acumed®

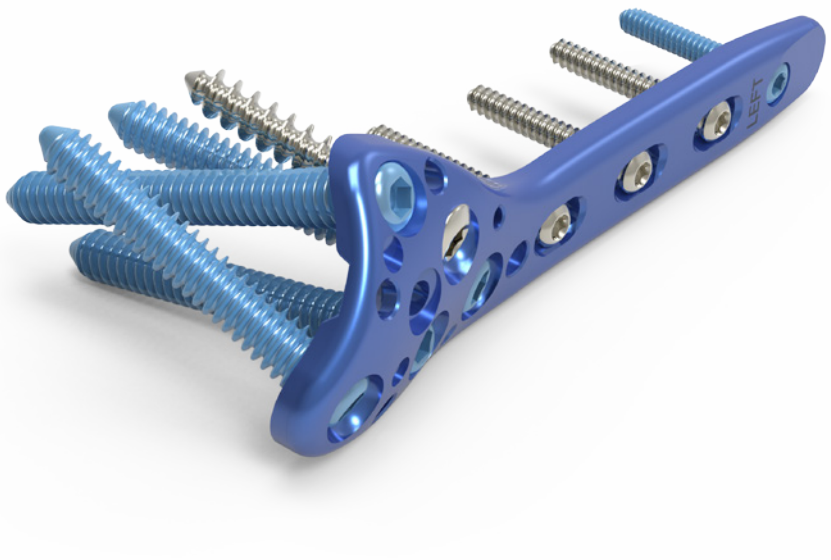
Polarus® Proximal Humeral Plating System

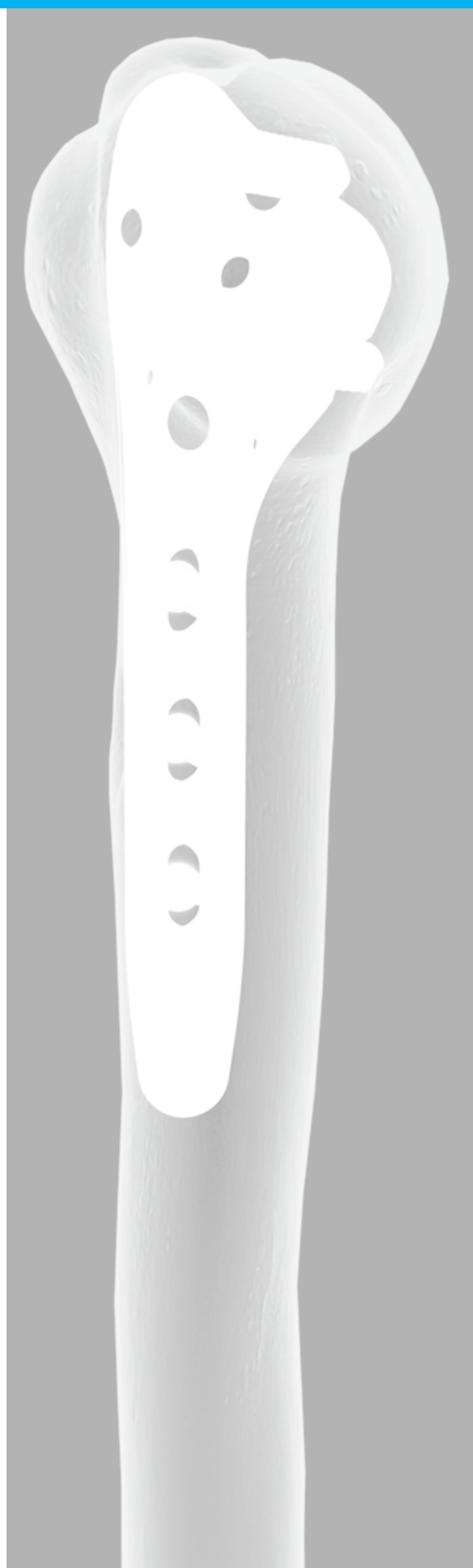
Surgical Technique

A COLSON ASSOCIATE

Acumed® is a global leader of innovative orthopaedic and medical solutions.

We are dedicated to developing products, service methods, and approaches that improve patient care.





Acumed® Polarus® Proximal Humeral Plating System

The Acumed Polarus Proximal Humeral Plating (PHP) System is designed to meet the challenges inherent in fractures of the proximal humerus that are difficult to resolve due to their unique anatomy.

	Definition
Warning	Indicates critical information about a potential serious outcome to the patient or the user.
Caution	Indicates instructions that must be followed in order to ensure the proper use of the device.
Note	Indicates information requiring special attention.

Table of Contents

System Features

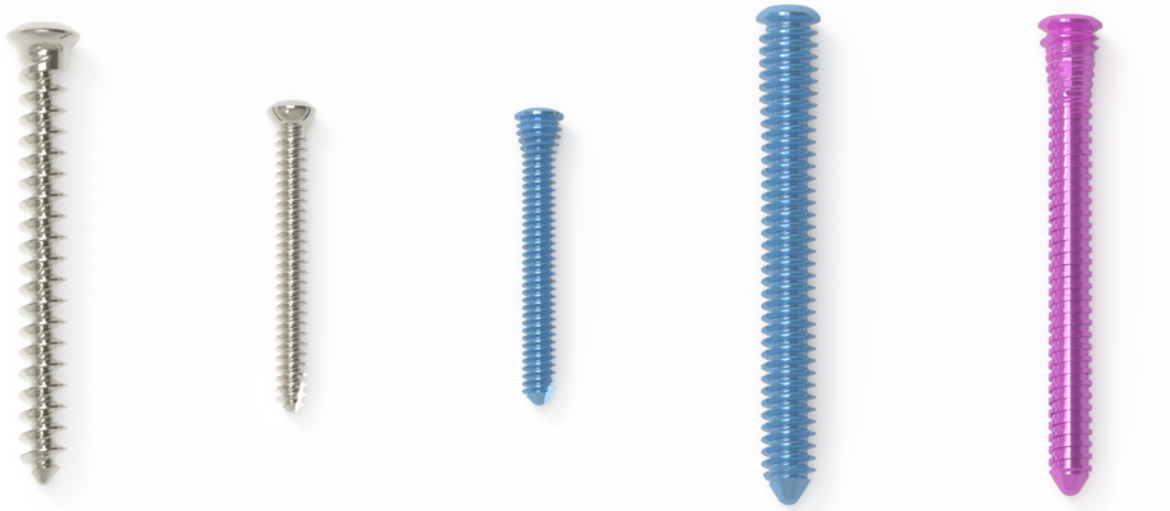
Plate Family

- Extra-long Plate: 154 mm
- 5-hole Large Plate: 102 mm
- 3-hole Small Plate: 93 mm

Proximal Humeral Plate
(PL-PHXX)

Screw Family

- 5.0 mm nonlocking cancellous screw (for reduction of the humeral head)
- 3.5 mm nonlocking cortical screw (for fixation in the humeral shaft)
- 3.5 mm locking cortical screw (for fixation in the humeral shaft)
- 5.7 mm locking cancellous screw (for fixation in the humeral head)
- 4.5 mm locking buttress screw (for fixation in the humeral head)



5.0 mm Nonlocking Cancellous Screw
(HCA-51XX)

3.5 mm Nonlocking Cortical Screw
(CO-32XX)

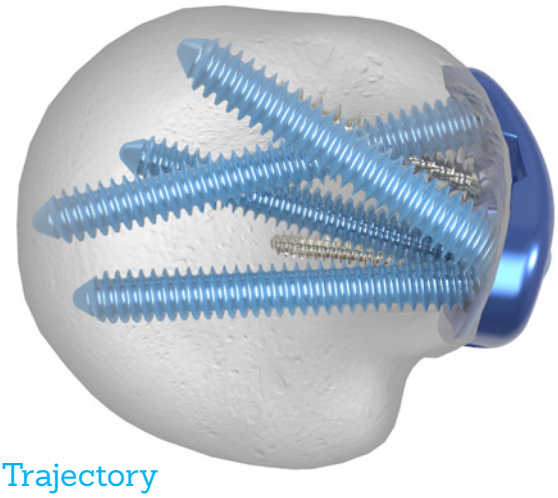
3.5 mm Locking Cortical Screw
(COL-32XX)

5.7 mm Locking Cancellous Screw
(30-04XX)

4.5 mm Locking Buttress Screw
(CA-PHBXX)

Instrumentation

Instrumentation is engineered to streamline the surgical experience.



Trajectory

Converging and diverging screw trajectories are designed to capture best quality bone in the humeral head.

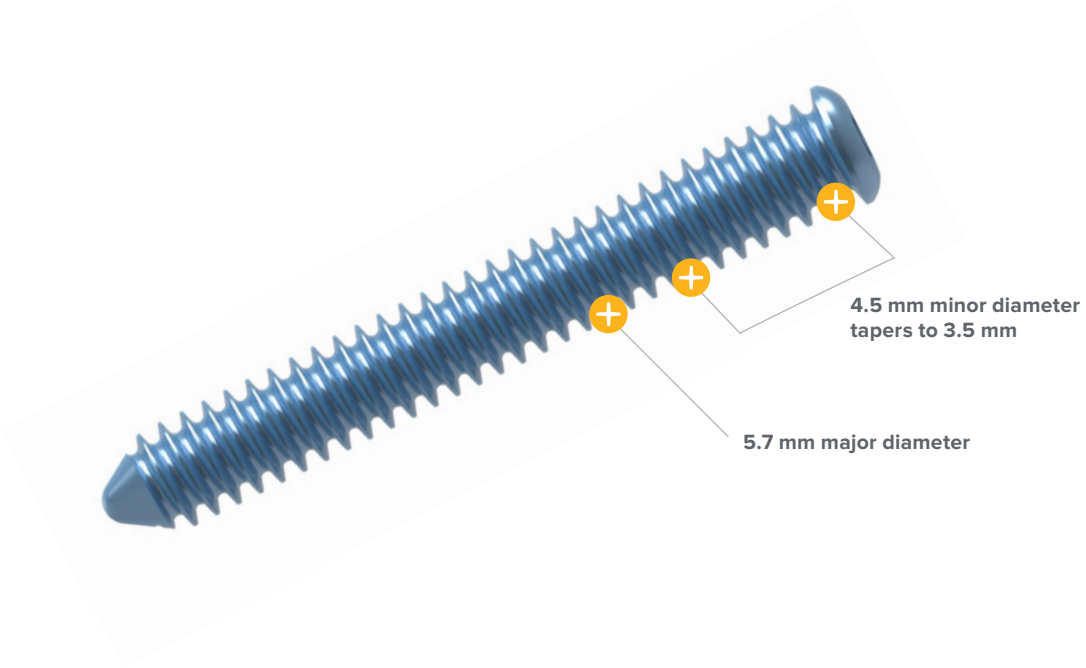
Anatomic Fit

Anatomic precontouring is designed to act as a template and minimize soft tissue irritation.

System Features [continued]

5.7 mm Locking Cancellous Screw

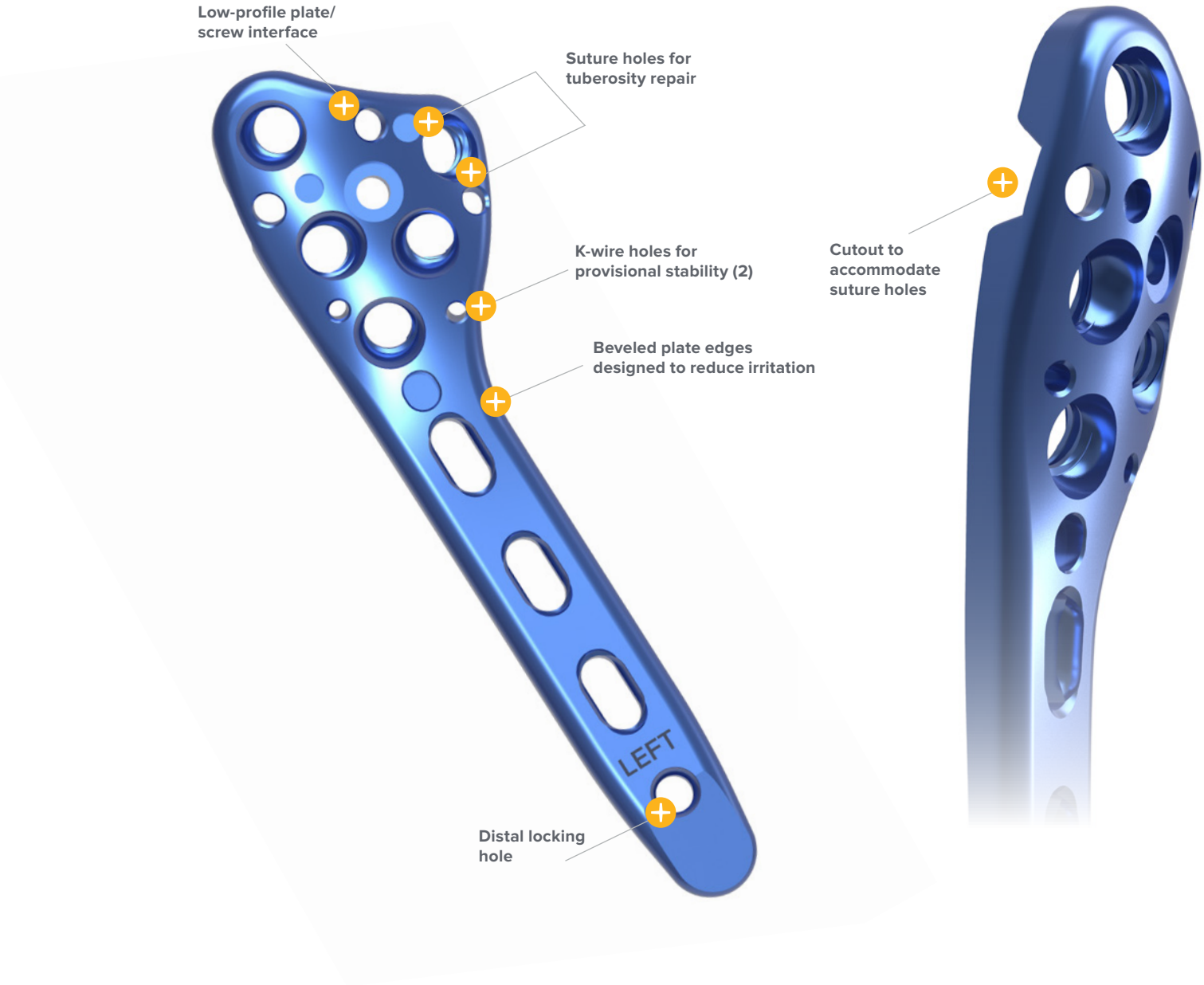
- Tapered inside diameter for even plate engagement
- 5.7 mm major diameter
- Titanium (Ti-6Al-4V ELI)
- Minor (core) diameter equals 4.5 mm and tapers to 3.5 mm
- Available in lengths of 26 mm to 54 mm in 2 mm increments



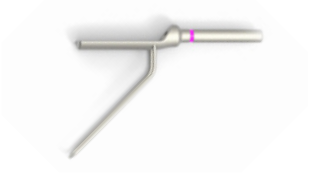
System Features [continued]

Plate

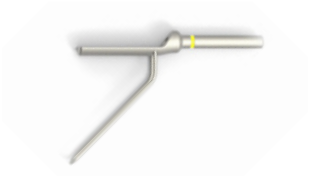
- Low-profile plate/screw interface
- Guide wire holes for provisional stability
- Suture holes for tuberosity repair
- Beveled plate edges designed to minimize soft tissue irritation
- Color-coded for left (blue) and right (green) applications
- Titanium Grade 2



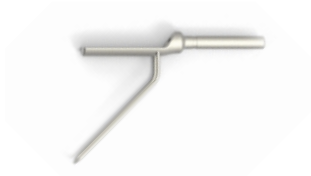
Instrument Overview



4.6 mm Drill Guide Assembly
(MS-DG46)



4.0 mm Drill Guide Assembly
(MS-DG40)



2.8 mm Drill Guide Assembly
(MS-DG28)

Polarus PHP Targeting Guide, Large, Left
(MS-PHGL)

Polarus PHP Targeting Guide, Small, Left
(MS-PHSL)

Polarus PHP Targeting Guide, Small, Right
(MS-PHSR)

Polarus PHP Targeting Guide, Large, Right
(MS-PHGR)

2.8 mm Cancellous Drill
(MS-PH28)

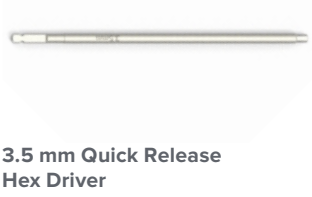
4.0 mm Cancellous Drill
(MS-PH40)

4.6 mm Cancellous Drill
(MS-PH46)

2.8 mm x 5" Quick Release Drill
(MS-DC28)

3.5 mm x 5" Quick Release Drill
(MS-DC35)

3.5 mm Cortical Screw Bone Tap
(MS-LTT35)



3.5 mm Quick Release Hex Driver
(HPC-0035)

2.5 mm Quick Release Hex Driver
(HPC-0025)

PHB Screw Clearance Drill
(MS-PHBCD)

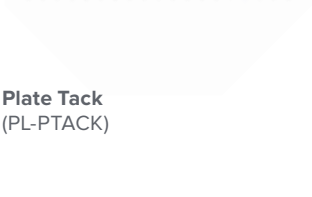


Plate Tack
(PL-PTACK)

Instrument Overview [continued]

Large Screw Holding Forceps
(MS-45210)

4.5 mm Screw Sleeve
(MS-SS46)

3.5 mm Screw Driver Sleeve
(MS-SS35)

7.0 mm Screw Driver Sleeve
(MS-SS57)

Verbrugge Clamp
(PL-CLVB)

3.5 mm Locking Drill Guide
(MS-LDG35)

Medium Ratching Driver Handle
(80-0663)

Large Cannulated Quick Release Driver Handle
(MS-3200)

8" Bone Reduction Forceps
(MS-1280)

Offset Drill Guide
(PL-2095)

3.5 mm Tap Sleeve Assembly
(PL-2190)

Periosteal Elevator
(MS-46213)

9" Bone Reduction Spanish Forceps
(MS-47107)

.0062" x 9" ST Guide Wire
(WS-1609ST)

2.0 mm x 9" ST Guide Wire
(WS-2009ST)

.059 x 5" ST Guide Wire
(WS-1505ST)

6 mm–70 mm Depth Gauge
(MS-9020)

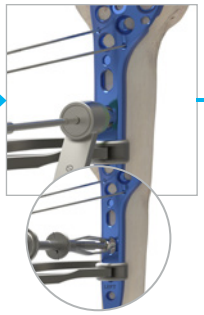
Surgical Technique Overview

Polarus Proximal Humeral Plate

Plate Selection

Plate Placement

Nonlocking Screw Insertion—Humeral Shaft

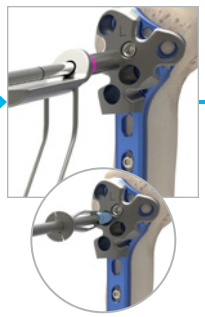


Nonlocking Screw Insertion—Humeral Head

Locking Screw Preparation—Humeral Head

Locking Screw Insertion—Humeral Head

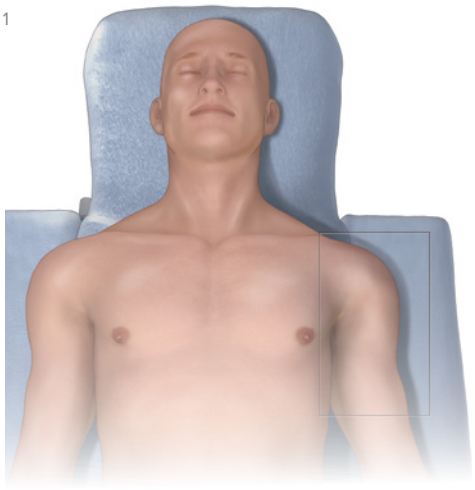
Nonlocking Screw Insertion—Humeral Head



Screw Insertion into Shaft

Polarus Proximal Humeral Plate Surgical Technique

Figure 1



1 Patient Positioning

Place the patient in a beach chair position with the arm draped to aid with fracture reduction. Create an entry site for access to the proximal humerus through a 10 mm standard deltoid-pectoral incision made obliquely in line with the deltoid-pectoral interval. As an alternative, make the incision in a more longitudinal direction, starting at the level of the acromioclavicular joint and extending distally. This approach may potentially be more cosmetic for the patient. **Fluoroscopy should be used in all cases.**

Figure 2

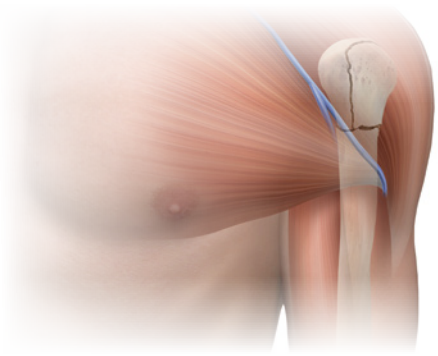
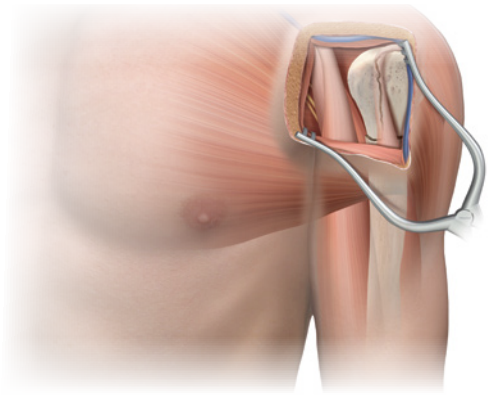


Figure 3



2 Incision

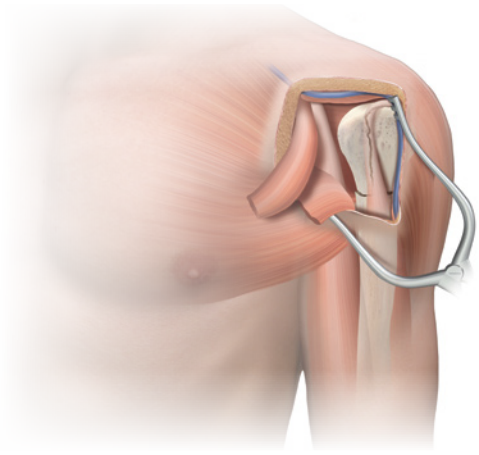
Sharply dissect down to the level of the fascia and elevate the skin flaps. Identify the cephalic vein and develop the interval between the deltoid and the pectoralis. Retract the cephalic vein laterally and the pectoralis major medially.

Polarus Proximal Humeral Plate Surgical Technique [continued]

3 Approach

Release the fascia along the lateral border of the coracobrachialis and retract it medially to expose the proximal humerus with the subscapularis tendon attachment. To help facilitate reduction and improve fracture visualization, release the superior one-third of the pectoralis major from the humeral shaft. It is important to place a finger underneath the pectoralis major as it is being released to protect the biceps tendon, which lies directly underneath.

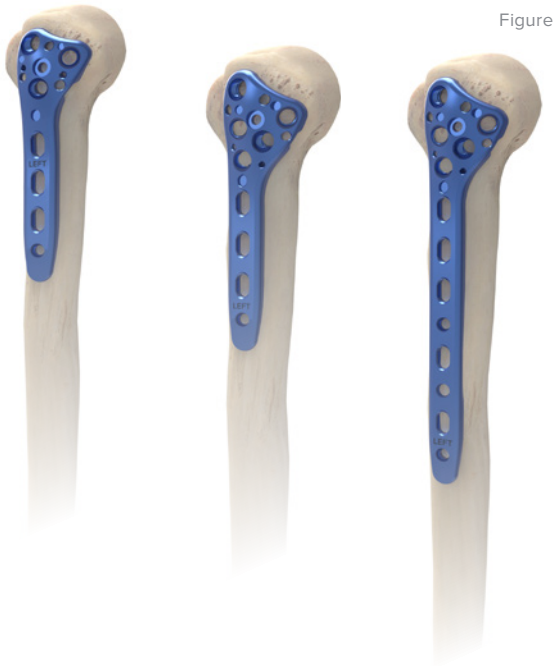
Figure 4



4 Plate Selection

The left and right specific Polarus Proximal Humerus (PHP) Plates (PL-PHXXX) are anatomically designed to fit an array of patient anatomies. In most cases, the Large Proximal Humeral Plate (PL-PHGL or PL-PHGR) should be chosen. If the patient is small-boned, the Small Proximal Humeral Plate (PL-PHSL or PL-PHSR) may be a better fit. If the fracture pattern includes a fracture line distal to the surgical neck, an Extra-Long Proximal Humeral Plate (PL-PHXGL or PL-PHGR) may be utilized.

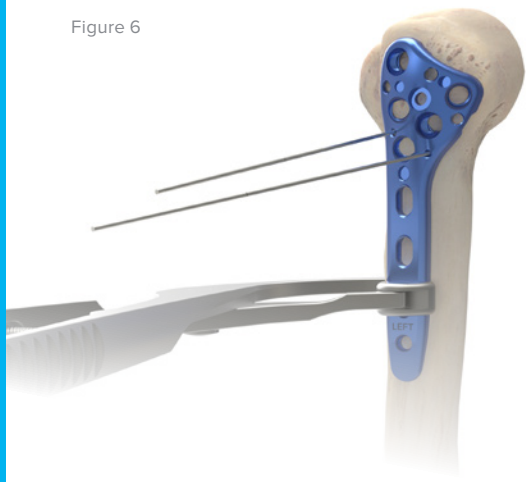
Figure 5



Proximal Humeral Plate
(PL-PHXXX)

Polarus Proximal Humeral Plate Surgical Technique [continued]

Figure 6

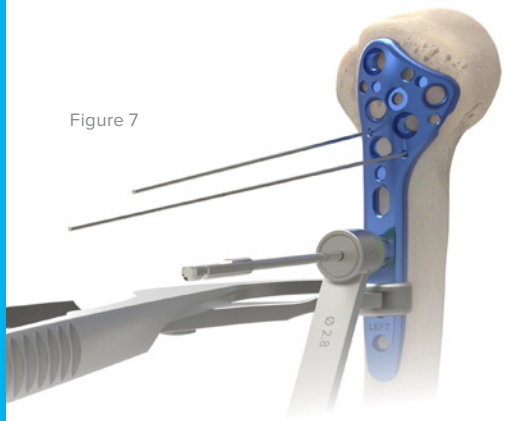


5 Plate Placement

Place the Polarus PHP 3 to 5 mm posterior to the bicipital groove and approximately 5 mm inferior to the top of the greater tuberosity. Confirm fracture reduction and plate height fluoroscopically. When proper reduction and positioning are obtained, provisionally secure the plate to the bone with K-wires (WS-2009ST or WS-1505ST) or Plate Tacks (PL-PTACK).

Note: Sutures are commonly used and may be utilized at this time to improve construct stability. The plate construct features suture holes to better address greater tuberosity fragments in three- and four-part fractures. These aid in achieving construct stability of these types of fractures. Due to the design of the three suture holes, the sutures may also be added upon completion of plate application.

Figure 7

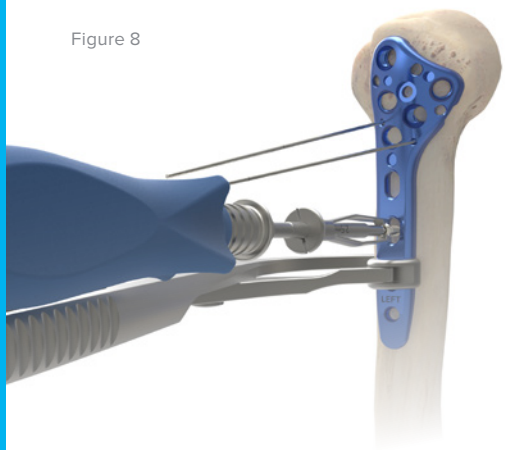


6 Nonlocking Screw Insertion—Humeral Shaft

Secure the plate to the humeral shaft with a 3.5 mm Cortical Screw (CO-3XXX). The screw may be inserted in any slot in the plate distal to the fracture.

Use the 2.8 mm Offset Drill Guide (PL-2095), the 2.8 mm x 5" Quick Release Drill (MS-DC28), and the Standard Depth Gauge (MS-9020) to determine the length of screw needed. With the 2.5 mm Quick Release Hex Driver (HPC-0025), insert a 3.5 mm Cortical Screw of the appropriate length. The provisional fixation hardware can now be removed.

Figure 8



2.0 mm x 9" ST Guide Wire
(WS-2009ST)
Also used as a K-wire

.059 x 5" ST Guide Wire
(WS-1505ST)
Also used as a K-wire

Plate Tack
(PL-PTACK)

3.5 mm Cortical Screw
(CO-3XXX)

2.8 mm x 5" Offset Drill Guide
(PL-2095)

2.8 mm x 5" Quick Release Drill
(MS-DC28)

Standard Depth Gauge
(MS-9020)

2.5 mm Quick Release Hex Driver
(HPC-0025)

Polarus Proximal Humeral Plate Surgical Technique [continued]

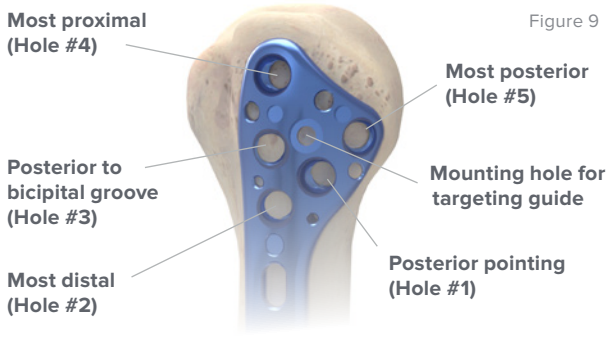
7 Nonlocking Screw Insertion—Humeral Head

Please see the diagram at right for reference to hole numbers. Select the appropriate Targeting Guide (MS-PHGL or MS-PHGR for large and extra long plates; MS-PHSL or MS-PHSR for small plates) and secure it to the plate with the Targeting Guide Locking Screw (MS-TGLS), utilizing the 3.5 mm Quick Release Hex Driver (HPC-0035). The first proximal head screw placed should be the posterior-pointing (Figure 9, Hole #1) on the large or extra long plate and the most distal (Figure 10, Hole #1) on the small plate.

Drill the hole with the 2.8 mm Drill Guide (MS-DG28) and the long 2.8 mm Cancellous Drill (MS-PH28). Use the laser mark on the drill with the scale on the back of the drill guide to determine the appropriate screw length. For accurate measurement, be sure that the drill guide is fully seated into the targeting guide.

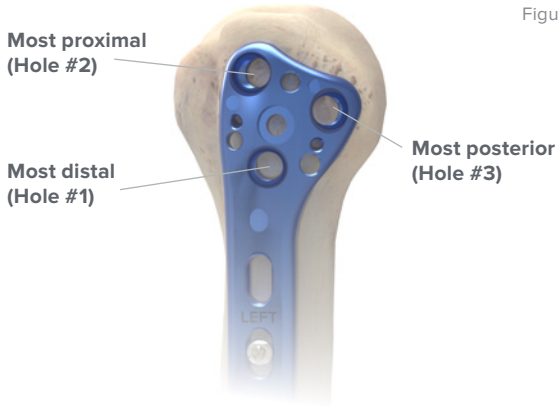
Remove the drill and drill guide, then insert a 5.0 mm Nonlocking Cancellous Screw (HCA-51XX) through the targeting guide and plate. The 5.0 mm nonlocking screw helps draw the plate to the bone, affirm reduction, and ensure a low-profile, plate-to-bone interface.

Figure 9



Proximal Humeral Plate, Large, Left

Figure 10



Proximal Humeral Plate, Small, Left

Figure 11

Figure 12

Polarus PHP Targeting Guide, Large (MS-PHGX)

Polarus PHP Targeting Guide, Small (MS-PHSX)

Polarus PHP Targeting Guide Locking Screw (MS-TGLS)

3.5 mm Quick Release Hex Driver (HPC-0035)

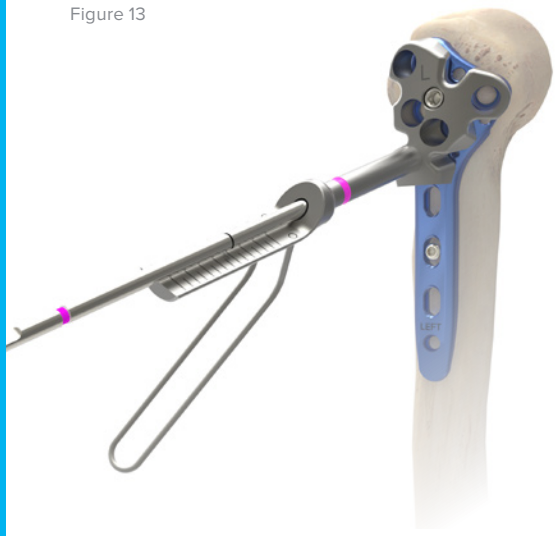
2.8 mm Drill Guide (MS-DG28)

2.8 mm Cancellous Drill (MS-PH28)

5.0 mm Nonlocking Cancellous Screw (HCA-51XX)

Polarus Proximal Humeral Plate Surgical Technique [continued]

Figure 13



8 Locking Screw Preparation—Humeral Head

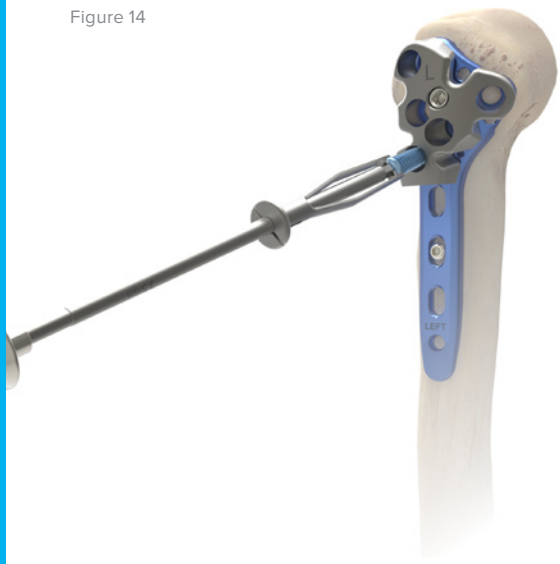
Note: For humeral head screw insertion, insert screws in a clockwise order.

Insert the fuchsia-banded 4.6 mm Drill Guide (MS-DG46) into the #2 (most distal) hole on the large and extralong plate and into the #2 (most proximal) hole on the small plate (see figures 9 and 10 on previous page). (Note that any proximal hole has the ability to accept either the blue 5.7 mm Locking Screws (30-04XX) or the fuschia 4.5 mm Locking Buttress Screws (CA-PHB25).

Drill using the 4.6 mm Cancellous Drill (MS-PH46) either under power or by hand. Determine the screw length by aligning the laser mark on the drill with the scale on the back of the drill guide. For accurate measurement, be sure the drill is fully seated into the targeting guide. Use fluoroscopy to help confirm accurate screw placement in the humeral head.

Optional: The 4.0 mm Cancellous Drill (MS-PH40) can be used with the fuschia 4.5 mm Locking Buttress Screws (CA-PHB25).

Figure 14



9 Locking Screw Insertion—Humeral Head

Note: Prior to inserting your choice of locking screws, be sure to confirm that the fracture is reduced anatomically.

Remove the drill and drill guide and insert the selected Locking Screw. Either screw choice should be of the longest length possible across the humeral head, reaching the subchondral bone but without breaking through the articular surface of the head. Both locking screw options can be inserted using the 3.5 mm Hex Driver (HPC-0035) with the Large Cannulated Quick Release Driver Handle (MS-3200).

4.6 mm Drill Guide
(MS-DG46)

5.7 mm Locking Screw
(30-04XX)

4.5 mm Locking Buttress Screw
(CA-PHB25)

4.6 mm Cancellous Drill
(MS-PH46)

4.0 mm Cancellous Drill
(MS-PH40)

3.5 mm Hex Driver
(HPC-0035)

Large Cannulated Quick Release Driver Handle
(MS-3200)

Polarus Proximal Humeral Plate Surgical Technique [continued]

10 Nonlocking Screw Insertion—Humeral Head

Using the same process described in steps 8 and 9, fill the remaining humeral head plate holes in the recommended clockwise order. The originally placed 5.0 mm nonlocking screw may be replaced with a locking screw at the end.

Note: If any screws have trouble locking into the plate, remove them and use the PHB Screw Clearance Drill (MS-PHBCD) to further prepare the entry site. Redrilling (without moving the plate) with the 4.6 mm Cancellous Drill (MS-PH46) and double-checking the depth measurement may also help.

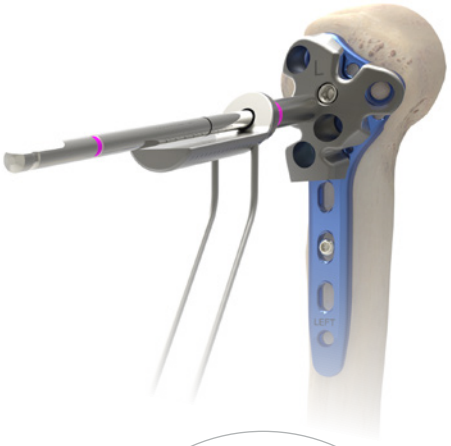


Figure 15

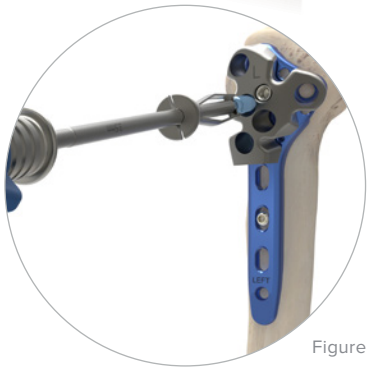


Figure 16

PHB Screw Clearance Drill
(MS-PHBCD)

4.6 mm Cancellous Drill
(MS-PH46)

Polarus Proximal Humeral Plate Surgical Technique [continued]

Figure 17

Figure 18

11 Screw Insertion in the Shaft

Insert the 3.5 mm Cortical Screws (CO-3XXX) in the remaining holes using the technique described in step 6.

Note: The blue 3.5 mm Locking Cortical Screws (COL-3XXX) should be placed in the round hole of the shaft (or holes, if using the extra-long plate). The Locking Drill Guide (MS-LDG35) must be used prior to drilling. In these cases, screw length is measured with the Standard Depth Gauge (MS-9020).

3.5 mm Cortical Screws
(CO-3XXX)

3.5 mm Locking Cortical Screws
(COL-3XXX)

Locking Drill Guide
(MS-LDG35)

Standard Depth Gauge
(MS-9020)

Polarus Proximal Humeral Plate Surgical Technique [continued]

12 Soft Tissue Closure

Close the wound in layers with a subarticular stitch and place a drain for early postoperative recovery.

13 Postoperative Protocol

Postoperative care is at the discretion of the surgeon. The following protocol is provided as an example.

Initiate passive range of motion exercises for the first four weeks, then active assisted for two weeks. Start active range of motion and strengthening at approximately six weeks postoperatively when fracture healing is evident on radiographs.

14 Optional: Implant Removal Instructions

If removal of the implant is desired, remove the screws with the 3.5 mm Quick Release Hex Driver (HPC-0035).

3.5 mm Quick Release Hex Driver
(HPC-0035)

Ordering Information

Tray Components

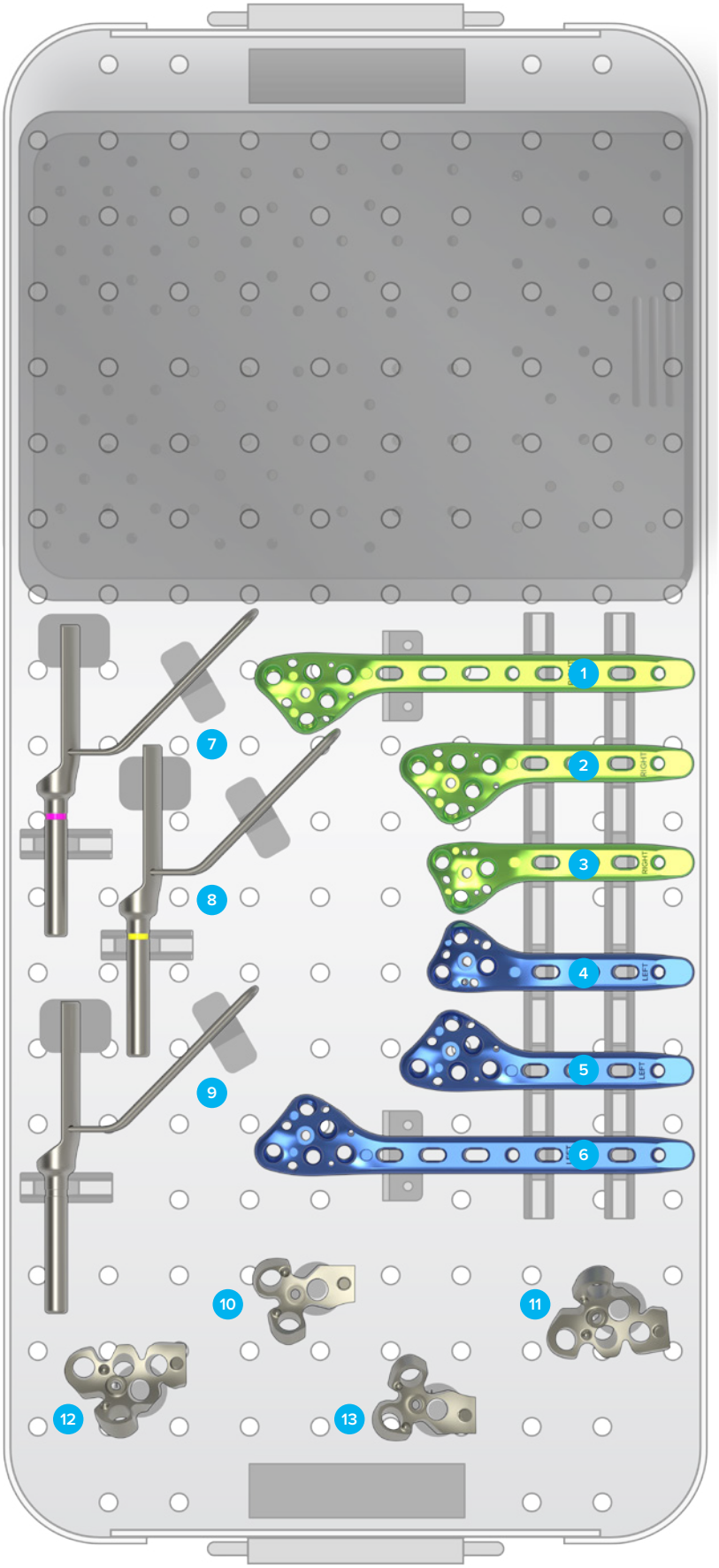
Proximal Humeral Plates

1	Proximal Humeral Plate, Extra Long, Right	PL-PHXGR
2	Proximal Humeral Plate, Large, Right	PL-PHGR
3	Proximal Humeral Plate, Small, Right	PL-PHSR
4	Proximal Humeral Plate, Small, Left	PL-PHSL
5	Proximal Humeral Plate, Large, Left	PL-PHGL
6	Proximal Humeral Plate, Extra Long, Left	PL-PHXGL

These implants are available nonsterile or sterile-packed. Add –S to the product number to designate sterile products. To order, contact your particular authorized Acumed distributor.

Instruments

7	4.6 mm Drill Guide Assembly	MS-DG46
8	4.0 mm Drill Guide Assembly	MS-DG40
9	2.8 mm Drill Guide Assembly	MS-DG28
10	Polarus PHP Targeting Guide, Large, Left	MS-PHGL
11	Polarus PHP Targeting Guide, Small, Left	MS-PHSL
12	Polarus PHP Targeting Guide, Small, Right	MS-PHSR
13	Polarus PHP Targeting Guide, Large, Right	MS-PHGR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2
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12
13

Ordering Information [continued]

Tray Components

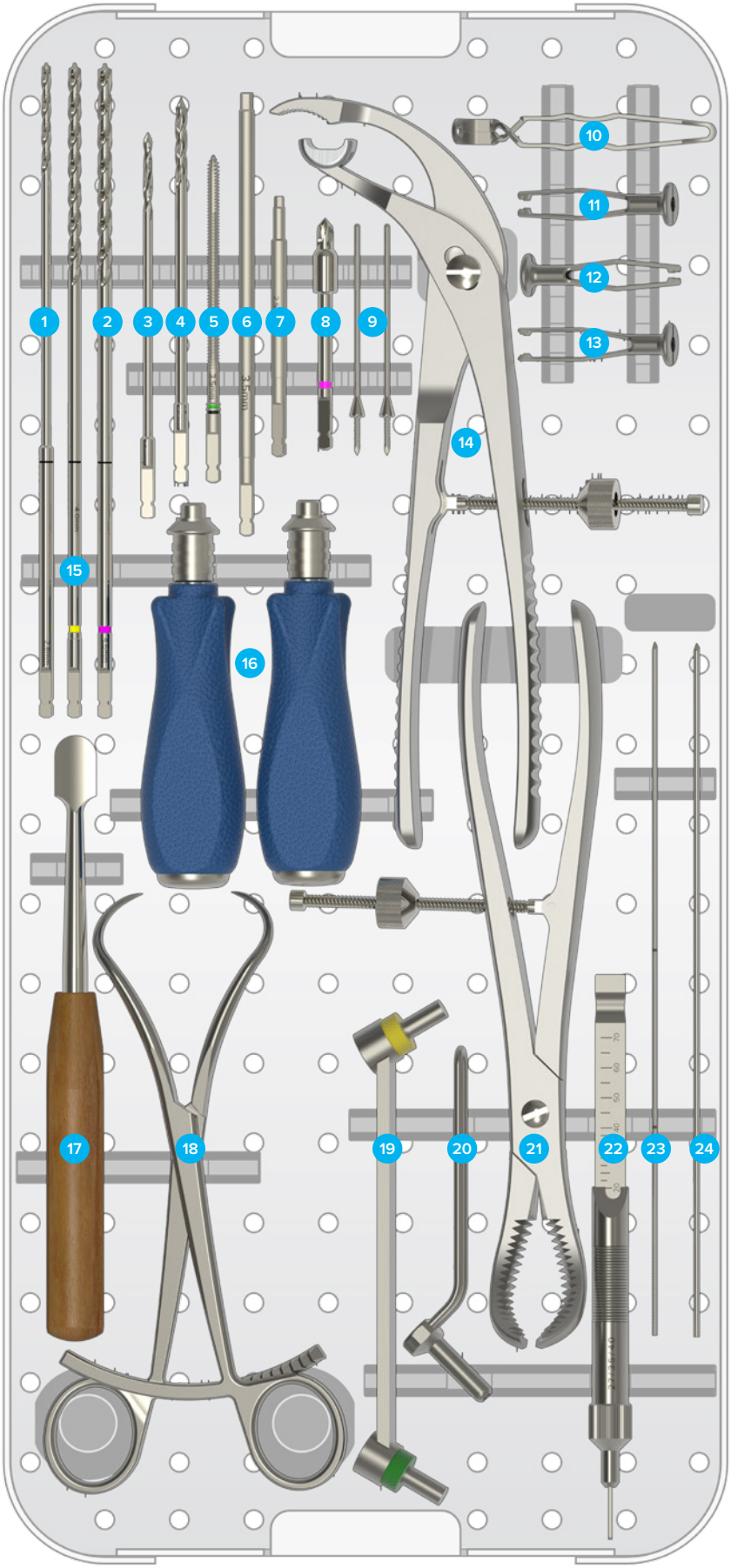
Instruments

1	2.8 mm Cancellous Drill	MS-PH28
2	4.6 mm Cancellous Drill	MS-PH46
3	2.8 mm x 5" Quick Release Drill	MS-DC28
4	3.5 mm x 5" Quick Release Drill	MS-DC35
5	3.5 mm Cortical Screw Bone Tap	MS-LTT35
6	3.5 mm Quick Release Hex Driver	HPC-0035
7	2.5 mm Quick Release Hex Driver	HPC-0025
8	PHB Screw Clearance Drill	MS-PHBCD
9	Plate Tack	PL-PTACK
10	Large Screw Holding Forceps	MS-45210
11	4.5 mm Screw Sleeve	MS-SS46
12	3.5 mm Locking Drill Guide	MS-SS35
13	7.0 mm Screw Driver Sleeve	MS-SS57
14	Verbrugge Clamp	PL-CLVB
15	4.0 mm Cancellous Drill	MS-PH40
16	Medium Ratcheting Driver Handle	80-0663
16	Large Cannulated Quick Release Driver Handle	MS-3200
17	Periosteal Elevator	MS-46213
18	8" Bone Reduction Forceps	MS-1280
19	Offset Drill Guide	PL-2095
20	3.5 mm Tap Sleeve Assembly	PL-2190
21	9" Bone Reduction Spanish Forceps	MS-47107
22	6 mm–70 mm Depth Gauge	MS-9020
23	062" x 9" ST Guide Wire*	WS-1609ST
24	2.0 mm x 9" ST Guide Wire*	WS-2009ST

Additional Instruments

.059 x 5" ST Guide Wire*	WS-1505ST
PHP Targeting Guide Locking Screw	MS-TGLS
3.5 mm Locking Drill Guide	MS-LDG35

* Also used as a K-wire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Ordering Information [continued]

3.5 mm Nonlocking Cortical Screws

3.5 mm x 20.0 mm Cortical Screw	CO-3200	3.5 mm x 35.0 mm Cortical Screw	CO-3350
3.5 mm x 22.5 mm Cortical Screw	CO-3225	3.5 mm x 40.0 mm Cortical Screw	CO-3400
3.5 mm x 25.0 mm Cortical Screw	CO-3250	3.5 mm x 45.0 mm Cortical Screw	CO-3450
3.5 mm x 27.5 mm Cortical Screw	CO-3275	3.5 mm x 50.0 mm Cortical Screw	CO-3500
3.5 mm x 30.0 mm Cortical Screw	CO-3300	3.5 mm x 55.0 mm Cortical Screw	CO-3550
3.5 mm x 32.5 mm Cortical Screw	CO-3325		

3.5 mm Locking Cortical Screws

3.5 mm x 20.0 mm Locking Cortical Screw	COL-3200	3.5 mm x 27.5 mm Locking Cortical Screw	COL-3275
3.5 mm x 22.5 mm Locking Cortical Screw	COL-3225	3.5 mm x 30.0 mm Locking Cortical Screw	COL-3300
3.5 mm x 25.0 mm Locking Cortical Screw	COL-3250		

4.5 mm Locking Buttress Screw

4.5 mm x 25 mm Locking Buttress Screw	CA-PHB25	4.5 mm x 37.5 mm Locking Buttress Screw	CA-PHB375
4.5 mm x 27.5 mm Locking Buttress Screw	CA-PHB275	4.5 mm x 40 mm Locking Buttress Screw	CA-PHB40
4.5 mm x 30 mm Locking Buttress Screw	CA-PHB30	4.5 mm x 45 mm Locking Buttress Screw	CA-PHB45
4.5 mm x 32.5 mm Locking Buttress Screw	CA-PHB325	4.5 mm x 50 mm Locking Buttress Screw	CA-PHB50
4.5 mm x 35 mm Locking Buttress Screw	CA-PHB35	4.5 mm x 55 mm Locking Buttress Screw	CA-PHB55

Ordering Information

5.7 mm Locking Cancellous Screws

5.7 mm x 26 mm Locking Screw	30-0426	5.7 mm x 42 mm Locking Screw	30-0442
5.7 mm x 28 mm Locking Screw	30-0428	5.7 mm x 44 mm Locking Screw	30-0444
5.7 mm x 30 mm Locking Screw	30-0430	5.7 mm x 46 mm Locking Screw	30-0446
5.7 mm x 32 mm Locking Screw	30-0432	5.7 mm x 48 mm Locking Screw	30-0448
5.7 mm x 34 mm Locking Screw	30-0434	5.7 mm x 50 mm Locking Screw	30-0450
5.7 mm x 36 mm Locking Screw	30-0436	5.7 mm x 52 mm Locking Screw	30-0452
5.7 mm x 38 mm Locking Screw	30-0438	5.7 mm x 54 mm Locking Screw	30-0454
5.7 mm x 40 mm Locking Screw	30-0440		

5.0 mm Nonlocking Cancellous Screws

5.0 mm x 25.0 mm Cancellous Screw	HCA-5125	5.0 mm x 37.5 mm Cancellous Screw	HCA-5137
5.0 mm x 27.5 mm Cancellous Screw	HCA-5127	5.0 mm x 40.0 mm Cancellous Screw	HCA-5140
5.0 mm x 30.0 mm Cancellous Screw	HCA-5130	5.0 mm x 45.0 mm Cancellous Screw	HCA-5145
5.0 mm x 32.5 mm Cancellous Screw	HCA-5132	5.0 mm x 50.0 mm Cancellous Screw	HCA-5150
5.0 mm x 35.0 mm Cancellous Screw	HCA-5135	5.0 mm x 55.0 mm Cancellous Screw	HCA-5155

Notes:

Notes:

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