, 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.



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