

SURGICAL TECHNIQUE GUIDE
FREEFIX[®]
ulnar shortening system



 **skeletal dynamics[®]**
UNDERSTANDING THE UPPER EXTREMITY

As described by:
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Miami Hand & Upper Extremity Institute

FREEFIX[®]

ulnar shortening system

Description

The Skeletal Dynamics Ulnar Shortening Plating System consists of the following:

1. Distal Ulnar Shortening Plates
2. Proximal Ulnar Shortening Plates
3. Screws, K-wires and Specialized Instrumentation

Both Distal and Proximal Ulnar Shortening Plates are titanium alloy plates and designed for fracture fixation, osteotomies, and non-unions of the ulna.

Distal Ulnar Shortening Plates

The Distal Ulnar Shortening Plates are available in left and right configurations.

For surgical instructions for the Distal Ulna Shortening Plate see page 4.

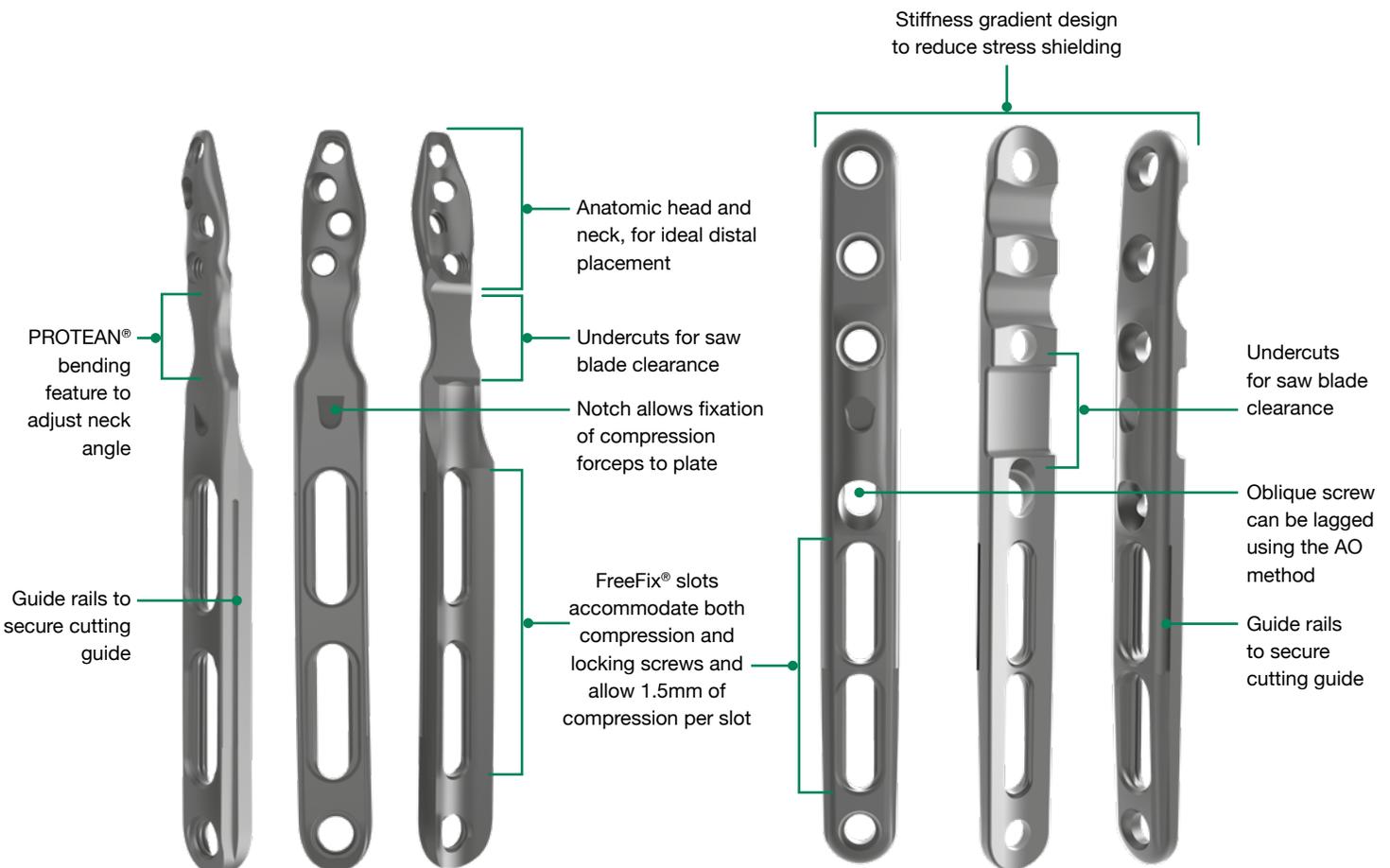
Proximal Ulnar Shortening Plates

The Proximal Ulnar Shortening Plates are available in two lengths.

For surgical instructions for the Proximal Ulna Shortening Plate see page 11.

Indications for Use

The Skeletal Dynamics Ulnar Shortening Plating System is indicated for fractures and osteotomies, in particular for the ulna.



1

EXPOSURE



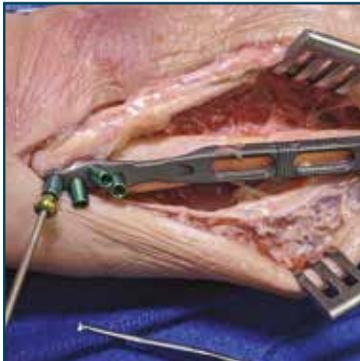
Make an 8cm to 10cm longitudinal incision ulnar distally between the extensor carpi ulnaris (ECU) and flexor carpi ulnaris (FCU) compartment.

Warning:

Retract and protect the tendons and dorsal branch of the ulnar nerve.

2

PLATE POSITIONING



Determine proper distal plate placement using fluoroscopy. Mount the k-wire AIMing guide in the most distal pre-loaded drill guide. Estimate the desired plate position and insert the 1.6mm k-wire. Using fluoroscopy, confirm the k-wire courses just proximal to the distal ulnar articular surface. If the plate is misaligned, remove the distal k-wire and reposition the plate, confirming with fluoroscopy.



Note:

Utilize the PROTEAN® Bending Pliers to adjust the inclination of the neck of the plate as needed.

Warning:

Caution should be taken when contouring plates. Bending the plates may weaken or break the plates.



PDG-AIM-015: AIMing Guides, 1.5mm



PRT-BND-PLL:
PROTEAN Plate
Bending Pliers, Large

KWIR-SD-16127: K-Wire, Single Diamond, 1.6mm x 127mm

DISTAL FREEFIX® SLOT

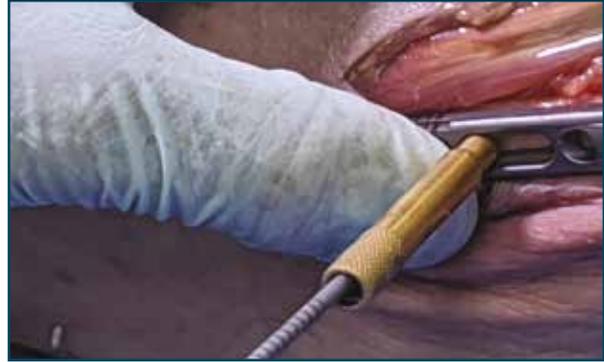
3

Use the 2.7mm drill bit to place a 3.5mm cortical non-locking screw of appropriate length into the distal FreeFix® slot in the most proximal position.

Warning:

At this time, do not use a cortical locking screw in the FreeFix® slot to prevent deformation of the cutting guide rails. If desired, a cortical locking screw may replace the non-locking screw after the final osteotomy has been achieved.

If replacing a cortical non-locking screw with a locking screw in a later step, use the thread-in drill guide.



DRLL-SSC-27050: Drill, 2.7mm x 50mm



DPGA-FF-050: FreeFix® Depth Gauge



TPDG-FF-35: Thread-in Drill Guide, FreeFix®, 3.5mm

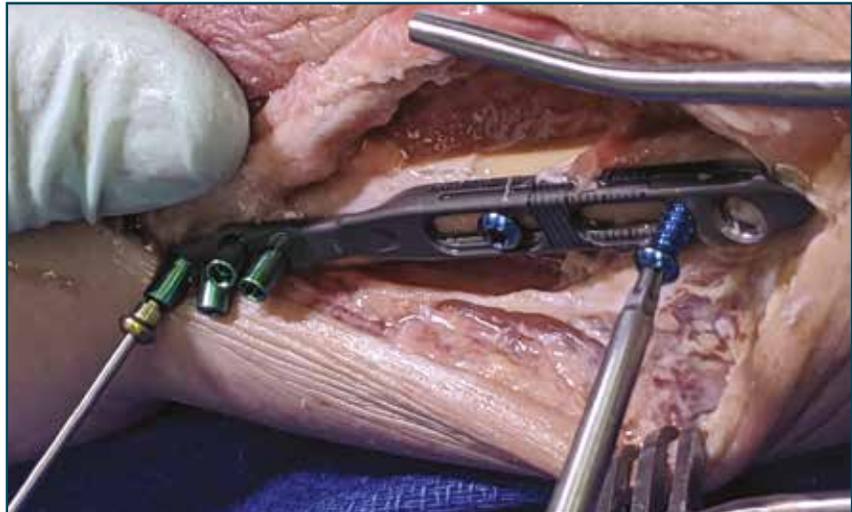
PROXIMAL FREEFIX® SLOT

4

Use the 2.7mm drill bit to place a 3.5mm cortical non-locking screw of appropriate length into the proximal FreeFix® slot in the most proximal position. Ensure the screw is 2mm longer than measured to prevent the screw from stripping during compression (see step 12).

Warning:

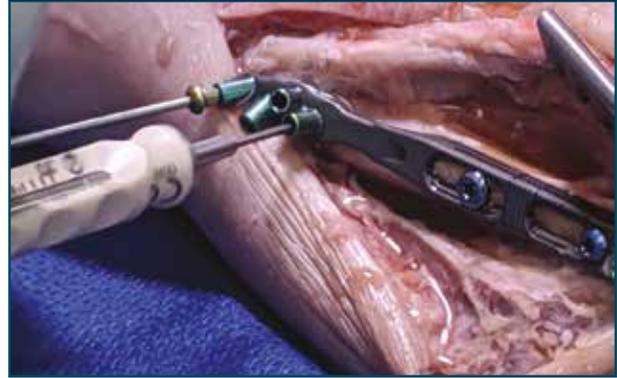
At this time, do not use a cortical locking screw in the FreeFix® slot to prevent deformation of the cutting guide rails. If desired, a cortical locking screw may replace the non-locking screw after the final osteotomy has been achieved.



If replacing a cortical non-locking screw with a locking screw in a later step, use the thread-in drill guide.

5

SCREW PLACEMENT



Use the 2.0mm drill bit to drill through the three pre-loaded drill guides on the head of the plate. Measure each screw length using the depth gauge, taking note of the appropriate scale, and insert a screw of selected length in each hole.

Warning:

Prevent excessive screw length as this will cause the screws to violate the distal radioulnar joint (DRUJ) space.



DRLL-SSC-20040: Drill, Solid Side Cutting, 2.0mm x 40mm

6

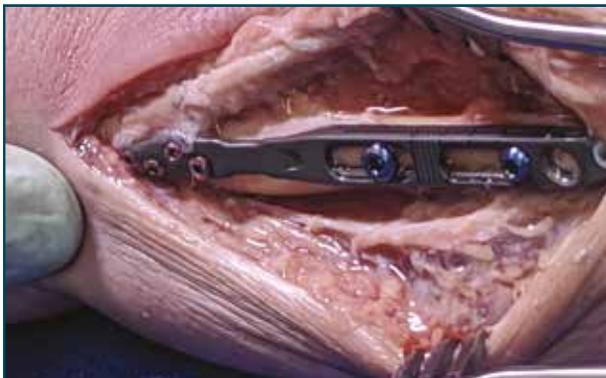
DISTAL SCREW



Remove the k-wire from the head of the plate, then drill using the 2.0mm drill bit. Measure the screw length using the depth gauge, taking note of the appropriate scale, and insert a screw of selected length in the distal hole.

Warning:

Prevent excessive screw length as this will cause the screws to violate the distal radioulnar joint (DRUJ) space.

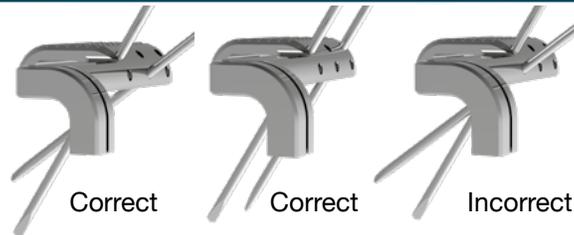


Attach the appropriate distal cutting guide (based on desired osteotomy approach) to the plate using the rails along the sides of the plate. Push the cutting guide until it reaches the end of the rail. It stops just distal to the leading edge thickest laser-etched line.



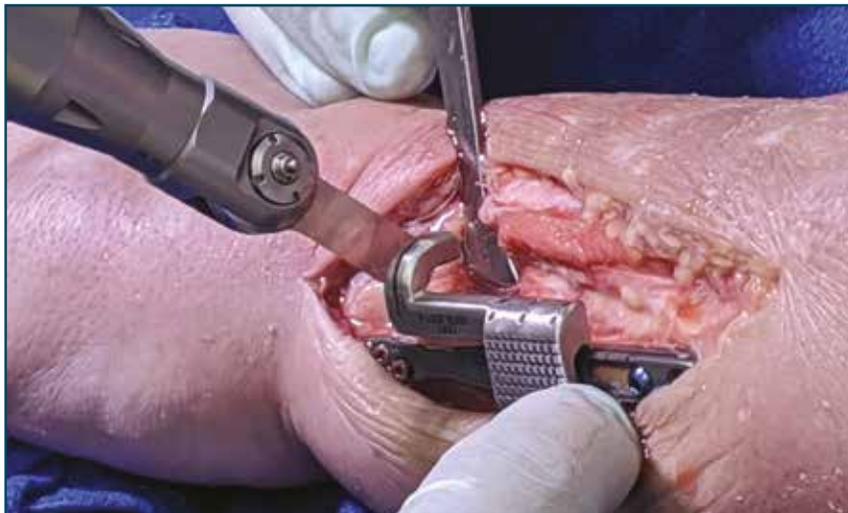
To fix the cutting guide, either hold it in place by pushing it against the end of the rail with a thumb or use two 1.6mm k-wires through the k-wire holes on the side of the cutting guide.

Insert the k-wires in two different holes, ensuring they are not transversely aligned.



Select the suggested saw blade by referencing the chart on page 19.

Use an oscillating saw and the selected saw blade to resect the ulna through the guiding slot on the distal cutting guide arm. Once the ulna has been resected all the way through, remove the saw blade and any k-wires from the bone.



Warning:

Protect soft tissues while cutting with the oscillating saw using the Mini Hohmann Retractors provided in the set.



INST-MHR-STD: Instrument, Mini-Hohmann Retractor, Standard



CUTG-DIST-R/L: Ulnar Shortening, Cutting Guide, Distal

9

ADJUST FOR LENGTH

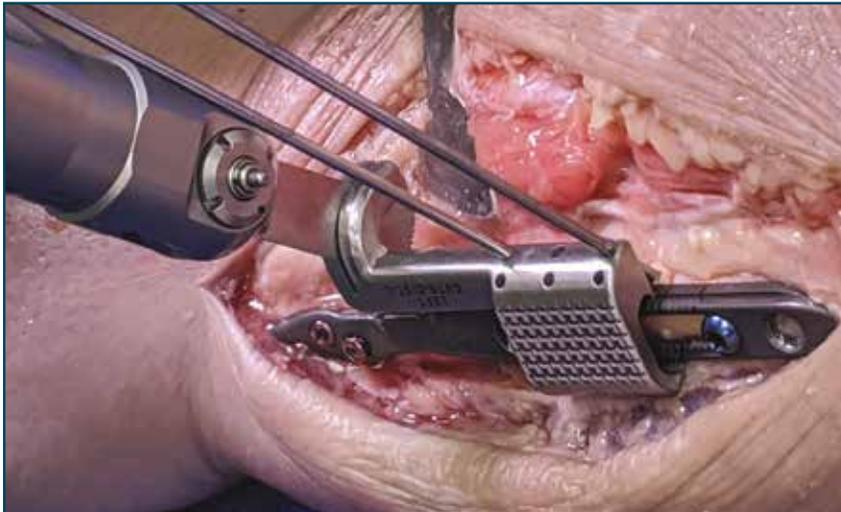


Adjust the cutting guide proximally until the determined osteotomy length is achieved. Each laser-etched line on the plate corresponds to an additional osteotomy length of 2mm.

To fix the cutting guide, use two 1.6mm k-wires through the k-wire holes on the side of the cutting guide. Note the k-wire placement; see step 7 for details.

10

PROXIMAL CUT

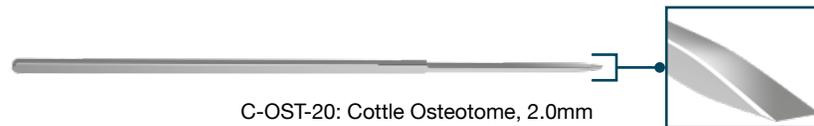
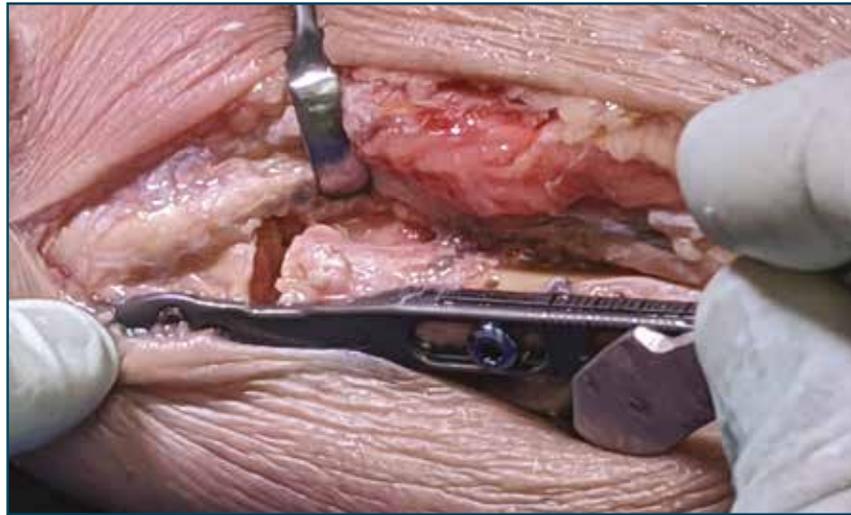


Use an oscillating saw and the saw blade selected in step 8 to resect the ulna through the guiding slot on the distal cutting guide arm. Once the ulna has been resected all the way through, remove the saw and any k-wires from the bone.

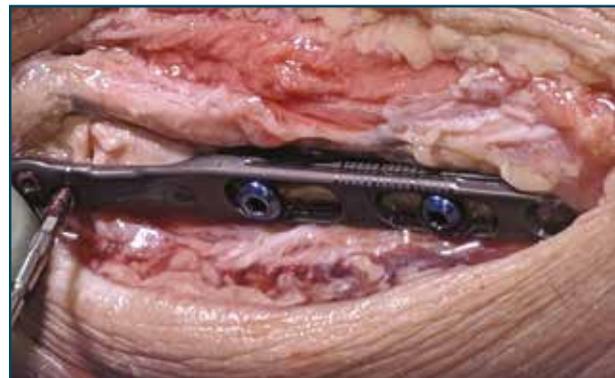
Warning:

Protect soft tissues while cutting with the oscillating saw using the Mini Hohmann Retractors provided in the set.

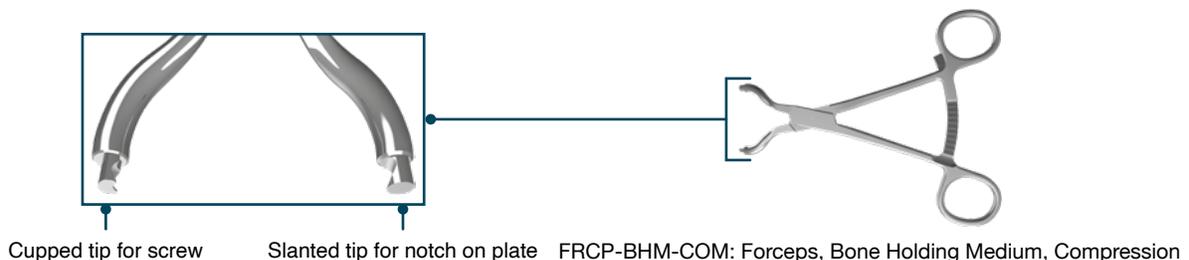
Fully remove the resected bone wafer from the osteotomy site. A Cottle Osteotome has been provided in the set to facilitate removal.



C-OST-20: Cottle Osteotome, 2.0mm



Loosen the cortical non-locking screws by approximately one half of a turn or until there is little friction for the plate to translate upon the bone in the distal and proximal FreeFix® slots. Place the appropriate tip of the Compression Forceps into the recess at the center of the plate and the other tip behind the head of the screw in the proximal slot. Using the Compression Forceps, reduce and compress the osteotomy site until adequate compression is achieved. Then tighten the distal and proximal cortical non-locking screws.

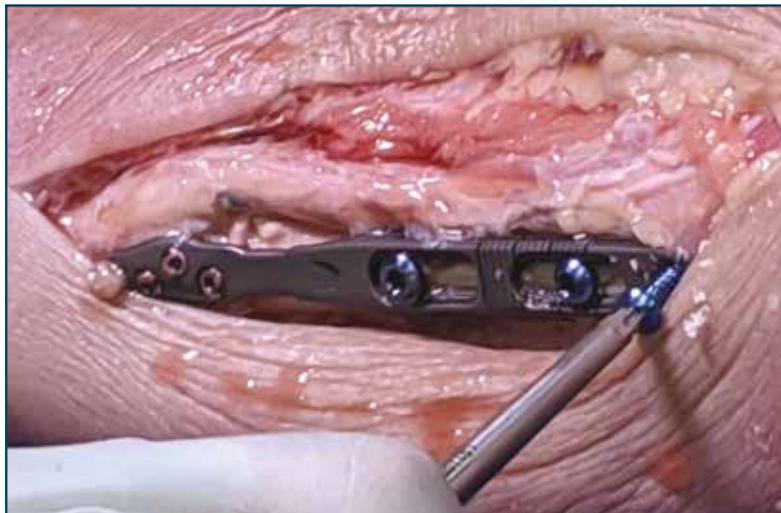


Cupped tip for screw

Slanted tip for notch on plate

FRCP-BHM-COM: Forceps, Bone Holding Medium, Compression

13 FINAL CORTICAL SCREW



Use the 2.7mm drill bit (and thread-in drill if selecting a cortical locking screw) to place the final 3.5mm cortical screw. Measure the appropriate length using the depth gauge and place the screw into the distal hole of the plate.

Note:

Additional dynamic compression may be achieved across the osteotomy site by either drilling the final screw eccentrically in the hole, or placing a cortical screw (either locking or non-locking) on the proximal edge of either of the FreeFix® slots. Be sure to loosen the screws in the distal and proximal FreeFix® slots prior to achieving dynamic compression.

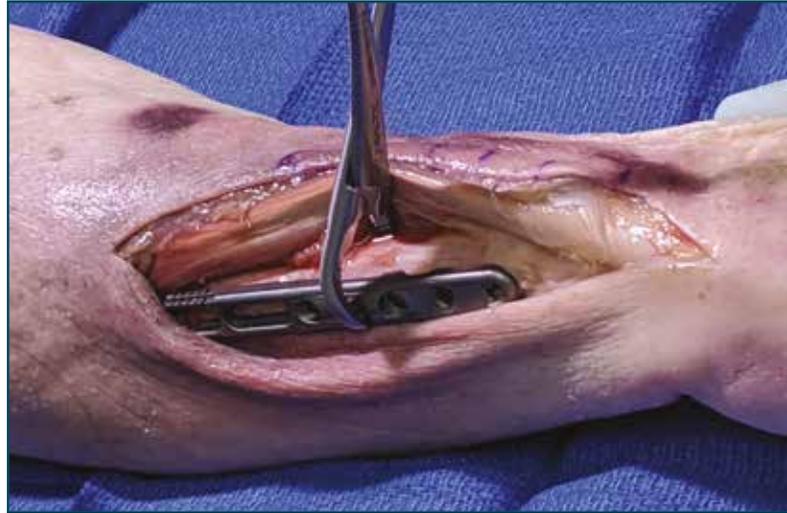
14 CLOSURE



Check the plate and screw trajectories under fluoroscopy for adequate placement and osteotomy compression. If satisfied, close the site in the usual fashion.

Make a 10cm to 12cm longitudinal incision along the subcutaneous border of the distal to mid-ulna. Determine proper plate placement using fluoroscopy. Plate should lie proximal to the distal band and distal to the central band of the interosseous ligament.

The osteotomy should be placed on the ulna 3/4 of way distal on the forearm. This will preserve the integrity of the central band of the interosseous ligament. The plate can be placed anterior or posterior on the ulna per surgeon's preference.



Use the 2.7mm drill bit (and thread-in drill guide if selecting a cortical locking screw) to drill through the three distal holes on the plate. Measure each screw length using the appropriate scale of the depth gauge and insert a screw of selected length in each hole.



DRLL-SSC-27050: Drill, 2.7mm x 50mm



DPGA-UNV-030: Depth Gauge, Universal, 30mm



TPDG-FF-35: Thread-in Drill Guide, FreeFix®, 3.5mm

3

DISTAL FREEFIX® SLOT



Use the 2.7mm drill bit to place a 3.5mm cortical non-locking screw of selected length into the distal FreeFix® slot in the most proximal position. Ensure the screw is 2mm longer than measured to prevent the screw from stripping during compression (see Step 10).

Warning:

At this time do not use a cortical locking screw in the FreeFix® slot to prevent deformation of the cutting guide rails. If desired a cortical locking screw may replace the non-locking screw after the final osteotomy has been achieved.



If replacing a cortical non-locking screw with a locking screw in a later step, use the thread-in drill guide.



DPGA-FF-050: FreeFix® Depth Gauge

4

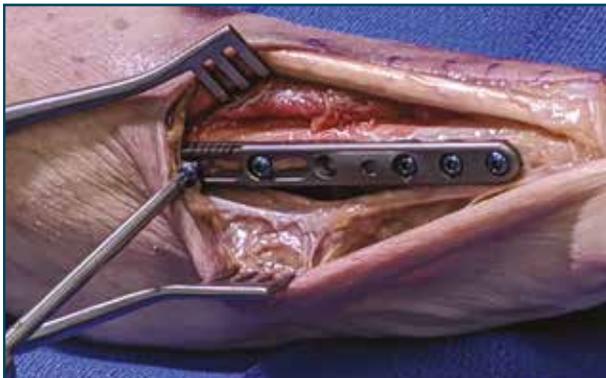
PROXIMAL FREEFIX® SLOT



Use the 2.7mm drill bit to place a 3.5mm cortical non-locking screw, of selected length, into the proximal FreeFix® slot in the most proximal position.

Warning:

At this time do not use a cortical locking screw in the FreeFix® slot to prevent deformation of the cutting guide rails. If desired a cortical locking screw may replace the non-locking screw after the final osteotomy has been achieved.



If replacing a cortical non-locking screw with a locking screw in a later step, use the thread-in drill guide.

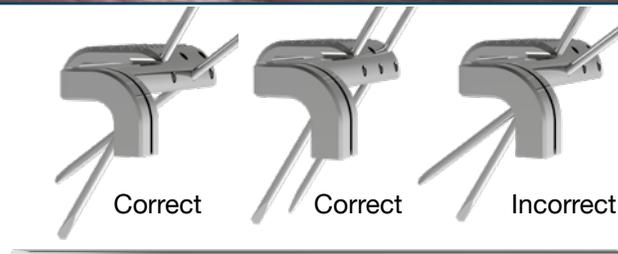
Check the placement of the plate using fluoroscopy. If the plate is misaligned, readjust as necessary.

Attach the appropriate proximal cutting guide to the plate using the rails along the side of the plate. Both transverse and oblique cut options are available in left and right configurations depending on the preferred osteotomy approach. Push the cutting guide until it reaches the end of the rail. It stops just distal to the thickest laser etched line.



To fix the cutting guide, either hold it in place by pushing it against the end of the rail with a thumb or use two 1.6mm k-wires through the k-wire holes on the side of the cutting guide.

Insert the k-wires in two different holes, ensuring they are not transversely aligned.



KWIR-SD-16127: K-Wire, Single Diamond, 1.6mm x 127mm

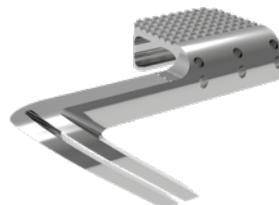
DISTAL CUT

Select the suggested saw blade by referencing the chart on Page 19.

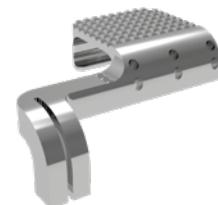
Use an oscillating saw and the selected saw blade to cut the ulna through the guiding slot on the proximal cutting guide arm. Once the ulna has been cut all the way through, remove the saw and any k-wires from the bone.

Warning:

Protect soft tissues while cutting with the oscillating saw using the Mini Hohmann Retractors provided in the set.



CUTG-OPRX-R/L: Ulnar Shortening, Cutting Guide, Oblique, Proximal



CUTG-PRX-R/L: Ulnar Shortening, Cutting Guide, Proximal

7

ADJUST FOR LENGTH



Adjust the cutting guide proximally until the determined osteotomy length is achieved. Each laser etched line on the plate corresponds to an additional osteotomy length of 2mm.

To fix the cutting guide, use two 1.6mm k-wires through the k-wire holes on the side of the cutting guide. Note the k-wire placement; see step 5 for details.

8

PROXIMAL CUT



Use an oscillating saw and the saw blade selected in step 6 to cut the ulna through the guiding slot on the proximal cutting guide arm. Once the ulna has been cut all the way through, remove the saw and any k-wires from the bone.

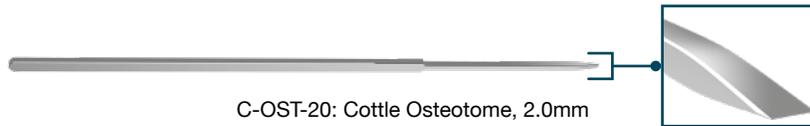
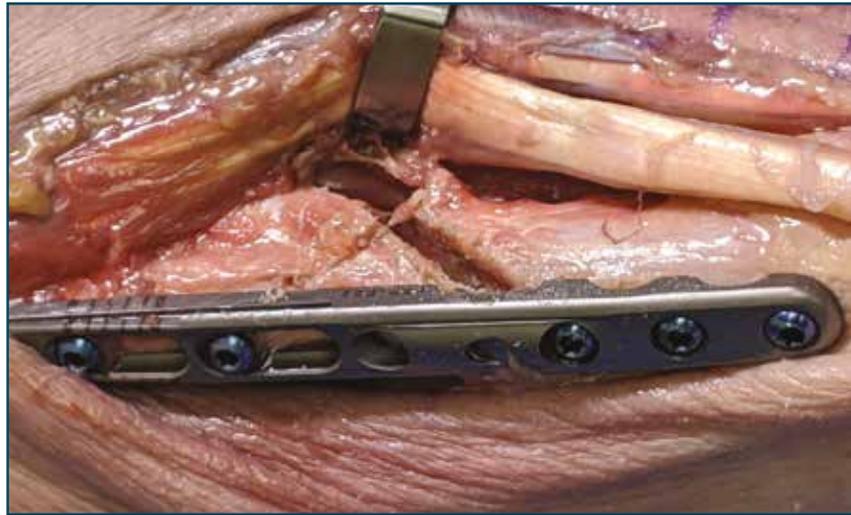
Warning:

Protect soft tissues while cutting with the oscillating saw using the Mini Hohmann Retractors provided in the set.



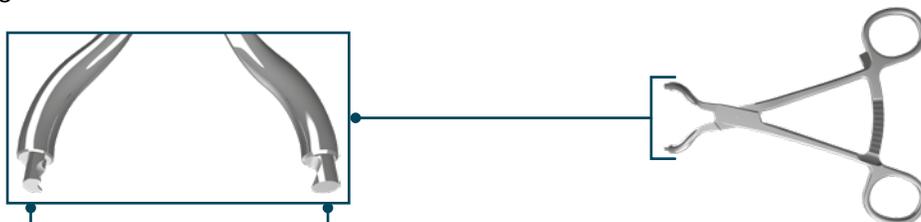
INST-MHR-STD: Instrument, Mini-Hohmann Retractor, Standard

Fully remove the cut bone wafer from the osteotomy site. A Cottle Osteotome has been provided in the set to facilitate removal.



C-OST-20: Cottle Osteotome, 2.0mm

Loosen the cortical non-locking screws by approximately one half of a turn or until there is little friction for the plate to translate upon the bone in the distal and proximal FreeFix® slots. Place the appropriate tip of the Compression Forceps into the recess at the center of the plate and the other tip behind the head of the screw in the proximal slot. Using the Compression Forceps, reduce and compress the osteotomy site until adequate compression is achieved. Then tighten the distal and proximal cortical non-locking screws.

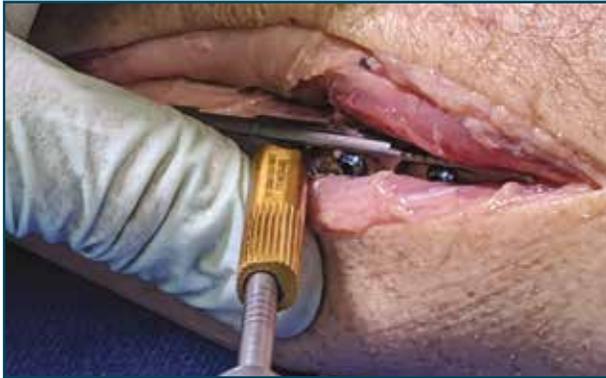


Cupped tip for screw

Slanted tip for notch on plate

FRCP-BHM-COM: Forceps, Bone Holding Medium, Compression

11 OBLIQUE SCREW (OPTIONAL)



If an oblique osteotomy cut was chosen, an oblique lag screw may be placed across the osteotomy interface.

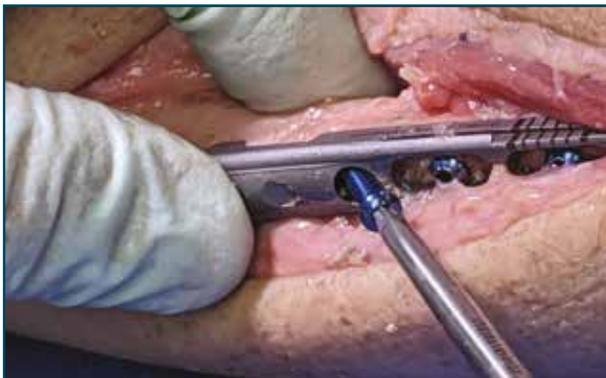
Use the 2.7mm drill bit and Oblique Compression Hole Guide to drill a pilot hole perpendicular to the plane of the osteotomy through both bone fragments. The Oblique Compression Hole Guide must be inserted at angle and levered down to properly fit into the slot.

To ensure the screw will be properly lagged, overdrill the hole in the proximal osteotomy fragment only with the 3.5mm drill bit.



TPDG-CHG: Oblique Compression Hole Guide

12 OBLIQUE SCREW (OPTIONAL)



Measure the hole using the depth gauge and drive 3.5mm cortical non-locking screw into the angled oblique hole of the plate. As the screw begins to achieve traction loosen the non-locking screws in the proximal and distal FreeFix® slots to compress along the osteotomy. Once the oblique screw is fully seated, tighten both screws in the proximal and distal FreeFix® slots.

To facilitate maintaining compression, utilize the compression forceps while driving the oblique screw into the bone.



DRLL-SSC-35040: Drill, 3.5mm x 40mm

FINAL CORTICAL SCREW

13

Use the 2.7mm drill bit (and thread-in drill guide if selecting a cortical locking screw) to place the final 3.5mm cortical screw. Measure the appropriate length using the depth gauge and insert the screw into the distal hole of the plate.

Note:

You may achieve additional dynamic compression across the osteotomy site by either drilling the final screw eccentrically in the hole, or placing a cortical screw (either locking or non-locking) on the proximal edge of either of the FreeFix® slots. Be sure to loosen the screws in the distal and proximal FreeFix® slots prior to achieving dynamic compression.



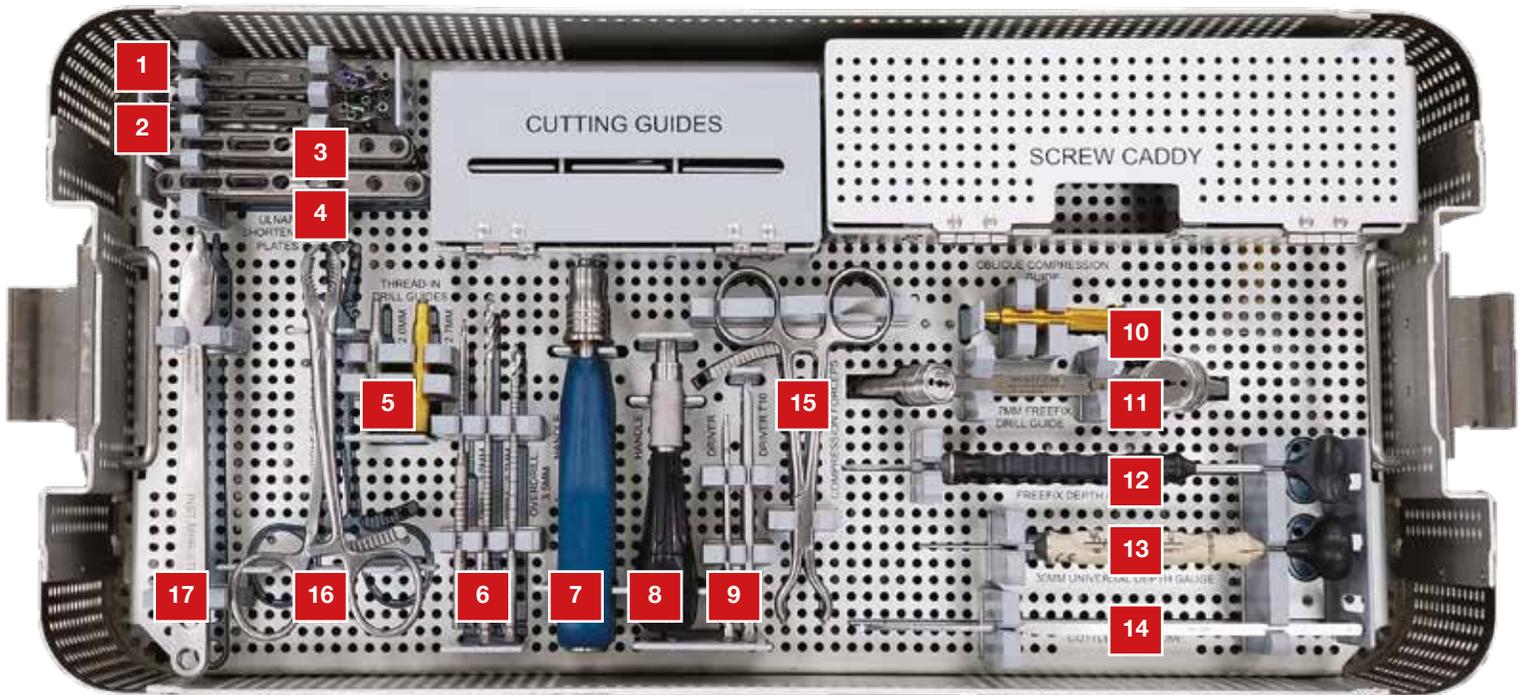
CLOSURE

14

Check the plate and screw trajectories under fluoroscopy for adequate placement and osteotomy compression. If satisfied, close the site in the preferred manner.



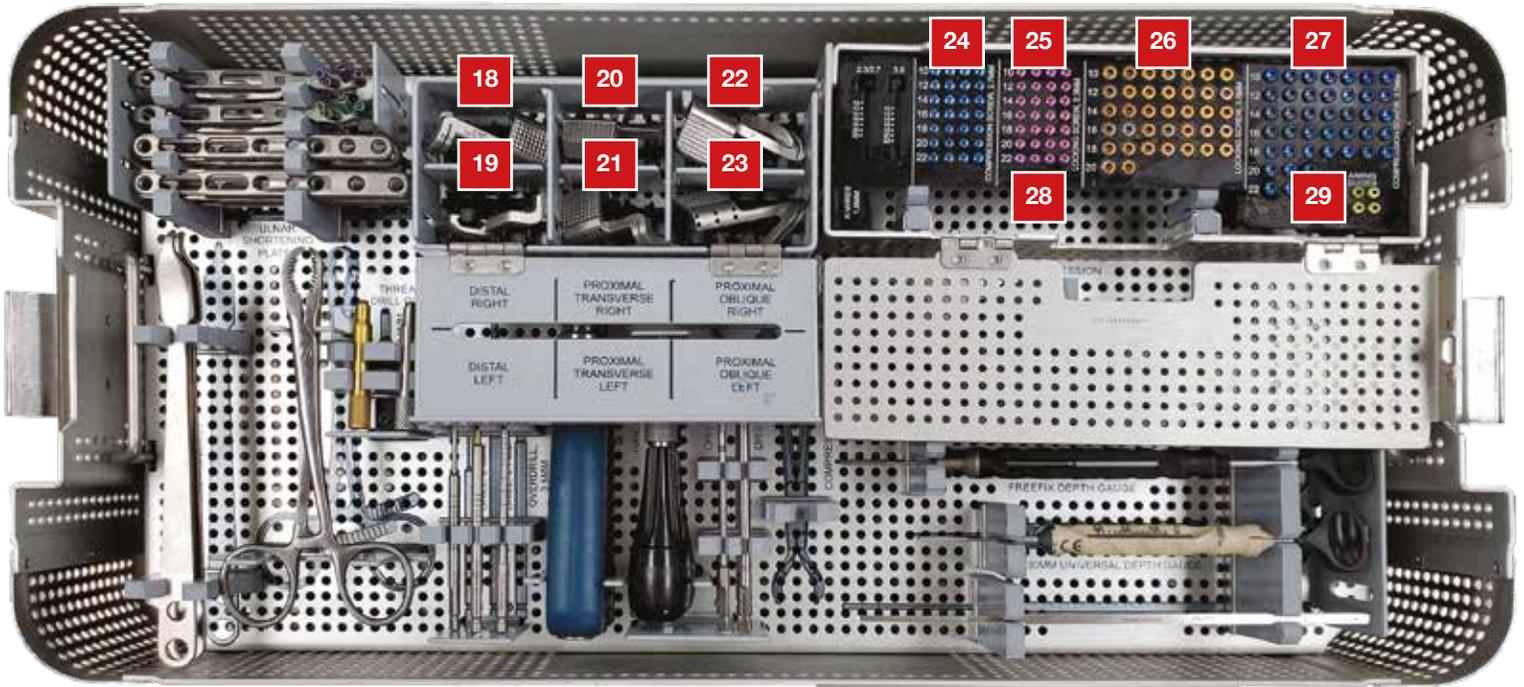
INSTRUMENT TRAY (Standard Configuration)



Loc #	Catalog #	Description	Loc #	Catalog #	Description
1	USP-DRT	Ulnar Shortening Plate, Distal, Right	12	DPGA-FF-050	FreeFix® Depth Gauge
2	USP-DLT	Ulnar Shortening Plate, Distal, Left	13	DPGA-UNV-030	Depth Gauge, Universal, 30mm
3	USP-PRX	Ulnar Shortening Plate, Proximal	14	C-OST-20	Cottle Osteotome, 2.0mm
4	USP-PRXL	Ulnar Shortening Plate, Proximal, Long	15	FRCP-BHM-COM	Forceps, Bone Holding Medium, Compression
5	TPDG-THD-DG20	Thread-in Drill Guide, 2.0mm	16	FRCP-BHM-RTC	Forceps, Bone Holding Medium, Ratcheting
	TPDG-FF-35	Thread-in Drill Guide, FreeFix®, 3.5mm	17	INST-MHR-STD	Instrument, Mini-Hohmann Retractor, Standard
6	DRLL-SSC-20040	Drill, Solid Side Cutting, 2.0mm x 40mm		PRT-BND-PLL	PROTEAN Plate Bending Pliers, Large *
	DRLL-SSC-27050	Drill, 2.7mm x 50mm			
	DRLL-SSC-35040	Drill, 3.5mm x 40mm			
7	HNDL-UQC-FXD	Handle, Universal Quick Connect, Fixed			
8	HNDL-SQC-FXD	Handle, Small QC, Fixed			
9	DRVR-AOS-S20	Driver, Peg, Torque Limiting			
	DRVR-S20	Driver, Peg			
	DRVR-UQC-T10	Driver, Universal Quick Connect, T10			
10	TPDG-CHG	Oblique Compression Hole Guide			
11	TPDG-FF-27ML	Drill Guide, FreeFix®, 2.7mm Medium-Long			

* Not Pictured, stored in area below this layer.

INSTRUMENT TRAY (Standard Configuration)



Loc #	Catalog #	Description	Loc #	Catalog #	Description
18	CUTG-DIST-R	Ulnar Shortening, Cutting Guide, Distal, Right	26	COLS-35100-TS	Screw, Cortical Locking, 3.5mm x 10mm, Ti
19	CUTG-DIST-L	Ulnar Shortening, Cutting Guide, Distal, Left		COLS-35120-TS	Screw, Cortical Locking, 3.5mm x 12mm, Ti
20	CUTG-PRX-R	Ulnar Shortening, Cutting Guide, Proximal, Right		COLS-35140-TS	Screw, Cortical Locking, 3.5mm x 14mm, Ti
21	CUTG-PRX-L	Ulnar Shortening, Cutting Guide, Proximal, Left		COLS-35160-TS	Screw, Cortical Locking, 3.5mm x 16mm, Ti
22	CUTG-OPRX-R	Ulnar Shortening, Cutting Guide, Oblique, Proximal, Right		COLS-35180-TS	Screw, Cortical Locking, 3.5mm x 18mm, Ti
23	CUTG-OPRX-L	Ulnar Shortening, Cutting Guide, Oblique, Proximal, Left		COLS-35200-TS	Screw, Cortical Locking, 3.5mm x 20mm, Ti
24	TPNL-27100-TS	Threaded Peg, Non-Locking, 2.7mm x 10mm, Ti	27	PANL-35100-TS	Screw, Cortical Non Locking, 3.5mm x 10mm, Ti
	TPNL-27120-TS	Threaded Peg, Non-Locking, 2.7mm x 12mm, Ti		PANL-35120-TS	Screw, Cortical Non Locking, 3.5mm x 12mm, Ti
	TPNL-27140-TS	Threaded Peg, Non-Locking, 2.7mm x 14mm, Ti		PANL-35140-TS	Screw, Cortical Non Locking, 3.5mm x 14mm, Ti
	TPNL-27160-TS	Threaded Peg, Non-Locking, 2.7mm x 16mm, Ti		PANL-35160-TS	Screw, Cortical Non Locking, 3.5mm x 16mm, T
	TPNL-27180-TS	Threaded Peg, Non-Locking, 2.7mm x 18mm, Ti		PANL-35180-TS	Screw, Cortical Non Locking, 3.5mm x 18mm, Ti
	TPNL-27200-TS	Threaded Peg, Non-Locking, 2.7mm x 20mm, Ti		PANL-35200-TS	Screw, Cortical Non Locking, 3.5mm x 20mm, Ti
	TPNL-27220-TS	Threaded Peg, Non-Locking, 2.7mm x 22mm, Ti		PANL-35220-TS	Screw, Cortical Non Locking, 3.5mm x 22mm, Ti
25	TPLS-23100-TS	Threaded Peg, Locking, 2.3mm x 10mm, Ti	28	KWIR-SD-16127	K-Wire, Single Diamond, 1.6mm x 127mm
	TPLS-23120-TS	Threaded Peg, Locking, 2.3mm x 12mm, Ti	29	PDG-AIM-015	AIMing Guides, 1.5mm
	TPLS-23140-TS	Threaded Peg, Locking, 2.3mm x 14mm, Ti			
	TPLS-23160-TS	Threaded Peg, Locking, 2.3mm x 16mm, Ti			
	TPLS-23180-TS	Threaded Peg, Locking, 2.3mm x 18mm, Ti			
	TPLS-23200-TS	Threaded Peg, Locking, 2.3mm x 20mm, Ti			
	TPLS-23220-TS	Threaded Peg, Locking, 2.3mm x 22mm, Ti			

Ulnar Shortening Saw Blade Suggestions (not provided)

Stryker CORE/CORE 2/F1 System/SABO Saw Series	Conmed Linvatec MicroFree, MicroPower, MicroPower+	Conmed Linvatec Hall 50 Sagittal Saw	Synthes Small Battery System/TRS	Synthes Electric Pen Drive	Arthrex All Systems Small Bone Saw	SNN Dyonics Power Small	MicroAire Series 5000
2296-3-125 DISTAL	5023-249 (MicroAire ZS-125) DISTAL	5071-133 DISTAL	519.103S DISTAL	03.000.305S DISTAL	AR-300-402S DISTAL	72204242 (MicroAire ZS-125) DISTAL	ZS-125 DISTAL
31 x 9.8 x 0.40mm (MicroAire SP-125A)	31 x 9 x 0.40mm	25.5 x 9.5 x 0.40mm	25 x 10 x 0.60mm	31 x 10 x 0.38mm	25 x 9.4 x 0.6mm	31 x 9 x 0.40mm	31 x 9 x 0.40mm
2296-33-410 PROXIMAL	5023-133 (MicroAire ZS-333) PROXIMAL	5071-134 PROXIMAL	519.105S PROXIMAL	03.000.315S PROXIMAL	AR-300-400S PROXIMAL	72204243 (MicroAire ZS-333) PROXIMAL	ZS-333 PROXIMAL
41.6 x 19 x 0.51mm (MicroAire SP-410R)	41 x 14 x 0.40mm	41 x 9.0 x 0.40mm	50 x 20 x 0.60mm	43 x 20 x 0.60mm	41 x 14 x 0.6mm	41 x 14 x 0.40mm	41 x 14 x 0.40mm



skeletal dynamics[®]
UNDERSTANDING THE UPPER EXTREMITY

