



# Zimmer® Trabecular Metal™ Reverse Shoulder System

Surgical Technique



Evolution Meets Revolution



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Confidence in your hands®



**Trabecular Metal™  
Reverse Shoulder System  
Surgical Technique****Table of Contents**

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## Foreword

Total shoulder replacement has evolved as a biomechanically logical reconstruction of the shoulder. Reconstruction using the humeral component of the *Trabecular Metal* Reverse Shoulder System in conjunction with the *Bigliani/Flatow*® glenoid component allows the potential for the surgeon to restore the geometry of a normal joint, thus ensuring good motion and pain relief, as well as durability of the reconstruction.

When there is severe distortion of osseous anatomy or loss of normal rotator cuff tendon structure, anatomical restoration of the glenohumeral joint is not possible. Patients who have severe loss of rotator cuff function may present with a pseudoparalysis as well as with pain. In such situations, reconstruction in order to restore function is possible using a reverse solution. The *Trabecular Metal* Reverse Shoulder option offers the ability for potential pain relief and restoration of function using the same humeral stem for reverse or hemiarthroplasty applications.

## The Implant System

The assembled humeral component may be used alone for hemiarthroplasty or combined with the glenoid component or reverse components for total shoulder arthroplasty (conventional or reverse applications).

The *Trabecular Metal* humeral and reverse base plate components are intended for either cemented or press-fit use. The reverse base plate requires two screws for initial fixation.

## Patient Positioning

Patient positioning is especially important in shoulder surgery. Place the patient in a semi beach-chair position with the knees flexed (Fig. 1). Raise the head of the table approximately 25-30 degrees to reduce the venous pressure. Use a head rest that allows for the superior part of the table to be removed. Place two towels under the spine and the medial border of the scapula to raise the affected side. The torso should be at the edge of the table. The shoulder will be off the edge of the table. Attach a short arm board to the table, or use another arm support method that will allow the arm to be raised or lowered as necessary throughout the procedure.



Fig. 1

## Incision and Exposure

There are two possible surgical approaches to the shoulder for reverse arthroplasty. The superior-lateral approach relies on a deltoid split similar to a rotator cuff procedure. It allows a more direct view and instrumentation of the glenoid. However, inferior positioning of the glenoid base plate may be more difficult and care to avoid excessive deltoid splitting is essential to minimize risk to the axillary nerve. The delto-pectoral approach will allow easier access to the proximal humerus if there are post-traumatic changes or prior arthroplasty. Additionally, it will allow easier access to the inferior portion of the glenoid.

The choice of approach is the surgeon's preference, but the delto-pectoral approach is typically preferred for revision surgery.

### Superior-Lateral Approach

The incision is made from the anteriolateral acromial border downward approximately 4cm.

Following subcutaneous dissection, the anterior and middle deltoid muscle bundles are separated opposite the lateral margin of the acromion through the tendinous raphe. Care should be taken to avoid any damage to the axillary nerve, which is located approximately 5-7cm distal to the acromion.

After excision of the scarred and inflamed subacromial bursa, gentle longitudinal traction in line with the limb will allow an elevator to be placed into the joint. The humeral head is dislocated by herniating the proximal humerus through the rotator cuff defect. To optimize the exposure, the anterior border and the rest of the superior cuff can be released.

### Delto-Pectoral Approach

Make a skin incision in a straight line starting from the lateral edge of the coracoid as far as the insertion of the deltoid muscle. Seek the cephalic vein between the deltoid muscle and the pectoralis major muscle. The cephalic vein can be taken either medially or laterally to open the delto-pectoral interval. The clavi-pectoral fascia is incised at the external border of the coracobrachialis. The axillary nerve is then identified just medial to the musculotendinous junction of the subscapularis. Often the subdeltoid bursa is inflamed and scarred and must be sharply excised for exposure. The remnant of the subscapularis is released and tagged for potential later repair. The inferior capsule is then released allowing a traumatic dislocation of the humeral head by adduction of the arm with progressive external rotation and extension.

## Description of the Implants

### Trabecular Metal Base Plate

- Small diameter to preserve glenoid bone
- *Trabecular Metal* surface for the potential of improved fixation
  - 28mm diameter *Trabecular Metal* base plate pad
  - 15mm *Trabecular Metal* central peg
- Accepts 2 Inverse/Reverse Screws

### Trabecular Metal Reverse UHMWPE Liner

- 60° Standard Liner
  - 36mm and 40mm
  - 3 thicknesses: +0mm, +3mm, and +6mm
- 65° Retentive Liner
  - 36mm and 40mm
  - 3 thicknesses: +0mm, +3mm, and +6mm

### Trabecular Metal Reverse Glenoid Heads

- 2 diameters: 36mm and 40mm
- Morse taper for secure fixation

### Inverse/Reverse Screw System

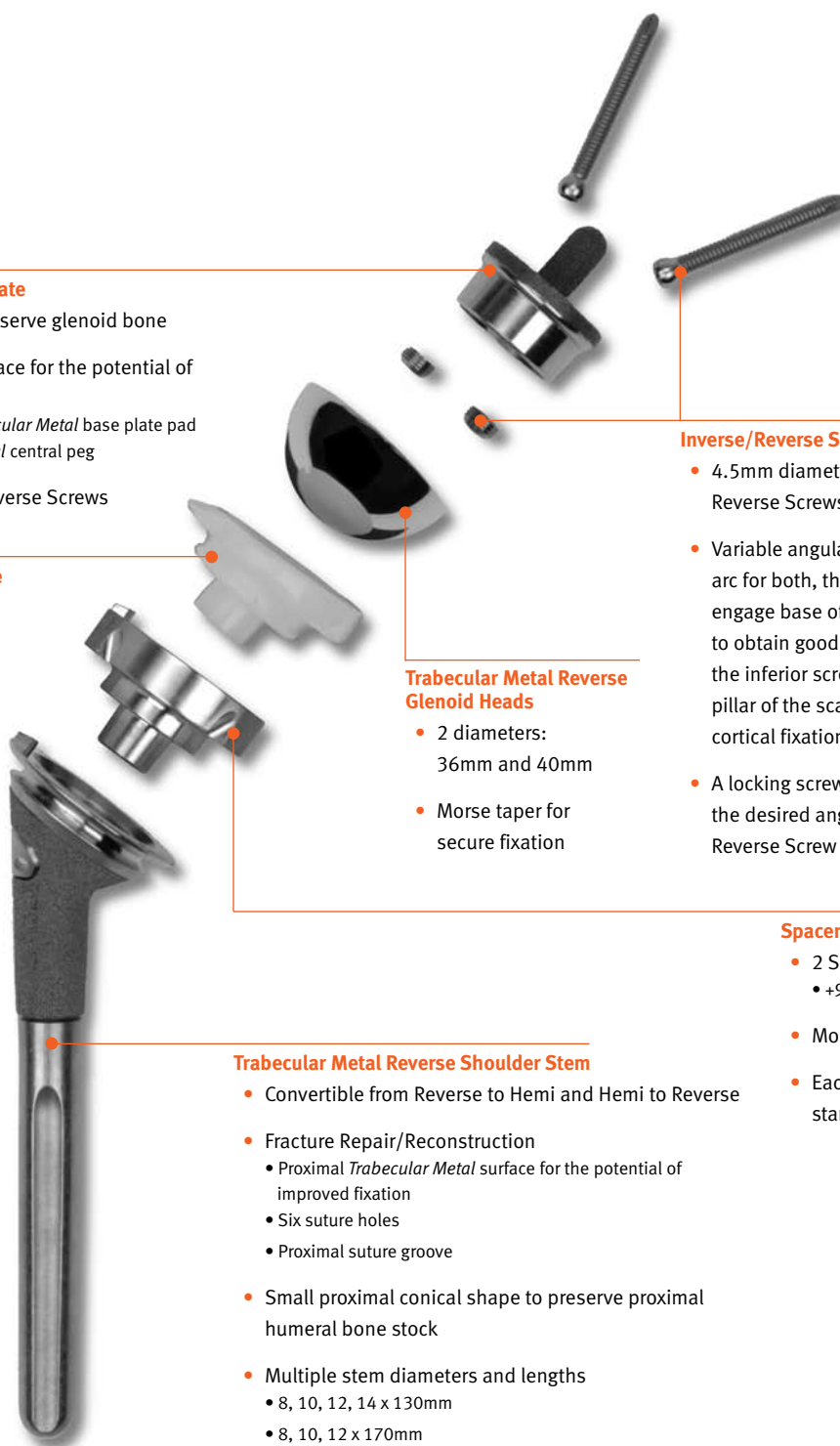
- 4.5mm diameter self-tapping Inverse/Reverse Screws
- Variable angulations to a maximum 30° arc for both, the superior screw in order to engage base of the coracoid process and to obtain good cortical fixation, and also the inferior screw in order to engage the pillar of the scapula to obtain good cortical fixation
- A locking screw cap will fix and secure the desired angle of each Inverse/Reverse Screw

### Spacer (optional)

- 2 Sizes
  - +9mm and +12mm
- Morse taper for secure fixation
- Each size accepts both standard and retentive liners

### Trabecular Metal Reverse Shoulder Stem

- Convertible from Reverse to Hemi and Hemi to Reverse
- Fracture Repair/Reconstruction
  - Proximal *Trabecular Metal* surface for the potential of improved fixation
  - Six suture holes
  - Proximal suture groove
- Small proximal conical shape to preserve proximal humeral bone stock
- Multiple stem diameters and lengths
  - 8, 10, 12, 14 x 130mm
  - 8, 10, 12 x 170mm
- Ability to use cemented and uncemented configurations



## Humeral Preparation

After dislocation of the humeral head, place a retractor medially between the humerus and the glenoid and laterally between the humeral head and deltoid. Release of capsule from the inferior aspect of the humeral neck may be needed to achieve dislocation. Before reaming the canal, it is important to remove all anterior and inferior osteophytes so that the true anatomical neck (junction of the articular cartilage and cortical bone) can be determined.

**Technique Tip:** To facilitate access to the humeral canal, the shoulder should be off the table to allow complete extension of the arm and straight access down the canal.

**Note:** In addition to the *Trabecular Metal Reverse* specific instrumentation, the *Bigliani/Flatow Shoulder System* and *Trabecular Metal Humeral Stem* instrumentation is also used in this technique.

## Sizing Information

Humeral stems are offered in 8, 10, 12 and 14mm distal diameters in 130mm lengths and in 8, 10 and 12mm distal diameters in 170mm lengths. Line to line distal implant fit can only be achieved with the 8, 10, 12 and 14mm distal reamers. If cementing, larger size distal reamers can be used to provide the desired cement mantle size. However, proximal press fit may still be possible depending on the proximal humeral size and preparation as well as the amount of cement used.

## Distal Humeral Preparation

Attach a short 6mm *Bigliani/Flatow* Intramedullary Reamer with a trocar point to the Ratchet T-Handle (Fig. 2). There are three positions marked on the collar of the T-Handle: FORWARD, LOCKED and REVERSE. To ream a starter hole, use the FORWARD position (Fig. 3). Place the trocar tip of the reamer just posterior to the bicipital groove and at the most superior point of the humeral head to allow straight reaming down the canal. Be careful the absence of the normal cuff insertion on the tuberosity does not mislead you into a lateral starting point. A mallet may be used to start the hole in hard bone. Attach the T-handle to the 8mm short trocar reamer and then the longer, blunt tipped 8mm Intramedullary Tapered Reamer and begin manually reaming the humeral canal (Fig. 4). The longer reamers have a blunt tip to help guide them down the canal and prevent obstruction into cortical bone. Use progressively larger reamers in one (1)mm increments until resistance is felt from cortical contact in the canal.

**Note:** The size of your distal reamer will influence your distal fit. Distal implant line to line contact can only be achieved when the last reamer size used was an even size diameter (8, 10, 12 and 14mm).

Continue reaming to the appropriate depth (either 130mm or 170mm) as indicated on the reamer shaft (Fig. 5). The lines on the reamer shaft correspond to the length of the stem. Remove the T-handle, but leave the last reamer in the canal to interface with the Humeral Head Cutting Guide or the Superior Cut Guide.

**Note:** This reamer will be reinserted after humeral head resection to ensure proper depth.

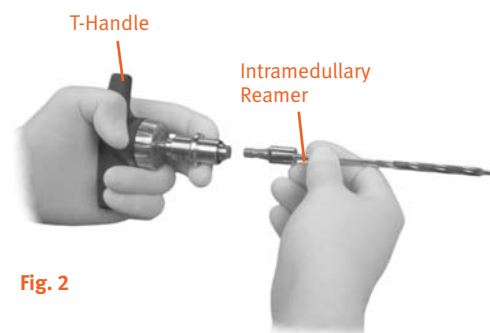


Fig. 2



Fig. 3



Fig. 4



Fig. 5

### Visualizing Humeral Resection Angle

Use the *Trabecular Metal Reverse 53° Silhouette* (Fig. 6) to aid in the visual assessment of the humeral resection angle.

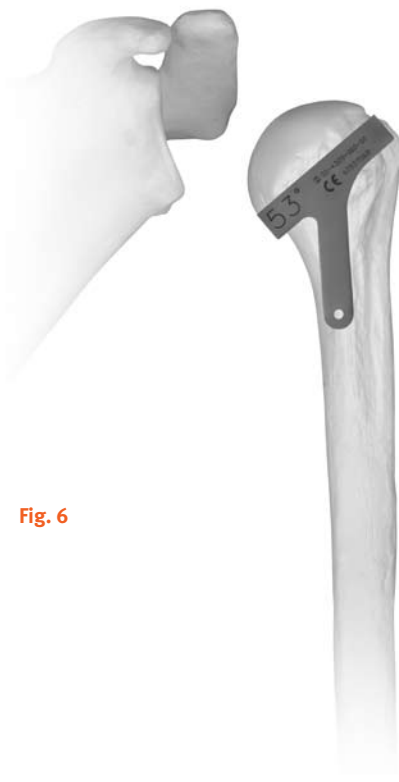


Fig. 6

### Resect Humeral Head

Assemble the Standard *Trabecular Metal Reverse Cutting Guide* for either a left or right configuration. See “Assembling the *Trabecular Metal Reverse Humeral Cutting Guide*”

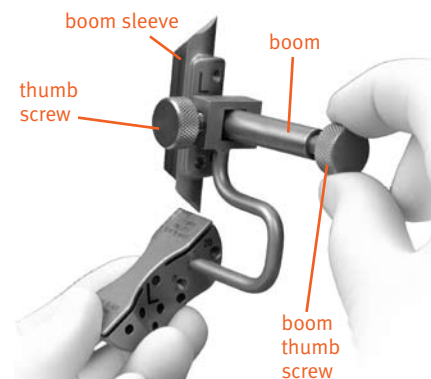
### Assembling the Trabecular Metal Reverse Humeral Cutting Guide

Select the cutting block side for the right or left humerus by referencing the R or L markings. With the thumb screw at the end of the boom pointed toward you, observe the various “R” and “L” etchings that indicate a right or left configuration. Push the cutting guide onto the boom sleeve (Step A). All of the etchings that are facing you now should be the same, either “R” or “L”.

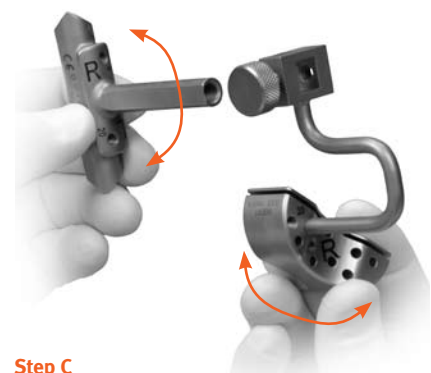


Step A

To change the right/left orientation, remove the thumb screw at the end of the boom (Step B). Then loosen the second thumb screw on the box at the top of the boom stem. Slide the boom stem off the end of the boom. Rotate the sleeve (top to bottom) and turn the cutting guide so that the other side is facing forward. Reinsert the sleeve on the boom and push the cutting guide onto the sleeve (Step C).



Step B



Step C

Retighten the thumb screw on the box at the top of the boom stem. Then reinsert and tighten the thumb screw at the end of the boom. Finally, verify that all the appropriate right or left etch marks are visible when the boom thumb screw is facing you (Step D).



Step D



Slide the boom sleeve over the reamer shaft (Fig. 7). Adjust the depth of cut by moving the sleeve up or down on the reamer shaft. Typically, the tip of the boom sleeve should be touching articular cartilage/bone surface. If the cut appears too low, the cutting guide can be moved to the correct height. Assessment of the level of the cut can be aided by use of the Humeral Head Cutting Guide Fingers to ensure that any remaining posterior rotator cuff is not inadvertently released by an excessive cut. Then, tighten the boom thumb screw, which is located on the end of the boom. Advance the boom stem and cutting block along the boom until the block contacts the bone. Tighten the second thumb screw, which is located at the junction of the boom and boom stem.

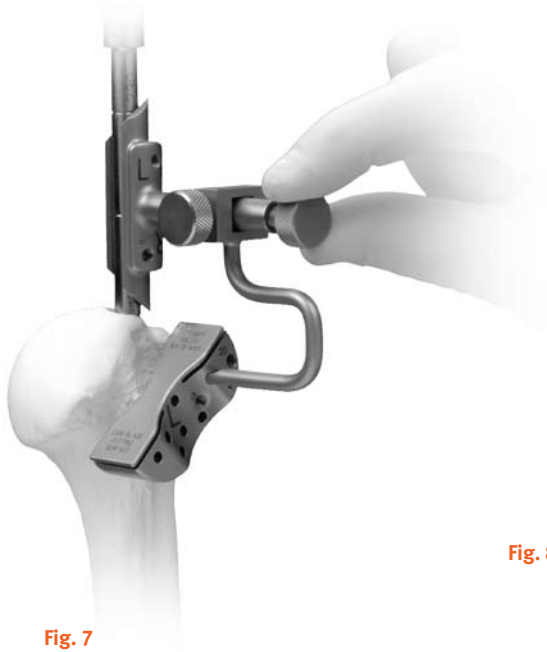


Fig. 7

To gauge the retroversion of the cut, insert Threaded Alignment Rods into the holes marked 0 degrees and 20 degrees on the boom sleeve. Optional placement for the threaded alignment rods can be found on the cutting block. Then line up the rods with the forearm to assess the retroversion (Fig. 8). Retroversion can be adjusted by loosening both thumb screws and rotating the cutting guide about the axis of the Intramedullary Reamer. Then retighten the thumb screws.



Fig. 8

Assemble and drive a 3.2mm Threaded Pin or a disposable 48mm Headed Screw through the cutting block into the humerus (Figs. 9 & 10). At least 2 pins are required to stabilize the cutting block. If the cortex is very hard, predrill these holes using a drill with a diameter between 2.0mm and 2.7mm.



Fig. 9

**Note:** Use caution not to drill through the threaded version holes on the cutting block, as they are very close in proximity to the pin holes.

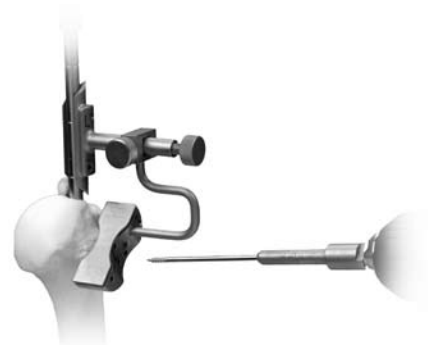


Fig. 10



Loosen both thumb screws on the guide and remove the boom, leaving the cutting block in place (Fig. 11). Set the T-handle to the **REVERSE** position. Attach the T-handle to the reamer and remove the reamer from the humeral canal. The Threaded Alignment Rods may be removed prior to making the cut. Use an oscillating saw to resect the humeral head (Fig. 12). Then remove the cutting block.

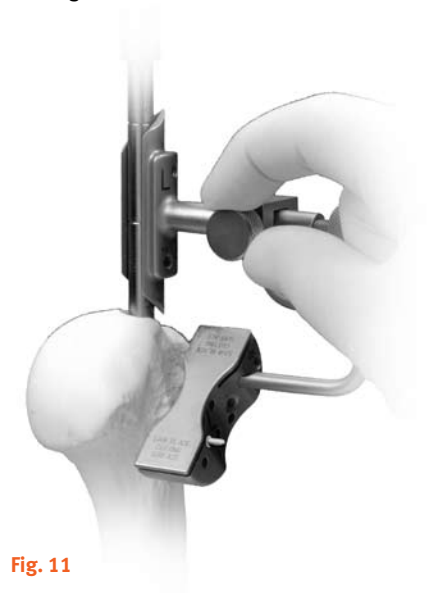


Fig. 11



Fig. 12

### Superior Cut Guide Assembly and Usage

An alternative approach to humeral head resection is to use the Superior Cut Guide. To use this guide, take the boom sleeve and orient it for the right or left humerus by rotating it so that either the R is up for a right humerus or the L is up for a left humerus. (Fig. 13) Next, take the boom thumb screw (Fig. 14) and screw it down through both openings until bottomed out.

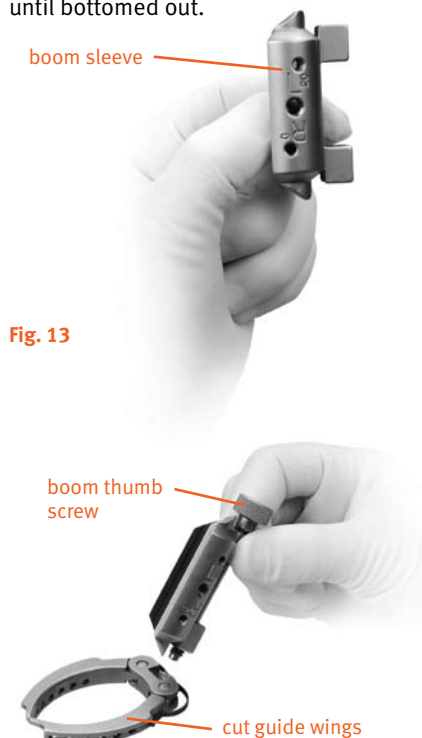


Fig. 13

Fig. 14

To engage the cut guide wings, place the cut guide wings on a flat surface and position the boom sleeve so that the inferior point of the boom sleeve is within the inner circle of the cut guide wings (Fig. 15). Next, take the boom thumb screw and engage the threads on the lateral edge of the cut guide wings (Fig. 15). The boom thumb screw should completely engage the cut guide wings. Screw downward until completely tight.



Fig. 15

Take the assembled construct and slide it over the reamer shaft with the cut guide wings wrapped around the proximal humerus (Fig. 16). Adjust the depth of cut by moving the sleeve up or down on the reamer shaft. Typically, the tip of the boom sleeve should be touching articular cartilage/bone surface. If the cut appears too low, the cut guide wings can be moved to the correct height. Once the appropriate height is determined, tighten the thumb screw to hold the boom sleeve and cut guide wings in place (Fig. 17).

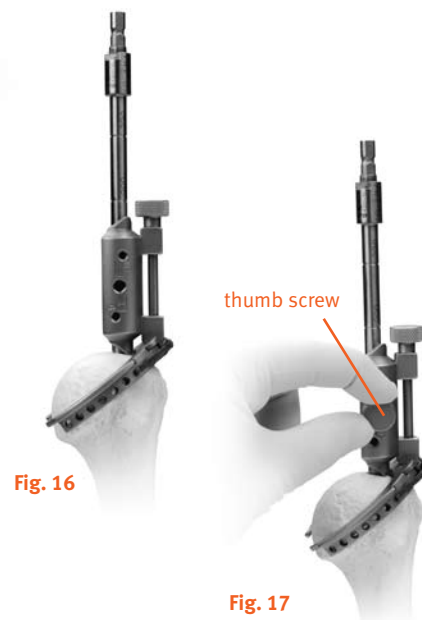


Fig. 16

Fig. 17

To gauge the retroversion of the cut, insert Threaded Alignment Rods into the holes marked 0 degrees and 20 degrees on the boom sleeve. Line up the rods with the forearm to assess the retroversion (Fig. 18). If necessary, retroversion can be adjusted by loosening the thumb screw and rotating the boom sleeve about the axis of the Intramedullary Reamer. Then retighten the thumb screw. The point of the sleeve points to the bicipital groove.



Fig. 18

Assemble and drive a 3.2mm Threaded Pin or a disposable 48mm Headed Screw, through the cut guide wings into the humerus (Fig. 19). At least 2 pins are required to stabilize the cut guide wings. If the cortex is very hard, pre-drill these holes using a drill with a diameter between 2.0mm and 2.7mm. **Insert the pins so that they are parallel with the hole in which they are inserted.** Once the cut guide wings are fixed, loosen both the boom thumb screw from the cut guide wings and the thumb screw on the middle of the boom sleeve. Remove the boom sleeve from the reamer shaft and leave the cut wings in place (Fig. 20). Set the T-handle to the **REVERSE** position, attach it to the reamer, and begin removing the reamer from the humeral canal. After using an oscillating saw to resect the humeral head (Fig. 21) you can then remove the cut wings from the proximal humerus.



Fig. 19



Fig. 20

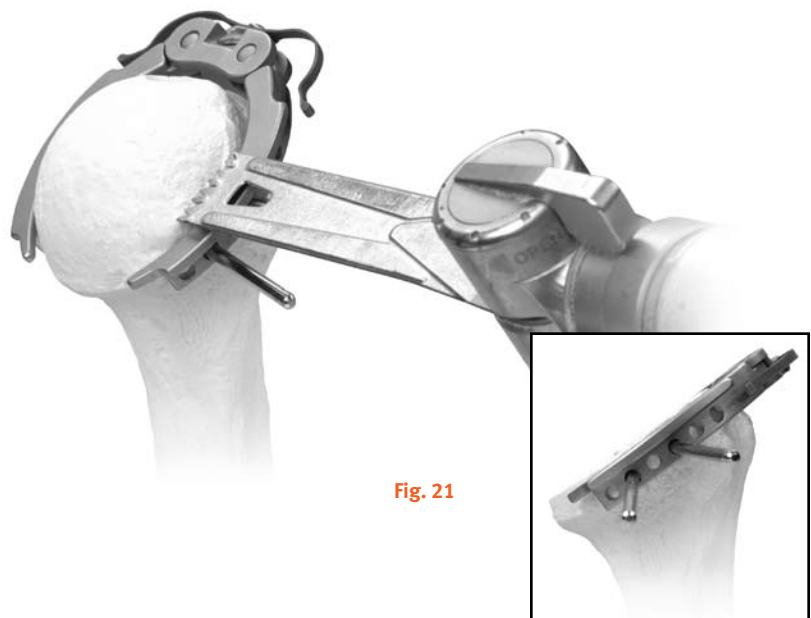


Fig. 21

## Proximal Humeral Preparation

Reaming of the humeral canal is done in three stages. First re-ream the canal with the last long blunt tipped reamer to ensure satisfactory depth of diaphyseal reaming. Then select the appropriate Tapered *Trabecular Metal* Proximal Humeral Reamer, which are matched to the implant size.

**Note: Implant sizes are 8, 10, 12, and 14mm in the 130mm length, and are also available in 8, 10, and 12mm in the 170mm length.**

Attach the Distal Pilot matching the reamed humeral canal to the Tapered *Trabecular Metal* Proximal Reamer. The Distal Pilot should spin freely. Ream the proximal humerus until the reamer is flush with the proximal-lateral edge of the canal opening (Figs. 22 & 23).



Fig. 22

Fig. 23

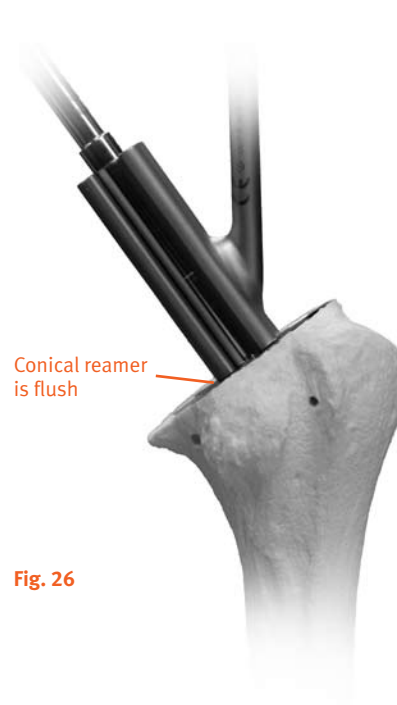
Thirdly, assemble the Conical Reamer to the Reamer Body Pilot which matches the *Trabecular Metal* Humeral Proximal Reamer last used (Fig. 24). Assemble the T-Handle onto the assembly and insert the assembly into the preparation. Place the Version Control Handle onto the shaft of the Conical Reamer (Fig. 25). The Alignment Rods may be threaded into the holes of the Version Control Handle. The version control handle should be held parallel to the humeral shaft, allowing accurate use of the alignment rods and control of the conical reamer.



Fig. 24

Fig. 25

For a reverse application the assembly would typically be inserted with 0 to 20 degrees of retroversion. For hemi or total shoulder arthroplasty, the assembly would typically be inserted more towards 20 degrees of retroversion. The Version Control Guide Handle can also be referenced as 0 degrees of version. Ream the proximal humerus until the Conical Reamer is flush with the proximal-lateral edge of the canal opening (Fig. 26) (typically at the rotator cuff insertion). Remove the Conical Reamer assembly.



Conical reamer is flush

Fig. 26

version control handle is flush with conical reamer

### Humeral Provisional Stem Assembly Insertion

Attach the appropriate Distal Trial Pilot to the appropriate sized Proximal Trial (Fig. 27). The appropriate size is matched to the last Proximal and Intramedullary Reamer used (assuming press fit). If cementing distally, the Intramedullary reamer can be larger than the distal stem and the larger Distal Trial/Pilot should be used.

**Note:** It is important that the Proximal Trial be sized to the last Proximal Reamer used to ensure an appropriate height of the implant in the bone (Fig. 27).



Fig. 27

Attach the Humeral Stem Inserter/Extractor to the trial assembly by opening the handle all the way, inserting the Inserter/Remover end into the proximal opening in the assembly, and closing the handle to lock the inserter in place (Fig. 28).

**Note:** The Inserter has a cut out that align with the small post on the proximal lateral face of the trial to orient your rotational position (Fig. 29).

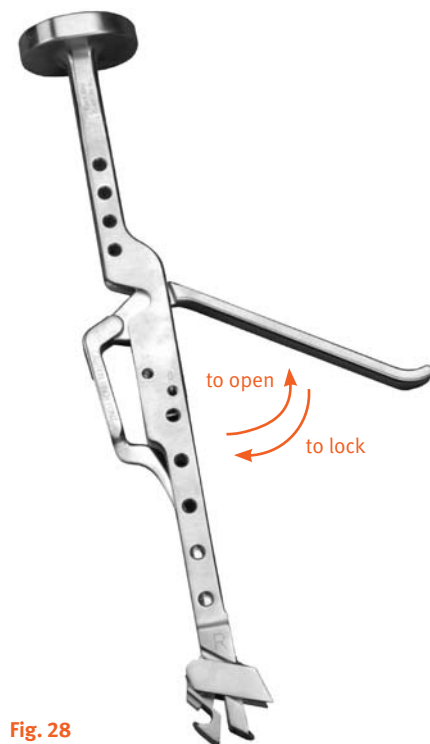


Fig. 28

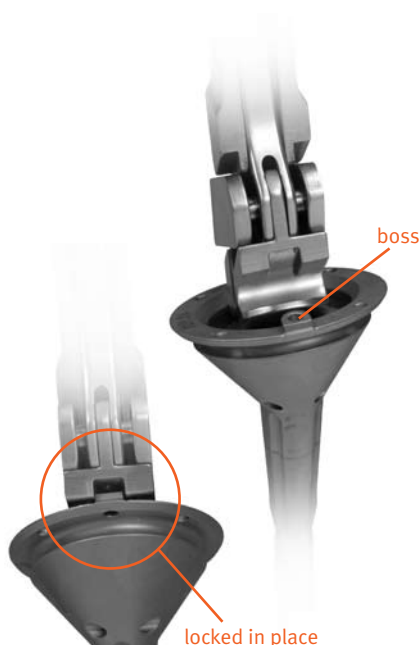


Fig. 29

There are 0 and 20 degree holes on the Inserter/Extractor to allow for verification of the stem retroversion using the Threaded Alignment Rods, if desired. The Alignment Rods may be removed prior to impacting the trial assembly. Impact the assembly into the canal until the rim is flush with the cut surface (Fig. 30).

**Note:** While inserting the stem, care should be taken not to rotate the stem.

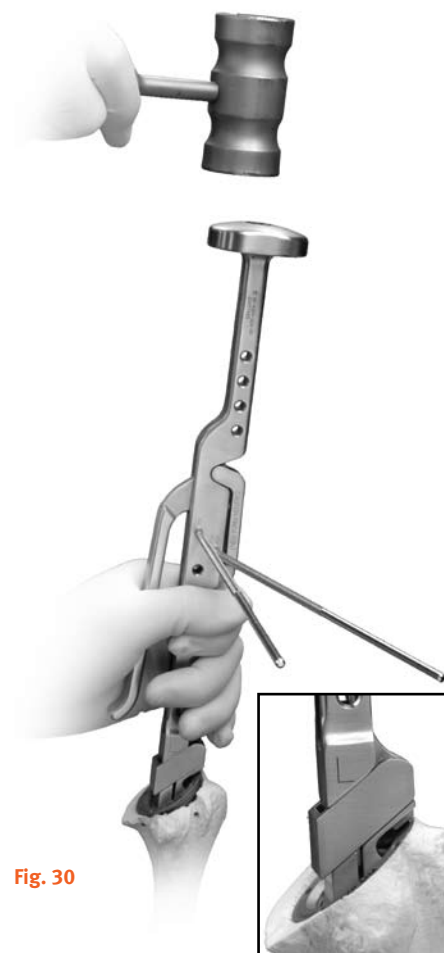


Fig. 30

The Dual Taper Trial may now be placed on top of the stem (Fig. 31). For a reverse application it will protect the taper during the remaining preparation. For a hemi or total application it will accept the trial humeral head and be used for a trial reduction.



Fig. 31

For a reverse application, continue on to the next section (Glenoid Preparation).

**For a hemi or total application, skip ahead to the Hemi-Arthroplasty / Total-Arthroplasty Section (see page 22).**

## Glenoid Preparation

Straight-on exposure of the glenoid is necessary for proper reaming and component insertion. If the Superior-lateral approach was utilized, a forked retractor or the *Zimmer Shoulder Shoehorn Retractor* (Fig. 32) can be placed inferiorly on the glenoid to retract the humeral head out of the way. If exposure is limited, re-evaluate the level of the humeral cut.

If the delto-pectoral approach was chosen, the proximal humerus is retracted posteriorly and inferiorly. Again if exposure is limited, re-check the humeral osteotomy level and ensure inferior capsular releases were thorough. Both approaches require circumferential exposure of the glenoid with labral excision. Inferiorly, the glenoid must be exposed to allow palpation of the inferior glenoid pillar and inferior positioning of the glenoid base plate.

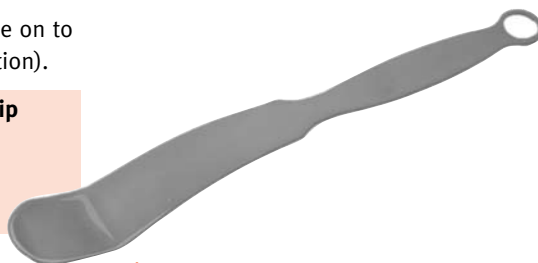


Fig. 32

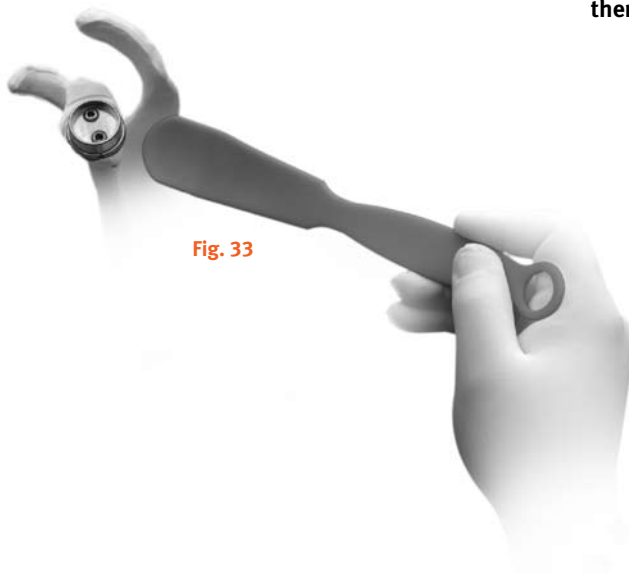


Fig. 33

**Note:** While preparing the glenoid, the placement of the proximal humerus and provisional along with retractors should be carefully considered. Their positions may allow for interference with glenosphere seating. Exposure should allow for straight on engagement of the glenosphere on the base plate taper. Consider use of the *Zimmer Shoulder Shoehorn Retractor* as it has been designed to aid in retracting the humeral head and other soft tissue when placed on the posterior side of the glenoid (Fig. 33).

**NOTE:** The *Anatomical Shoulder™ Inverse/Reverse System* glenoid component assembly (i.e. base plate and glenosphere) is compatible with the *Zimmer Trabecular Metal Reverse Shoulder System* humeral stem poly liner. Please refer to Appendix A at the end of this document for this alternate glenoid preparation and implant fixation.

If the complete surgical technique is desired, please refer to the following documents and/or websites:

### Paper Copy:

*Anatomical Shoulder™ Inverse/Reverse System* (item number: 97-4223-002-00)

### Online Copy:

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

Please select Medical Professional and then select surgical techniques.

If desired, the Glenoid Scraper can be used to clean the glenoid face of any remaining articular cartilage or scar tissue. Assemble the Base Plate Drill Guide 1 by placing the face into the handle so that the two pieces mate and rotate into position (Fig. 34). Evaluate positioning of the base plate by placing the Base Plate Drill Guide 1 on the glenoid face. The outer rim of Drill Guide 1 is the same diameter as the base plate. The outer rim can be rotated relative to the handle to check coverage of the anterior, inferior and posterior edges of the glenoid. The drill guide should be placed so that the outer rim aligns with the inferior rim of the glenoid and is centered in the anterior/posterior direction (Fig. 35). This will place the glenosphere at the edge of the inferior glenoid bone.



Fig. 35

**Note: Inferior placement of the glenosphere is critical and will help reduce the possibility of scapular impingement and notching.**

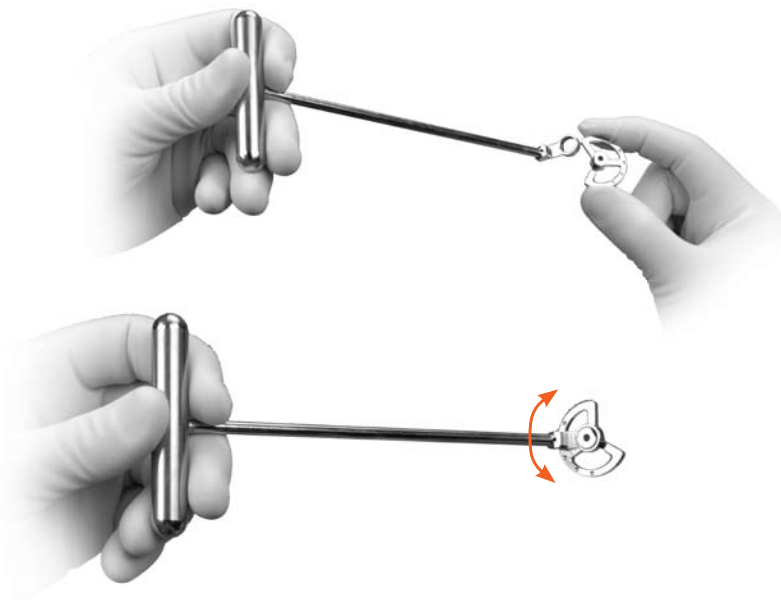


Fig. 34

Load the 2.5mm Pin into a K-wire driver or Jacobs chuck. The 2.5mm Pin is marked for the appropriate insertion depth (Fig. 36). Insert the 2.5mm Pin through Drill Guide 1 until the depth mark indicated on the pin meets the top of Drill Guide 1 (Fig. 37). Release the Pin from the K-wire driver or Jacobs chuck, and lift Drill Guide 1 from the glenoid leaving the 2.5mm pin in place.

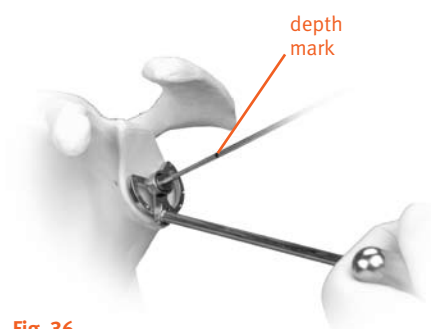


Fig. 36



Fig. 37



The 6mm Cannulated Drill is now used to create a pilot hole for the glenoid reamers. It is attached to the Cannulated Straight Driver by sliding the Driver tabs into rounded slots of the 6mm Cannulated Drill. Turn the Cannulated Straight Driver to retain the 6mm Cannulated Drill. Place the Cannulated Drill assembly over the 2.5mm Pin and drill until the housing collar is flush to the glenoid face (Fig. 38). The 6mm Cannulated Drill and the 2.5mm pin are now removed.

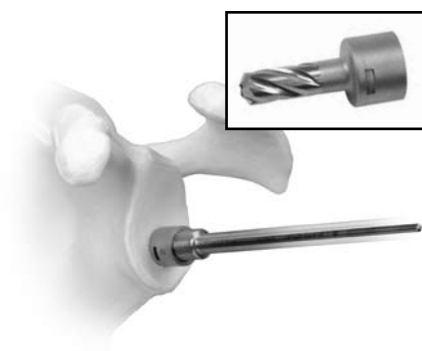


Fig. 38

Attach Base Plate Reamer 1 to the Cannulated Straight Driver assembly and **hand** ream to prepare the glenoid surface for the back of the base plate. This is a sharp reamer and power reaming may remove excessive bone. Ream until the reamer face is completely flush with the prepared surface and the subchondral bone is exposed inferiorly (Figs. 39 & 40).

**Note: If necessary, remove any remaining prominent glenoid bone.**



Fig. 39



Fig. 40

Attach either the 36mm or the 40mm Base Plate Reamer 2 to the Cannulated Straight Driver assembly (Fig. 41). Ream until the spokes are flush to the previously reamed face. The outer cutting teeth of Base Plate Reamer 2 will ream the surrounding bone to provide clearance for the glenosphere head. Once the base plate implant is in place, surface reaming is not possible.



Fig. 41

**Note: This step is necessary to ensure the glenosphere head will lock on the Glenosphere Base Plate properly. All reasonable efforts should be made to use the appropriate Base Plate Reamer 2. The size of base plate reamer corresponds to the glenosphere head to be used.**

The base plate post hole must now be prepared. The system provides three tools, a 7.5mm Drill, a 7.5mm Cortex Drill and a 7.5mm Compression plug, to aid in post hole preparation based on bone quality and surgeon preference (Fig. 45). All three are used through the Base Plate Drill Guide 2 which is placed in the cavity created by the last Base Plate Reamer used.



Fig. 45



**Poor Bone Stock:**

When poor bone stock exists, use the 7.5mm Cortex Drill (Fig. 46) to remove only the first 3 to 4mm of glenoid cortex. If a press fit of the distal end of the Glenosphere Base Plate post is desired, then the preparation is complete. If it is deemed appropriate to compress more bone, use the 7.5mm Compression Plug to compress the cancellous bone in the vault prior to implant insertion.

**Note: The Compression Plug should not be used unless the 7.5mm Cortex Drill is first used. Otherwise there may be a risk of fracture.**



Fig. 46

**Good Bone Stock:**

Only if there is good hard bone, use the 7.5mm Drill to ream bone for the full depth of the post of the base plate (Fig. 47).



Fig. 47

**Note: A small drill can be used to sound for confirming good bone quality. Drill Guide 2 has two reference marks to help aid in the superior/inferior placement of the Inverse/Reverse Screws. You may choose to make anatomical marks for the placement of the Inverse/Reverse Screws.**

**Base Plate Insertion**

Before glenoid component insertion, carefully note and mark the inferior glenoid pillar. Place the Base Plate implant on the Base Plate Inserter and insert it into the preparation (Figs. 48 & 49). Achieve proper orientation by aligning the grooves on the base plate to the previously placed marks or anatomic reference points for placement of inferior and superior screws. The Base Plate is inserted by striking the Base Plate Inserter until the component is completely flush with the prepared surface (Fig. 50). Care should be taken to avoid tipping the Base Plate during insertion thus preventing circumferential contact.



Fig. 48



Fig. 49



Fig. 50

**Screw Insertion**

The 2.5mm Drill Guide is inserted into the screw holes and oriented to prepare for screw insertion (Fig. 51). The inferior screw should be oriented toward the inferior border of the scapula down the previously identified glenoid pillar. The superior screw should be oriented along the superior border of the scapula toward the coracoid.

**Note: Do not aim the drill towards the central Trabecular Metal post.**

Attach the 2.5mm drill to power and drill the screw holes through the 2.5mm drill guide and base plate at the desired orientation (Fig. 52). The 2.5mm drill has lines corresponding to the screw lengths available.



Fig. 51

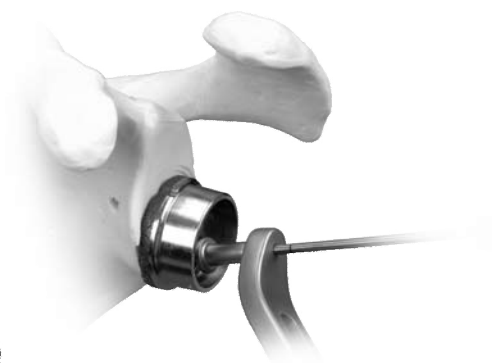


Fig. 52

Remove the drill and the drill guide. Assemble the Depth Gauge and insert into the screw holes to aid in selecting the proper screw length (Figs. 53 & 54).

**Note: Screws are available in 18-48mm lengths.**



Fig. 53



Fig. 54

Inverse/Reverse Screws are adjustable within a possible 30° arc (Fig. 55) and thus can readily be angled to achieve good bone purchase. The screws are inserted through the inferior and superior screw holes with the Hexagonal Screw Driver, making sure good bone purchase is achieved (Fig. 56). If good bone purchase is not achieved, the screws should be removed and prepared at a new angle. The screws are then converted to a fixed angle by placing the locking screw caps on the Inverse/Reverse screws using the Inverse/Reverse Torque Wrench and Locking Screw Holder.

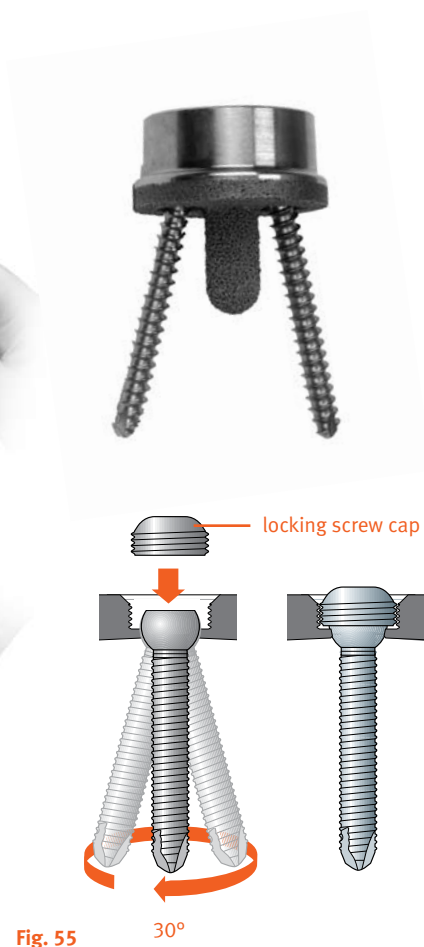


Fig. 55

30°

Fig. 56



To do this, the locking screws are placed onto the tip of the Inverse/Reverse Torque Wrench and the Locking Screw Holder is gently slid over the locking screws to secure them (Fig. 57). The locking screws are placed over the heads of the Inverse/Reverse Screws and the Locking Screw Holder is slid back (Fig. 58). Turn the locking screws in place until the Torque Wrench slips or an audible click is heard.

**Note: The locking screws only engage in one orientation. The wider opening (Fig. 59) must be pointing toward the screw. Additionally to avoid mis-threading, the screwdriver shaft should be perpendicular to the base plate to properly screw down the locking screw. Failure to slide back the Locking Screw Holder can block locking screw insertion.**



Fig. 57



Fig. 58



Fig. 59

### Base plate Removal

Should the Base Plate ever need to be removed, the Locking Screws and Inverse/Reverse Screws are removed by utilizing the Hexagonal Screwdriver (Fig. 60). If removal is intraoperative, the Base Plate can be removed by levering with osteotome. If removal is postoperative, standard osteotomes are first used to disassociate as much of the bone ingrowth area as possible from the implant. Each bolt of the Base Plate Remover is threaded into the Base Plate using the Hexagonal Screwdriver. This is done by moving the barrel over to one side, threading one bolt into a screw hole in the base plate, then moving the barrel to the other side and inserting the second bolt into the other screw hole (Fig. 61). Thread down the bolts until the instrument is securely attached.

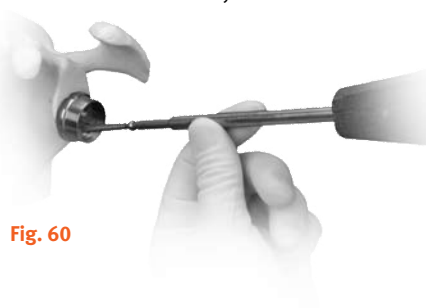


Fig. 60



Fig. 61

A Standard Slaphammer should be screwed into the body of the Base Plate Remover (Fig. 62). Repeatedly impact until the Base Plate has been removed.



Fig. 62

### Component Selection and Trial Reduction

Utilize the Liner and Glenosphere Trials to evaluate range of motion and joint retention. There are two angle options for the Trial Liners: Standard (Fig. 63a) and 65° Retentive (Fig. 63b). Each trial liner option is available in both 36mm and 40mm diameters and each is offered in 3 different thicknesses: +0mm, +3mm, and +6mm. The use of the Standard Liner Trial makes the implant neck angle 60° while the Retentive Liner Trial increases the implant neck angle to 65°. The Standard Liner Trial is typically used; however, if more stability is necessary, the Retentive Liner Trial may be used. Trial Spacers are available in +9mm and +12mm sizes thus providing size combinations ranging from +0mm to +18mm.

#### Green (36mm)



#### Yellow (40mm)



Fig. 63a Standard Liner Trials (60°)

#### Blue (36mm)



#### Orange (40mm)



Fig. 63b Retentive Trials (65°)

**Note:** The Trial Liners can also be used on the actual stem if you prefer to make this determination off of the final stem position and with the actual glenosphere head.

**Note:** The suture holes exist on the Proximal Trial to help visualize where they will be during final implantation. If desired, these locations can be marked to facilitate trial placement.

If not placed previously, attach a Trial Glenosphere Head to the Base Plate by hand or with the Glenosphere Helmet (Fig. 64). If used, remove the Dual Taper Trial from the proximal humerus and place a Poly Trial Liner on the humerus (Fig. 65). To aid in determining proper soft tissue clearance around the base plate, use the windows in the trial glenosphere to visually confirm that the trial glenosphere is fully seated onto the base plate. If desired, rotate the trial glenosphere, using the scalloped bottom to determine if any bone or other soft tissue would impede a full seating of the final glenosphere implant. Reduce the joint and perform a range of motion assessment (Fig. 66). The joint should be stable throughout the range of motion. If the construct dislocates, varying thickness Trial Liners and/or Trial Spacers should be used to obtain the proper joint stability (Fig. 67). Trial Glenospheres are available in either 36 or 40mm diameters.



Fig. 64

**Note:** The 36mm is typically used while the 40mm is used in larger patients to provide additional stability if needed, or to avoid bone impingement due to bone overhang.

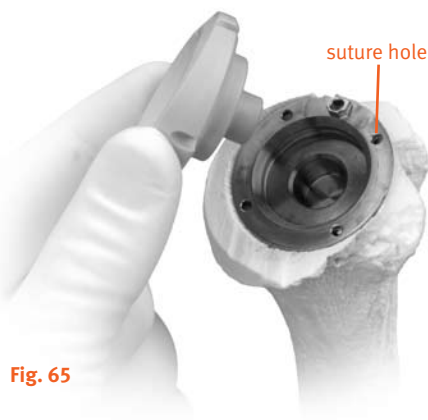


Fig. 65

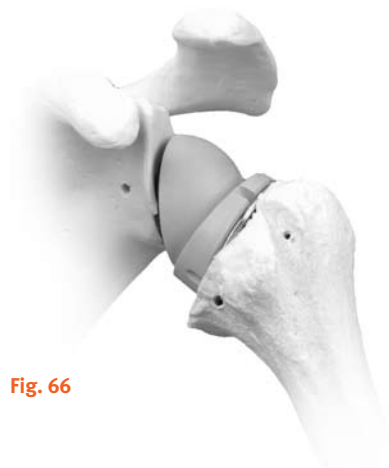


Fig. 66

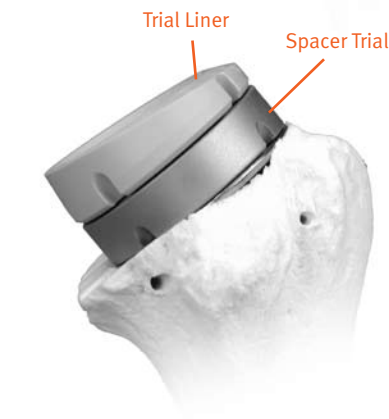


Fig. 67

### Provisional Removal

Remove the Glenosphere Trial, Poly Liner Trial and Spacer Trial (if used), attach the Humeral Stem Inserter/Extractor to the Stem Trial. Apply the Slaphammer Weight to the Humeral Stem Inserter/Extractor and repeatedly impact until the Stem Trial is removed from the canal (Fig. 68).



Fig. 68

**Note:** If desired, a retaining bolt may be threaded through the handle into the body of the Inserter/Extractor to prevent the handle from opening while applying the slaphammer weight.

## Implant Insertion

### Glenosphere Assembly

The glenosphere is typically inserted prior to humeral component final seating to maximize exposure of the glenoid and ease of insertion. Ensure all soft tissue is removed around the base plate to allow the glenosphere to completely seat.

Assemble the Glenosphere Helmet Insert by threading the dual taper/spacer impactor into either the 36mm (green) or the 40mm (yellow) glenosphere helmet (Fig. 69). Insert the appropriate diameter glenosphere into the helmet by sliding it into the helmet so that the glenosphere is held in place by the body of the helmet and the tabs rest securely underneath the glenosphere (Figs. 70 & 71). Wipe the Base Plate taper clean of all fluids. Place the *Zimmer* Shoulder Shoehorn Retractor on the posterior side of the glenoid to aid in retracting the humerus and other soft tissue (Fig. 72). When approaching the base plate, a finger can be placed on top of the glenosphere to help guide and feel the glenosphere slide over the taper into position. **Note: While engaging the glenosphere, it is important to monitor the position of the proximal humerus and provisional along with retractors since they could interfere with glenosphere placement.** Once the glenosphere is seated evenly and circumferentially, use your free hand to press firmly on the glenosphere to secure it to the base plate. Keeping a finger on the glenosphere, remove the Glenosphere Helmet pulling the instrument away in the SAME DIRECTION used to insert the glenosphere (i.e. If an anterior approach was used to insert the glenosphere, remove the instrument by pulling it from the anterior direction). This will help minimize changes to the glenosphere placement on the base plate and damage to the glenosphere helmet itself.

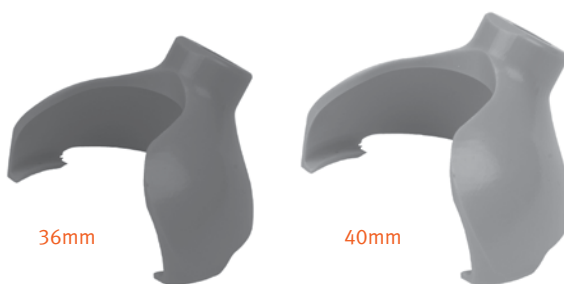


Fig. 69



Fig. 70

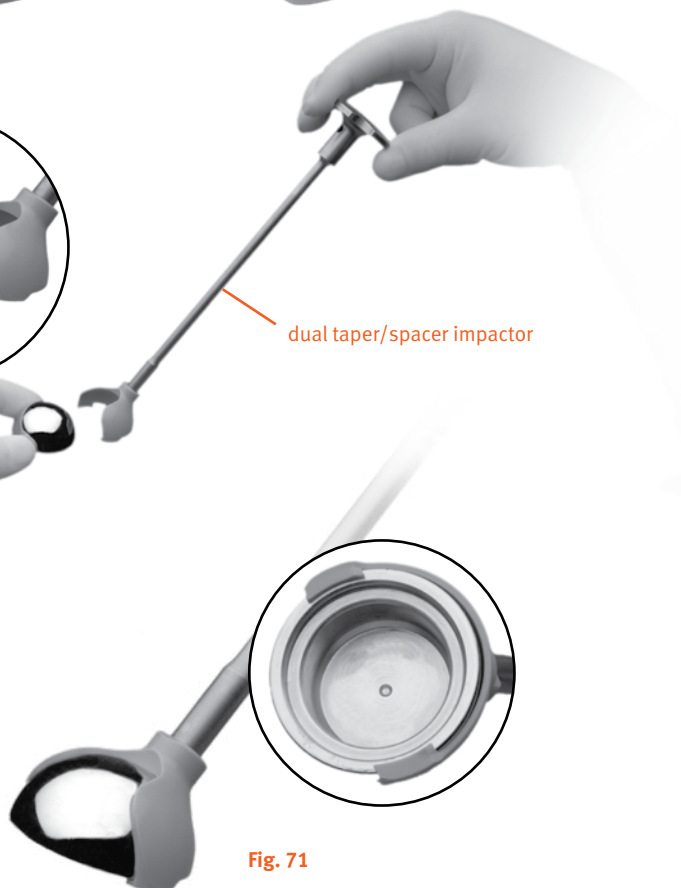


Fig. 71

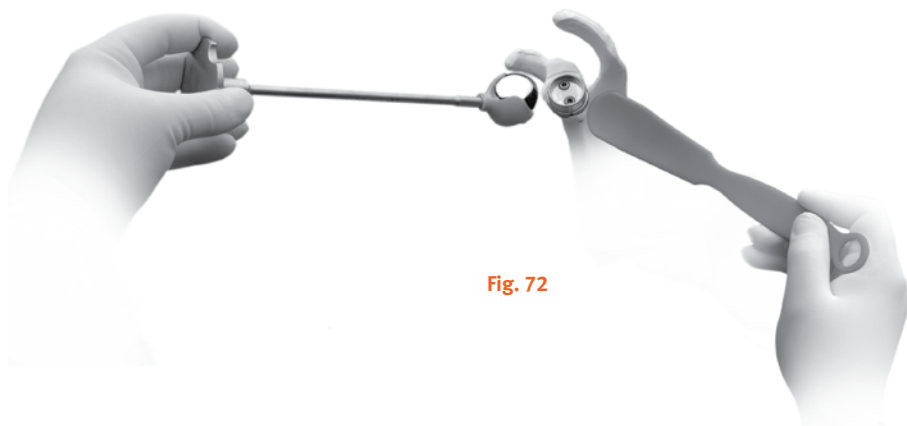


Fig. 72



**Note:** If unable to visually confirm an even, circumferential engagement of the glenosphere to the base plate, consider the use of a fluoroscope to aid in the confirmation. Seating of the glenosphere to the base plate can be examined in the axillary view or in a view parallel to glenoid version. The medial rim of the glenosphere should be parallel to the face of the base plate (Fig. 73).

Assemble Glenosphere Impactor Head to the Impactor Handle and place the Glenosphere Impactor Head on the Glenosphere. Strike the Glenosphere Impactor Head with 3 firm mallet strikes to engage the glenosphere on the base plate (Fig. 74). Pull on the glenosphere to verify the taper is locked. Reconfirm the circumferential engagement with the base plate. Reduce the joint and confirm and confirm range of motion.

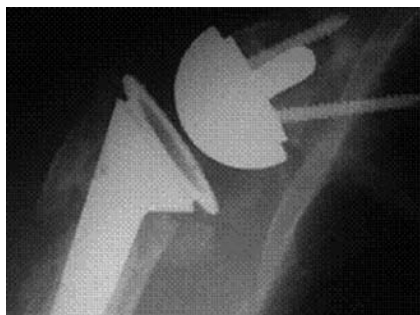


Fig. 73

#### Glenosphere Removal

Should it become necessary to remove the glenosphere, the Glenosphere Distractor can be used. Assemble the Glenosphere Distractor. Wedge the fin tip between the superior glenoid bone and the underside of the glenosphere (Fig. 75). There must be good contact on these two surfaces for disengagement to occur. Pull the Glenosphere Distractor trigger until it fires. The glenosphere head should be loose enough to gently remove by hand. If not, repeat the step making sure there is contact between the distractor tip, the glenoid bone surface and the glenosphere head. Reduce the joint and confirm range of motion. If all is satisfactory, continue on to the Closure Section.



Fig. 75

#### Cemented Technique Humeral Preparation

If using a Cement Restrictor Plug, insert the plug one centimeter distal to the tip of the Humeral Stem. Thoroughly clean and dry the canal. Inject cement into the humeral canal. Use a finger to thoroughly pack the cement.

**Note:** Stem size is chosen based on cement mantle desired and the last reamers used.

*Technique Tip:* Be careful to avoid contact between the cement and the Trabecular Metal material as the cement will interfere with the biological ingrowth properties of the material.

#### Press-fit Technique

The Humeral Stem can be press-fit by sizing to the reamed diameter.

#### Insertion for Cemented and Press-fit Techniques

Before inserting the final humeral component, drill any desired suture holes through the proximal neck of the humerus. Attach the Humeral Stem Inserter/Extractor to the Humeral Stem Implant by opening the handle all the way, inserting the stem inserter end into the proximal opening in the assembly, and closing the handle to lock the inserter in place (Fig. 76).

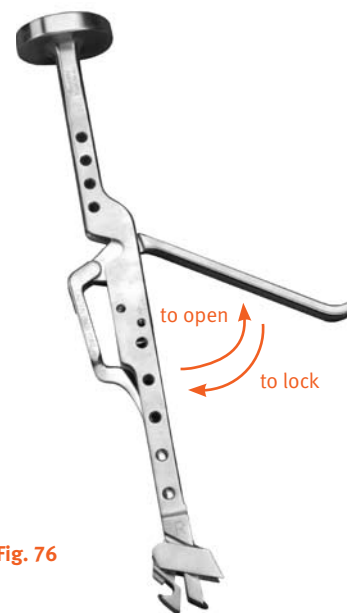


Fig. 76



Fig. 74



**Note: The Humeral Stem Inserter/Extractor has a cut-out that aligns with the small post on the proximal lateral face of the stem to orient your rotational position (Fig. 77).**



**Fig. 77**

There are 0 and 20 degree holes on the inserter to allow for verification of the stem retroversion using the Threaded Alignment Rods. Thread the Alignment Rods into the inserter. The Rods may be removed prior to impacting the stem. Impact the Humeral Stem into the canal until the rim is flush with the cut surface (Fig. 78). While inserting the stem care should be taken to not rotate the stem and lose the desired version.



**Fig. 78**

If it was determined during the trial reduction to utilize a humeral spacer, it should be impacted on the stem implant now. To accomplish this, the Dual Taper/Spacer Impactor (Fig. 79) is threaded into the Humeral Head Spacer and the Spacer is impacted into the stem with at least three forceful blows of a mallet (Fig. 80).

**Note: The +9mm and +12mm spacers can not be assembled together.**



**Fig. 79**



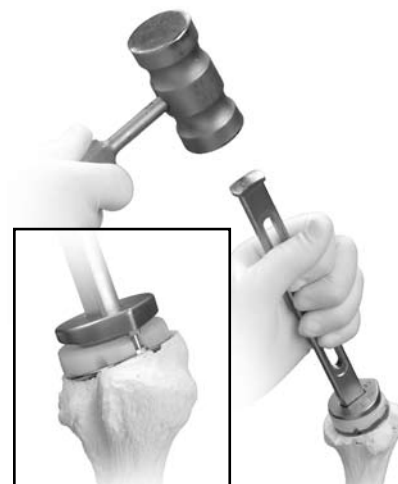
**Fig. 80**

Next, place the desired Poly Liner (Standard or 65° Retentive) onto the *Trabecular Metal Reverse Humeral Stem* (Fig. 81). Complete poly liner insertion by snapping the appropriate 60° (Standard) or 65° (Retentive) Poly Liner Impactor to the Poly Liner Impactor Handle. Then, place the Poly Liner Impactor on the Poly Liner articular surface and forcefully strike the poly liner handle with a mallet.



**Fig. 81**

**Note: Be sure to use the Poly Liner Impactor that corresponds to the appropriate Poly Liner implant. (i.e. Use a 60° Poly Liner Impactor with a Standard 36mm or 40mm Poly Liner. Use the 65° Poly Liner Impactor with a 36mm or 40mm 65° Retentive Liner. Also make sure that the guide pin on the Poly Liner Impactor is aligned into the post on the lateral side of the stem face prior to impacting (Fig. 82).**



**Fig. 82**

**Note: If not using a spacer, the 2.5mm Drill should be inserted into the post and drilled between 2-4mm to prevent sticking of the Poly Liner Impactor in the proximal humeral bone.**

It is necessary to support the humerus laterally during impaction. A Brown retractor can be placed around the humerus for additional support.

### Poly Liner Inserter

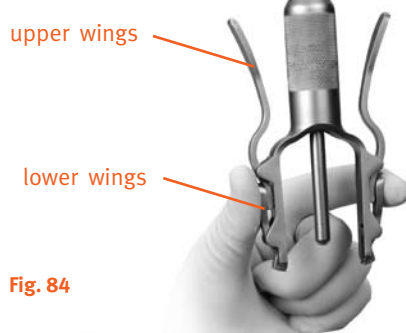
An alternative approach to locking the poly liner into the stem is to use the poly liner inserter. The use of this instrument is based upon implanting the definitive humeral stem into the prepared humerus, correctly positioning the poly liner implant on the humeral stem implant, and properly placing the correct poly liner impactor on the poly liner implant.

To use this instrument, you will first need to screw the push rod into the poly liner inserter and attach a ratchet T-handle to the push rod (Fig. 83). (Make sure that the T-handle is in the forward position.) Next, grab the poly liner inserter by the lower wings, compressing them so that the hooks at the distal portion of the poly liner inserter move outward (Fig. 84). While compressing the lower wings, place the poly liner inserter over the implanted humeral stem and position the hooks just under the proximal rim of the implanted stem (Fig. 85). It may be necessary to burr away bone around the proximal rim of the stem to allow the hooks to engage under the rim. Next, take your free hand and compress the upper wings, tightening the hooks under the implanted stem. While keeping the pressure on the upper wings, start ratcheting down the push rod with the T-handle (Fig. 86). While ratcheting the push rod down into the poly liner impactor, make sure that the push rod engages the circular center of the poly liner impactor (Fig. 87). Continue to ratchet down the push rod into the poly liner impactor until the pressure snaps the poly liner into the implanted stem. Upon successful insertion of the poly liner, release the upper wings and detach the instrument from the implant.



push rod

Fig. 83



upper wings

lower wings

Fig. 84



Fig. 85



Fig. 86



Fig. 87

**Note:** If a 9mm or 12mm spacer is required, please impact the spacer into the implanted stem before using the poly liner inserter.

### Removal of Liner and Humeral Stem Spacer

Should it become necessary to remove the Poly Liner after it has been impacted, place the Poly Liner Extractor over the Poly Liner so that the feet are between the Poly Liner and the stem. The handle is turned clockwise until the Poly Liner is levered out of the stem (Fig. 88). If desired, the wrench can be placed in handle for additional leverage.

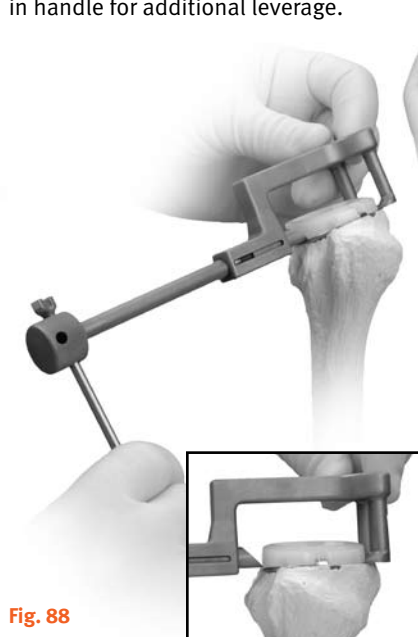


Fig. 88

**Note:** The Liner cannot be used after it has been inserted and then removed.

If used, the Humeral Stem Spacer can be removed by screwing the Taper Removal Bolt onto the Dual Taper/Spacer Impactor (Fig. 89). Next, screw the assembly clockwise through the center of the part of the Humeral Stem Spacer until it bottoms out in the stem and lifts the Spacer out (Fig. 90).



Fig. 89

Fig. 90

### Hemi-Arthroplasty or Total Arthroplasty Application

The Dual Taper implant allows the *Trabecular Metal* Humeral Stem to be converted from a reverse stem component to a standard humeral stem component.

#### Humeral Head Provisional Selection

If not already seated, place the Dual Taper Trial onto the selected Stem Trial (Fig. 91).



Fig. 91

Choose the *Bigliani/Flatow* Humeral Head provisional that best covers the prepared surface of the proximal humerus and fills the rotator cuff circumferentially. Standard and offset humeral heads are available. The resected humeral head can be used as an initial reference for choosing the humeral head provisional and implant size. Insert a metallic capture pin into the humeral head provisional (Fig. 92).



Fig. 93

A head that does not fill the capsule will dislocate over the glenoid rim, and one that overstuffs the joint will not allow this “50-50” laxity assessment. Pull the subscapularis muscle over the joint. If the fit is too tight, release the tendon as necessary. Often, releasing the subscapularis from the anterior labrum and capsule will provide sufficient mobilization to the neck of the humerus. Remove the provisional components and perform any necessary soft tissue releases.

If the humeral component is placed too low, the greater tuberosity will be relatively prominent and may impinge under the acromion. This condition can limit the range of motion. In addition, the resulting vector forces will drive the humeral head down against the inferior margin of the glenoid and can contribute to rocking and possible loosening. Therefore, it is important to always check that the superior aspect of the humeral head is above the superior aspect of the greater tuberosity.

If the humeral component is placed too high, the supraspinatus muscle will be under too much tension around the prominent lateral margin of the humeral head. In addition, the uncovered calcar can abut under the inferior margin of the glenoid component and may lead to glenoid rocking and possible loosening.

It is important to keep in mind the very precise relationship of the glenoid articular surface to the tuberosities and rotator cuff insertions so that contracture of the rotator cuff muscles and capsule do not eccentrically load the glenoid. The relationship of this entire complex to the acromion is also critical. The subacromial space should just accommodate the functional rotator cuff and tuberosities.

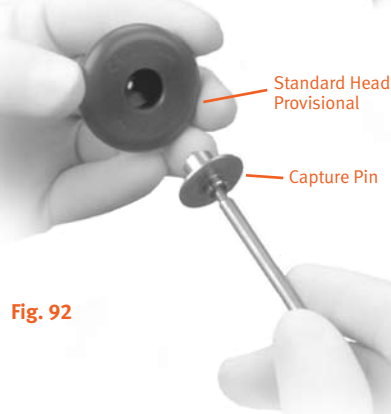
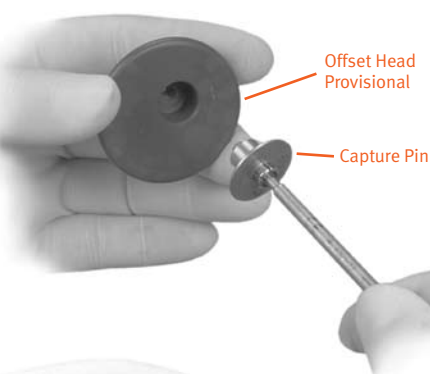


Fig. 92

With the Dual Taper Trial in place, set the Humeral Head Provisional on the Humeral Stem Provisional to the point where the head is at the level of the rotator cuff insertion. The humeral head must at least reach or slightly overhang the calcar medially (Fig. 93). If using an offset head, rotate the head into proper anatomical position and mark the position on the bone at the etched line labeled “MAX” (Fig. 94).



Fig. 94

Reduce the joint and check the fit on both the superficial and deep surfaces. Applied pressure to the appropriate humeral head will sublux the head about 50 percent of its diameter posteriorly and inferiorly, falling back into place when the pressure is released.

### Provisional Removal

Once the humeral head size is chosen, remove the provisional head and the Dual Taper Trial. Attach the Humeral Stem Inserter/Extractor to the Stem Trial. Apply the Slaphammer Weight to the Humeral Stem Inserter/Extractor and repeatedly impact until the Stem Trial is removed from the canal (Fig. 95).



Fig. 95

**Note:** If desired, a retaining bolt may be threaded through the handle into the body of the Inserter/Extractor to prevent the handle from opening while applying the slaphammer weight.

## Implant Insertion

### Cemented Technique Preparation

If using a Cement Restrictor Plug, insert the plug one centimeter distal to the tip of the Humeral Stem. Thoroughly clean and dry the canal. Inject cement into the humeral canal. Use a finger to thoroughly pack the cement.

**Note:** Stem size is chosen based on cement mantle desired and the last reamers used.

**Technique Tip:** Be careful to avoid contact between the cement and the Trabecular Metal material as the cement will interfere with the biological ingrowth properties of the material.

### Press-fit Technique

The Humeral Stem can be press-fit by sizing to the reamed diameter.

### Insertion for Cemented and Press-fit Techniques

Before inserting the final humeral component, drill any desired suture holes through the proximal neck of the humerus. Attach the Humeral Stem Inserter/Extractor to the *Trabecular Metal Reverse Humeral Stem* by opening the handle all the way, inserting the inserter end into the proximal opening in the stem, and closing handle to lock the inserter in place.

**Note:** The Inserter has ridges that align with the small post on the proximal lateral face of the implant to orient your rotational position.

There are 0 and 20 degree holes on the Inserter to allow for verification of the stem retroversion using the Threaded Alignment Rods. Thread the Alignment Rods into the inserter. The Rods may be removed prior to impacting the stem.

Impact the Humeral Stem into the canal until the rim is flush with the cut surface. While inserting, care should be taken to not rotate the stem and lose the desired version.

### Intraoperative Stem Removal

Should the *Trabecular Metal Reverse Stem* ever need to be removed during initial implantation surgery, a Slaphammer can be used, as described earlier in the Provisional Removal section. Apply the Slaphammer Weight to the Inserter/Extractor and repeatedly impact until the stem is removed from the canal. If necessary, standard femoral slap hammers may be attached by threading into the proximal end of the Inserter/Extractor.

### Dual Taper Insertion

Thread the Dual Taper/Spacer Impactor into the Dual Taper and impact (Fig. 96) the Dual Taper onto the stem with a mallet (Fig. 97).



Fig. 96



Fig. 97



### Dual Taper Removal

Should it become necessary, the Dual Taper can be removed by screwing the Taper Removal Bolt onto the Dual Taper/ Spacer Impactor (Fig. 98). Screw the assembly clockwise through the center of the part of the Dual Taper until it bottoms out in the stem and lifts the Dual Taper out (Fig. 99).



Fig. 98



Fig. 99

### Humeral Head Selection and Insertion

**Note: If the stem was cemented then the humeral head may be assembled to the implanted stem only after the cement has been allowed to cure.** Select the appropriate *Bigliani/Flatow* humeral head implant. Thoroughly clean the Dual Taper component taper that will attach to the head. If using an offset humeral head, attach the Offset Humeral Head Component to the Offset Humeral Head Insertor so the single prong is positioned at the “MAX” or previously marked indication. Make sure protective sleeves are properly in place on the prongs of the Offset Humeral Head Insertor. Insert the final humeral head component so the single prong is at the mark made earlier (Fig. 100). If using a standard head, assemble the taper by hand. Apply the Humeral Head Pusher to the head and impact it with a mallet (Fig. 101). Make sure that the head is firmly attached. Then reduce the joint and assess stability.



Fig. 100



Fig. 101

**Note: If a Total Shoulder Replacement will be conducted, utilize a glenoid implant from the *Bigliani/Flatow* Shoulder system and follow those corresponding surgical techniques.**



### Humeral Head Removal

Should a humeral head ever have to be removed, slide the Head Distractor between the collar of the humeral stem and the undersurface of the humeral head. Firmly tap the end of the instrument to loosen the head. This instrument can be used to remove either provisional heads or implants (Fig. 102).



Fig. 102

### Closure

After the definitive prosthesis has been securely implanted, irrigate the wound. Retrieve any previously prepared sutures and complete suturing process. Insert a *Hemovac*® Wound Drainage Device being careful to avoid the axillary nerve. Close the deltoid and the subcutaneous layers, then close the skin.

### Postoperative Management

#### Total or Hemi- Shoulder Arthroplasty

On the first postoperative day, the patient typically begins hand and elbow motion, and passive shoulder range of motion. For a hemi or standard total arthroplasty therapy should include pendulum exercises, elevation exercises, and external rotation exercised with a stick in the supine position and the arm slightly abducted. Passive elevation in the plane of the scapula is preformed by the surgeon, a therapist, or a trained family member to a predetermined limit. The limits of postoperative motion are determined intraoperatively.

For a hemi or standard arthroplasty, if the tuberosities are fragmented and osteoporotic, elevation in the scapular plane should be limited to about 90 or 100 degrees, and gentle external rotation is allowed to about 10 or 20 degrees. If the tuberosity repair is more secure, elevation to 140 degrees may be allowed. Motion is passive, and pulley exercises are usually avoided as these tend to cause some active use of the rotator cuff. Internal rotation, which can add tension to the greater tuberosity repair, should be avoided. Patients should continue exercised as an outpatient. At six to eight weeks, when some tuberosity healing is evident on radiographs, active exercised can begin, as well as increased range of motion stretches, including internal rotation.

### Reverse Shoulder Arthroplasty

With severe rotator cuff damage and the use of the Reverse System the arm is often placed in a brace with the elbow close to the body in neutral or internal rotation. An abduction cushion can be used especially in cases of deltoid detachment or if the superior-lateral approach was performed. Passive pendulum motion is the focus of initial rehabilitation.

**Note: For a reverse surgery patient, external and internal rotation arm motion should be avoided.**

Resistive strengthening exercises are gradually added. These exercises should emphasize stretching and balancing the range of motion. Strengthening is a secondary concern that need not be achieved until several months postoperatively.

## APPENDIX A:

### Alternate Glenoid Preparation and Implant Fixation Using the Anatomical Shoulder™ Inverse/Reverse System

To expose the glenoid, perform a capsulotomy and resect the remaining glenoid labrum. Position a retractor at the inferior border of the glenoid, seated on the scapular pillar for the supero-lateral approach or at the posterior part of the glenoid during the delto-pectoral approach. Use additional retractors, positioned anterior and posterior to the glenoid. Any peripheral osteophytes should be removed to restore the natural anatomic shape of the glenoid.

If necessary, set the correction of version determined from the preoperative CT scan on the Guiding Instrument for Glenoid Inverse (see page 12 – preoperative planning – glenoid), identify the optimal position, the position of the inferior part of the Guiding Instrument for Glenoid Inverse should be at the inferior end of the articular surface, and vertical to the ground (Fig. A1). Introduce a 3mm K-wire guide pin into the guiding instrument for glenoid inverse. The laser marking on the K-wire must disappear slightly into the eyelet of this guiding instrument.

Remove the guiding instrument over the K-wire. The K-wire is now perpendicular to the required alignment of the articulating surface, which was determined preoperatively (Fig. A2).

The Glenoid Reamer size S (small) and then the Cannulated Handle are mounted on the guide wire (Fig. A2). For a sclerotic glenoid the separate sclerotic reamer (Fig. A3) may be used to start the reaming process. Now ream the glenoid in the new alignment of the articulating surface (Fig. A4).

Now use the reamer size L (large).

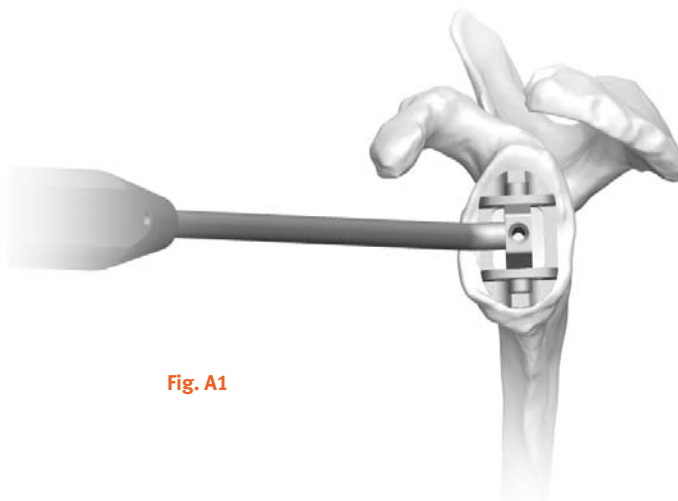


Fig. A1



Fig. A2

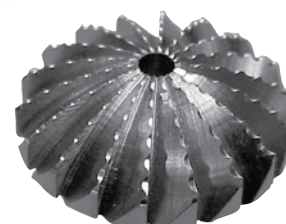


Fig. A3



Fig. A4

**Note:** The reamer size S (small) corresponds to the back surface of the *Anatomical Shoulder Inverse/Reverse Glenoid Fixation*. But the reamer size L (large) is needed to generate enough clearance for the backside of the *Anatomical Shoulder Inverse/Reverse Glenoid Head*.

Mount the Milling Cutter for glenoid inverse with the Cannulated Handle and ream over the guide wire until the collar is flush with the glenoid face (Fig. A6).

Place the Drill Guide for Glenoid Inverse (Fig. A6) over the 3mm K-wire, flush with glenoid surface, and bore the inferior and the superior fixation holes. After drilling the inferior hole, place the Centering Pegs for Glenoid Inverse inside the hole, then drill the superior hole. Remove the Drill Guide, the Centering peg and also the K-wire guiding pin.

The *Anatomical Shoulder Inverse/Reverse Glenoid Fixation* is available in one size for both 36mm and 40mm glenoid heads and is implanted without cement.

#### **Positioning and Screw Fixation of the Anatomical Shoulder Inverse Glenoid Fixation**

The *Anatomical Shoulder Inverse/Reverse Glenoid Fixation* is attached to the Holding Forceps for glenoid fixation. Place the glenoid fixation with the Central Peg into the previously drilled hole. Start impacting with the Impactor for Glenoid Fixation, using controlled force. Once impacted, the glenoid fixation should seat fully on the glenoid. If not, impact until fully seated (Fig. A7).

**Note:** Care should be taken to correctly orient the superior/inferior peg position of the glenoid fixation, before impacting the glenoid fixation

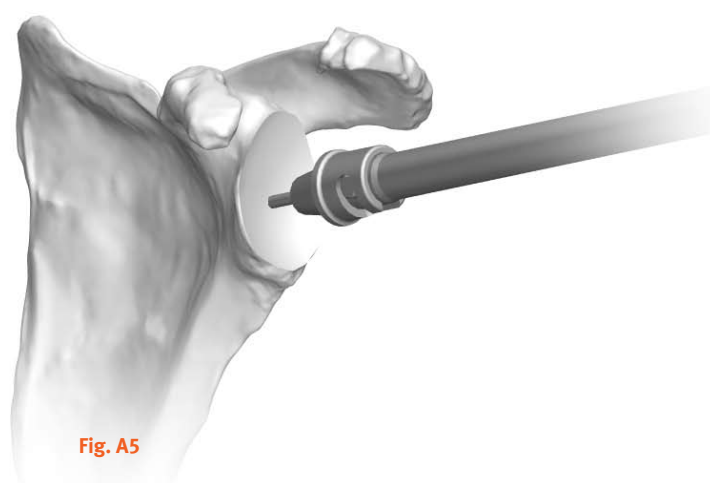


Fig. A5

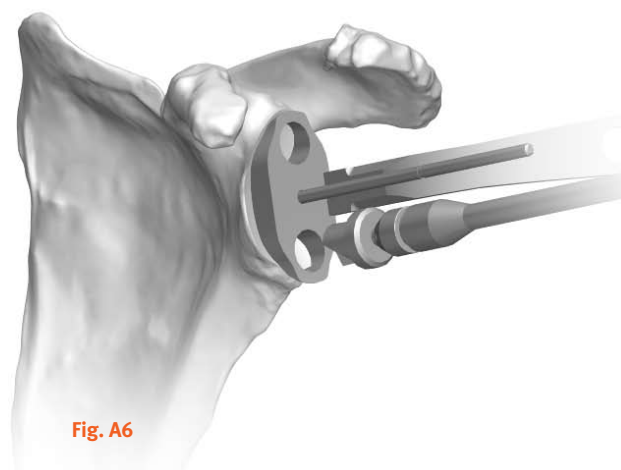


Fig. A6



Fig. A7

The Impactor is removed and the Free Hand Drill Guide for Inverse/Reverse Screws is located in the inferior glenoid fixation hole. Both inferior and superior screw positions allow angulations of 30°. The Drill Guide for Inverse/Reverse Screws is used to set the most appropriate angle to ensure that each screw is located in reliable bone stock. Preferential position is usually chosen by palpating the inferior and superior aspects of the scapula as well as examining the radiographs and CT scans. The inferior hole is drilled with the 3.3 drill for Inverse/Reverse Screws (Fig. A8).

**Note: The screw lengths are laser marked on the drill, for use with the drill guide. Remove the drill guide.**

The Inverse/Reverse Screw 4.5mm (available in lengths of 18–48mm) is introduced into the inferior hole and fully tightened with the hexagonal screw driver. Next, prepare the superior hole in the same manner as the inferior hole.

Now secure the Inverse/Reverse Screw position by using the Inverse/Reverse Locking Screw. The locking screw is then fastened with the Torque Wrench, until the Torque Wrench slips or audibly clicks (Fig. A9).

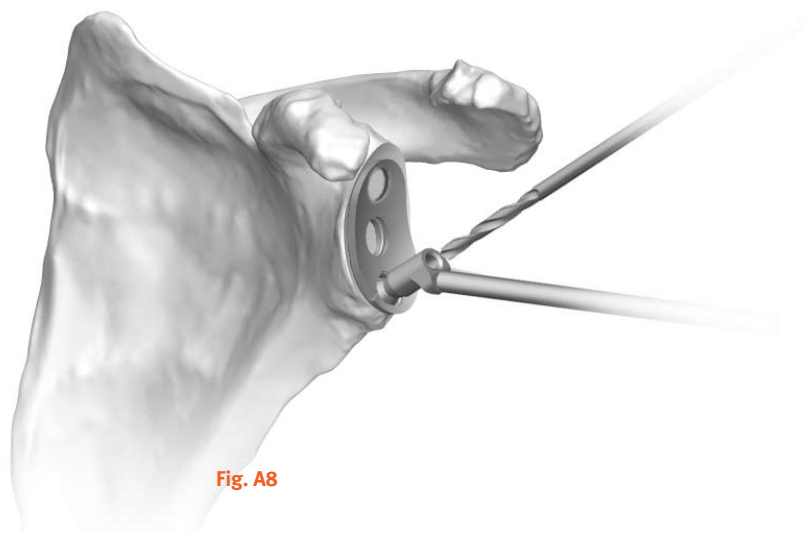


Fig. A8

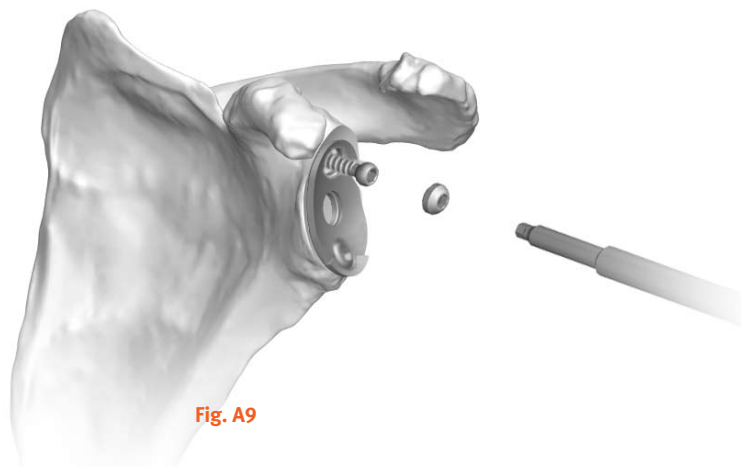


Fig. A9

**Trial Reduction**

The appropriate trial glenoid head 36 (green) or 40 (yellow) is attached to the glenoid fixation.

**Note: For humeral component selection and trial reduction, refer to page 16.**

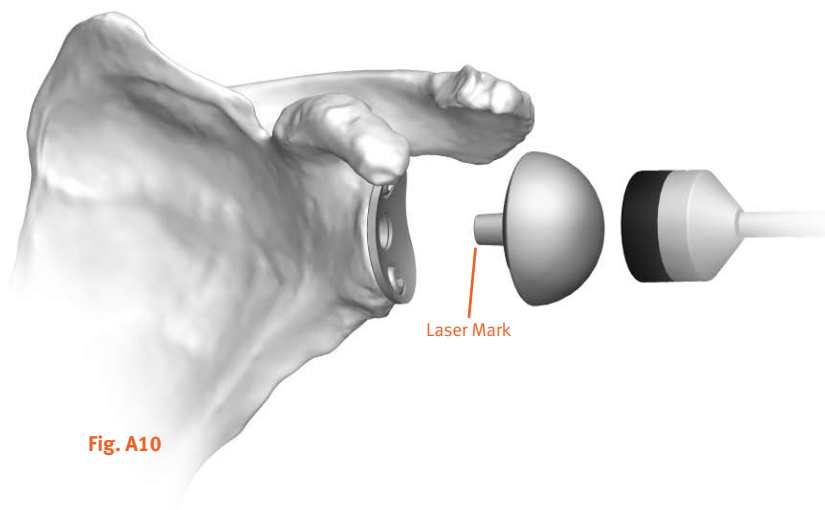
**Glenosphere Placement**

The definitive *Anatomical Shoulder Inverse/Reverse* Glenoid Head is now unpacked. The size of the glenoid head has been defined by the previously used Trial Glenoid Head, 36mm or 40mm.

**Note: The *Anatomical Shoulder Inverse Glenoid Head* has a laser mark for correct connection, this laser mark must face the acromion.**

The Glenoid Head is now fitted onto the oval taper of the glenoid fixation (Fig. A10). Use three consecutive mallet strikes on the Impactor to seat the Glenoid Head. The Glenosphere is now prepared.

**Please refer to page 19 for humeral preparation.**



**Fig. A10**









Please refer to the package inserts for complete product information, including contraindications, warnings, precautions and adverse effects.

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