Identity™ Shoulder System

Reverse Total Shoulder

Surgical Technique

ZIMMER BIOMET

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Introduction

The Identity Shoulder System is a platform system that enables implantation in a reverse or anatomic total shoulder configuration. The system can also be revised from anatomic to reverse while preserving a well-fixed humeral stem. This technique focuses on the surgical steps to implant a reverse total shoulder.

The Identity Reverse System includes Uniform Thickness (135° neck shaft angle) and 12° (147° neck shaft angle) bearing options. Both options utilize a 135° inclination for the humeral resection.

Additionally, the latter part of the technique includes instructions for conversion from anatomic to reverse, as well as explanation of all humeral components.

Indications for Use and Contraindications

The Identity™ Shoulder System implants are intended for shoulder joint arthroplasty. Instruments are intended to facilitate the implantation and explantation of the corresponding compatible Zimmer Biomet implants. Instruments cases/trays are intended to facilitate the organization, identification, storage, transportation, and sterilization reprocessing of the compatible Zimmer Biomet Instruments.

INDICATIONS

Zimmer Biomet Reverse Shoulder products are indicated for use in patients whose shoulder joint has a grossly deficient rotator cuff with severe arthropathy and/or previously failed shoulder joint replacement with a grossly deficient rotator cuff. The patient must be anatomically and structurally suited to receive the implants and a functional deltoid muscle is necessary.

The Zimmer Biomet Reverse Shoulder is indicated for primary, fracture, or revision total shoulder replacement for the relief of pain and significant disability due to gross rotator cuff deficiency.

The Titanium Glenosphere is indicated for patients with suspected cobalt alloy sensitivity. The wear properties of Titanium and Titanium alloys are inferior to that of cobalt alloy. A Titanium Glenosphere is not recommended for patients who lack suspected material sensitivity to cobalt alloy.

The assembled humeral component may be used alone for hemiarthroplasty or combined with a glenoid component or reverse components for total shoulder arthroplasty (anatomic or reverse applications). The humeral stems may be used cemented or uncemented (biological fixation).

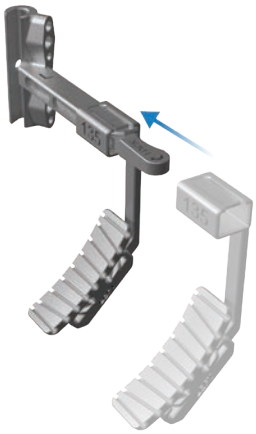
CONTRAINDICATIONS

This device is contraindicated for the following:

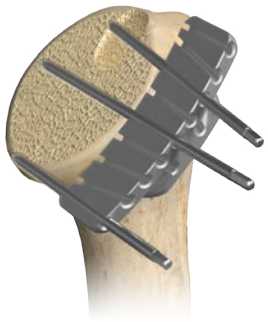
- Local/systemic infection
- Presence of significant injury to the upper brachial plexus
- Paralysis of the axillary nerve
- Marked bone loss
- Nonfunctional deltoid or external rotator muscles
- Any neuromuscular disease compromising the affected limb that would render the procedure unjustifiable

Surgical Technique Summary

1. Ream



2. Assemble resection guide



3. Resect humerus

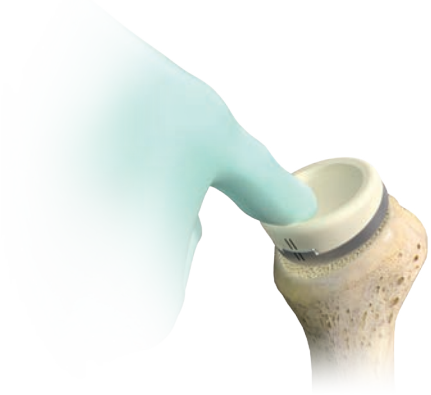
4. Rasp

5. Mate +0mm tray trial to rasp

6. Mate chosen tray/bearing trials to rasp

7. Mate tray/stem implants

8. Insert tray/stem assembly into humerus



9. Seat bearing implant by hand

Uniform Thickness Bearing Considerations

1. **LATERALIZATION:** Uniform Thickness Bearings will require more glenosphere lateralization than 12° bearings. Consider using +3 or +6mm Glenosphere and/or augmented baseplate. Compatible glenospheres for the Uniform Thickness Bearing are Comprehensive® Reverse and Trabecular Metal® Reverse+ (TMR+). The humeral head resection should make firm contact with the glenosphere with the arm in neutral rotation.

2. **INCLINATION ANGLE:** Resections less than 135° must be avoided as joint stability will be compromised and dislocations are more likely with a varus neck shaft angle.

3. **JOINT TENSIONING:** Trialing will feel different with a Uniform Thickness Bearing compared to a 12° bearing. When placing a finger on the medial calcar and applying lateral traction, a substantial amount of lateral shuck to the point that the shoulder has some subluxation is acceptable, as long as it comes back into position.

4. **IMPINGEMENT-FREE RANGE OF MOTION (RoM):** Verify that subacromial impingement has been avoided during RoM assessment in abduction.

5. **SUBSCAPULARIS REPAIR:** There is some evidence that the subscapularis improves the stability of the implant. When possible, the subscapularis should be repaired at the completion of the procedure, as long as it does not significantly reduce external rotation [1].

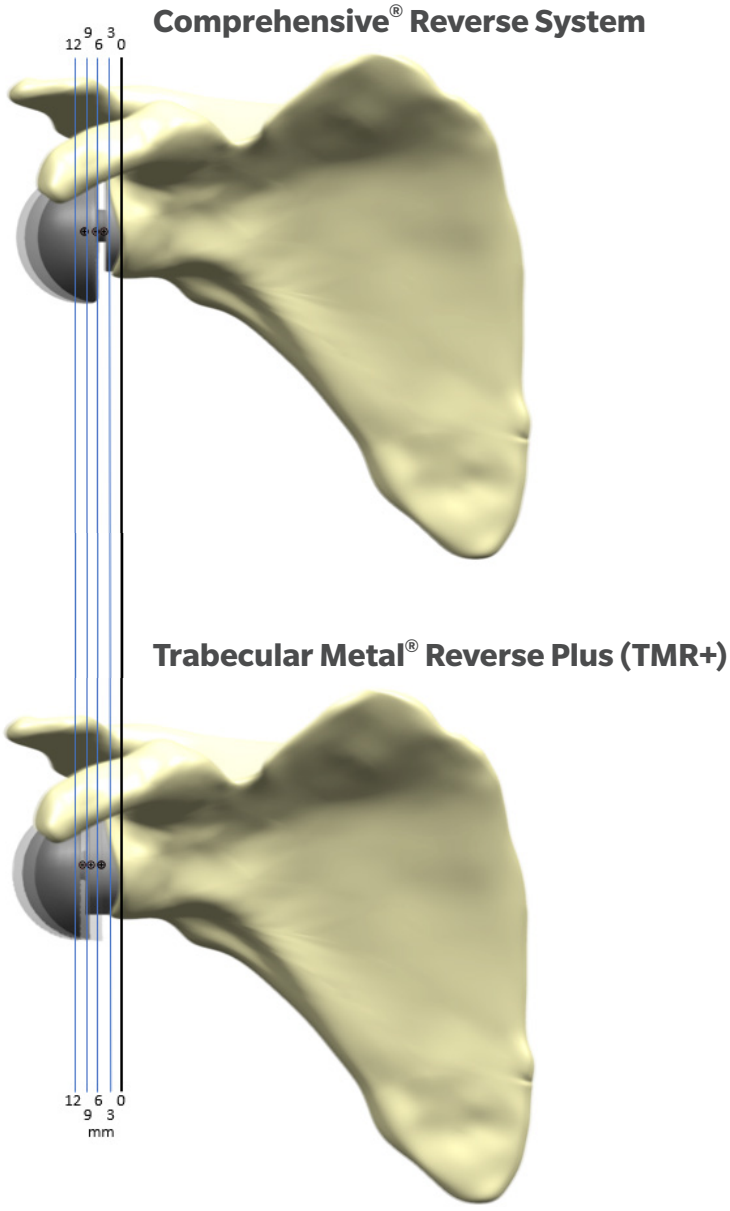
[1]Werner BC. Wong AC. Mahony GT. Craig EV, Dines DM, Warren RF, Gulotta LV. Clinical Outcomes After Reverse Shoulder Arthroplasty With and Without Subscapularis Repair: The Importance of Considering Glenosphere Lateralization. J Am Acad Orthop Surg. 2018 Mar 1:26(5)e114-e119

Glenosphere Lateralization Options

The figures below provide guidance on the lateral offset achievable with the compatible Comprehensive® Reverse and Trabecular Metal® Reverse Plus (TMR+) systems. Additional lateralization of the glenosphere can be achieved with the use of a Comprehensive® Augmented Baseplate[2].

Glenosphere Design/ Lateral Offset	Reamed Face to Center of Rotation (mm)
+0	4.5
+3	7.5
+6	10.5

Glenosphere Design/ Lateral Offset	Reamed Face to Center of Rotation (mm)
+0	4.8
+3	7.8
+5	9.8



Note: The following considerations were made when establishing the figure above.

- The glenoid was reamed to ensure 100% baseplate backing.
- Both figures represent glenospheres with a 36mm diameter.
- The 12° bearings are also compatible with the original Trabecular Metal® Reverse (TMR) system.

[2]Bone Preserving Application of the Comprehensive Augmented Baseplate 2375.1-GLBL

Pre-Operative Planning

Prior to surgery obtain patient imaging to evaluate bony anatomy for any deformities or acquired bone loss. Recommended x-rays include A/P, scapular Y and axillary views. A CT scan can be used to assess bone quality and identify any glenoid erosion patterns which may affect implant selection. The system includes x-ray templates to determine humeral stem and head sizes prior to surgery.

Patient Positioning

The arm and shoulder are prepped and draped free. Utilize a modified beach chair position at about 30 to 40 degrees of flexion.

Incision and Exposure

Utilize an extended deltopectoral anterior incision with an optional biceps tenodesis beginning immediately above the coracoid process and extending distally and laterally, following the deltopectoral groove along the anterior border of the deltoid.

Laterally retract the deltoid muscle, avoiding release of the deltoid from the clavicle. The deltoid may be partially released from its distal insertion by subperiosteal dissection. Make a partial relaxing incision through the proximal coracoid tendon and medially retract the conjoined tendon.

Note: A lesser tuberosity osteotomy may also be performed in order to release the subscapularis.

Identify anterior structures and externally rotate the humerus. Make a longitudinal incision through the tendinous portion of the subscapularis muscle and capsule, just medial to the lesser tuberosity. In cases of severe contracture, subscapularis lengthening may be required.

Tag the subscapularis tendon with non-absorbent sutures for easy identification during closure. Externally rotate and extend the humerus to expose the humeral head, while protecting the axillary nerve.

Figure 1

Figure 2

Humeral Resection

With the head exposed, remove any osteophytes to reveal the articular margin.

Attach a 4mm trocar-tipped Intramedullary Reamer to the T Handle (Figure 1). This system has standard and micro length humeral stems as well as dedicated Intramedullary Reamers for both lengths. Ensure Reamer length corresponds to the intended implant length. Place the trocar tip of the reamer at the superior-most portion of the humeral head and in line with the humeral axis. If necessary, use a mallet to penetrate the cortical bone. Bore through the humeral head until the Reamer teeth are just below the humeral head.

Use progressively larger reamers in 1mm increments until feeling initial resistance in the canal. Insert the Reamer until the engraved groove on the Reamer shaft aligns to the humeral head cortical bone (Figure 2). Note the size of final Reamer used as this will correspond to the final Rasp and humeral stem implant size.

Remove the T-handle, leaving the last Intramedullary Reamer in the canal.

Figure 3

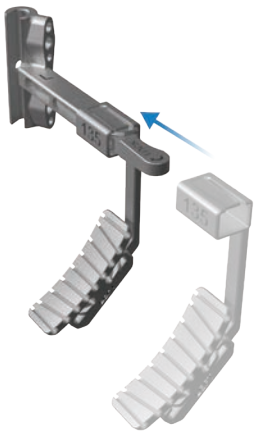


Figure 4

Figure 5

Figure 6

The Identity Reverse humeral tray has a 135° inclination. Ensure the Resection Guide Carriage has a "135" engrave.

To assemble the IM Humeral Resection Guide, do the following steps in order:

Holding the 135° Resection Guide Carriage with the appropriate side etch ("R" for right shoulder, "L" for left shoulder) facing towards you, slide the Resection Block onto the Carriage such that the concave side of the Resection Block will face the humerus (Figure 3).

Hold the Humeral Reamer Shaft Clamp with the appropriate side etch facing up. Slide the rectangular opening of the Resection Guide Carriage onto the Shaft Clamp arm (Figure 4).

If assessing version prior to resection, then advance the threaded 30° Alignment Rod onto the Version Rod Coupling. With the appropriate side engraving mark facing up ("R" for right shoulder, "L" for left shoulder) (Figure 5), thread the version guide assembly into the superior holes of the Humeral Reamer Shaft Clamp. The holes are polarized to ensure proper side orientation.

Attach the assembled IM Resection Guide to the Reamer shaft (Figure 6).

Figure 7

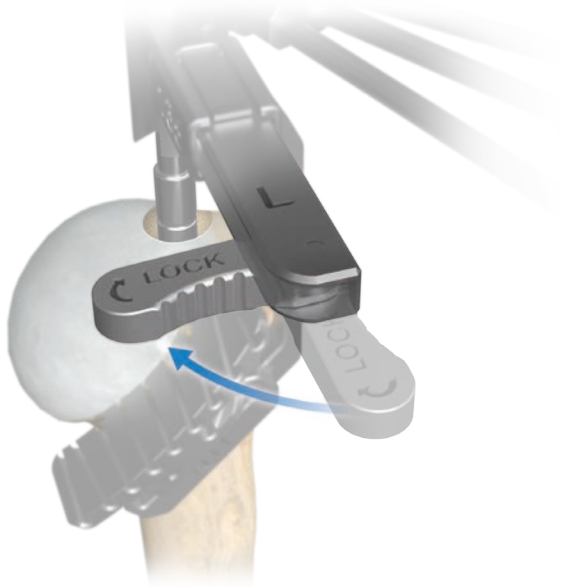


Figure 8

Humeral Resection (cont.)

Resection height can be adjusted by sliding the IM Resection Guide assembly up or down the Reamer shaft until the top of the Resection Block aligns to the articular margin. The Reamer depth stop will prevent lowering the resection guide beyond that point. If the depth stop places the resection too high, then reattach the T Handle to the IM reamer and advance the reamer deeper into the canal. If the depth stop places the resection too low, then consider placing an IM reamer one size larger into the canal to enable proper height.

To establish resection version, flex the forearm at 90° and rotate the resection guide assembly until it aligns to the forearm at the desired version (Figure 7). In this example the forearm aligns with the 30° retroversion rod. When the Resection Guide is in the desired position, lock the Shaft Clamp onto the reamer shaft (Figure 8) and slide the Resection Guide Carriage as close to the humerus as possible. Slide the Resection Block against the humerus. The Resection Block is magnetic and will self-adjust to the unique contours of the patients humerus. If desired, place the wide end of the Angel Wing on the Resection Block to assess the planned resection (Figure 9). If resection height appears too shallow and the Shaft Clamp is bottomed out on the Reamer, then advance the Reamer deeper into the humerus as necessary. If resection height appears too deep and the Shaft Clamp is abutting the top of the Reamer, then back out the Reamer enough to enable proper resection height.

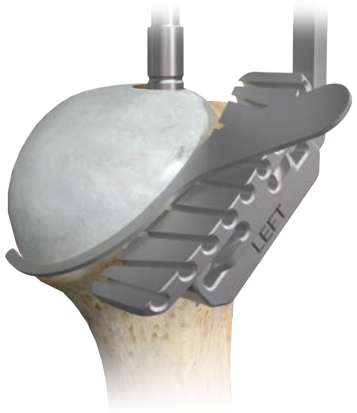


Figure 9

Figure 10

Figure 11

Figure 12

The system has sterile, single-use Hex Pins of 70mm and 100mm lengths. Each box contains three Hex Pins. Place a Hex Pin into the Hex Pin Driver and insert at least three pins through the Resection Block slots until reaching the far cortical wall (Figure 10). Divergent pin slots should be used to maintain fixation against bone. If needed, there are two divergent pin holes below the pin slots in the Resection Block for additional stability. Note: If the lateral-most pin might interfere with Intramedullary Reamer removal, then temporarily back the lateral pin out enough to enable removal.

With one hand on Shaft Clamp and one on the Carriage, unlock the Shaft Clamp (Figure 11), simultaneously disengaging the Carriage from the Resection Block (Figure 12). Remove the shaft clamp from the reamer shaft. Remove the Intramedullary Reamer from the canal.

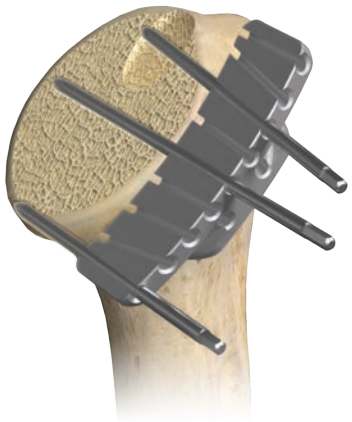


Figure 13

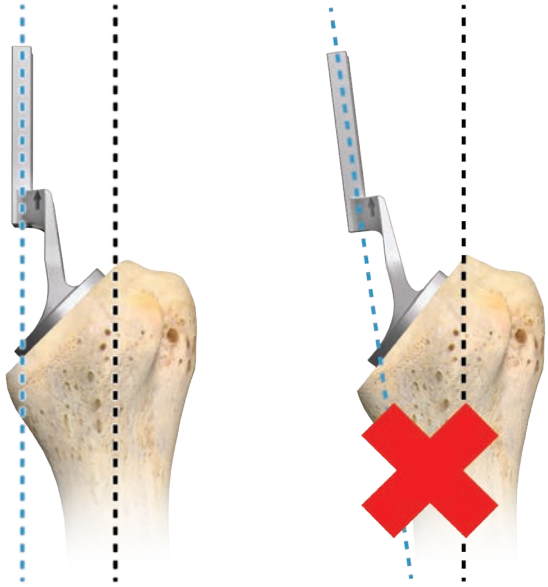


Figure 14

Resect the humeral head by cutting on top of the Resection Block and across the Hex Pins. If after resection, the pins are not visible across the entire resection surface, then resect enough bone to make them visible (Figure 13). A flush resection is important to ensure uniform contact with the Reference Foot which will be used in subsequent surgical steps. Remove the Resection Block from the resected humerus.

Note: Place the appropriately sized reference foot component on the resection surface. Visually verify the inclination by ensuring the reference foot is parallel to the axis of the humerus (Figure 14).

Humeral Rasping

To determine the appropriately sized 135° Reference Foot, select the size based on the last Intramedullary Reamer used (Figure 15):

IM Reamer	Reference Foot
4-7	Small
8-16	Medium
17-20	Large

Figure 15

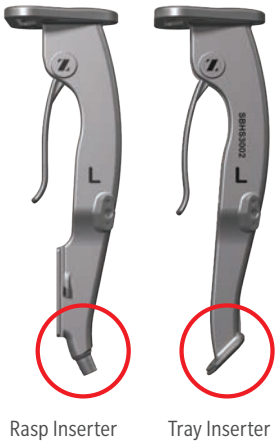


Figure 16a

Figure 16b

Figure 17

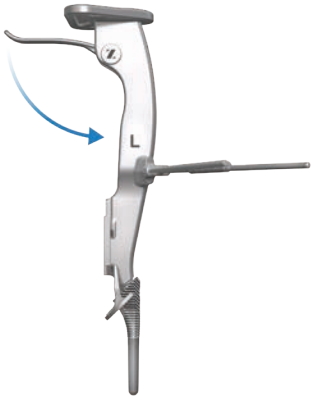


Figure 18

Figure 19

Prior to Rasping, note that the instrument set includes two Inserters with several common features (Figure 16a). The Rasp Inserter has an oval distal tip and lateral side latch to rigidly mate to the Humeral Rasps. The Tray Inserter has a flat plate and lateral side latch which rigidly mate to a reverse humeral tray. Both instruments have differentiating etch marks on the handle.

Attach the Reference Foot to the Humeral Rasp Inserter (Figure 16b). If desired, thread the Version Rod Coupling into the Rasp Inserter hole with the appropriate side engraving ("R" for right shoulder, "L" for left shoulder) facing up (Figure 17). The holes are polarized to ensure proper side orientation.

Select a Humeral Rasp that is three sizes smaller than the last IM Reamer used. With the Inserter handle fully open (Figure 18), align the lateral side of the Rasp with the small hook on the Rasp Inserter tip, and attach the Rasp to the Rasp Inserter. Close the Inserter handle to rigidly affix the Rasp to the Inserter. Slide the Reference Foot down distally and introduce the Rasp into bone (Figure 19).

Figure 20

Figure 21

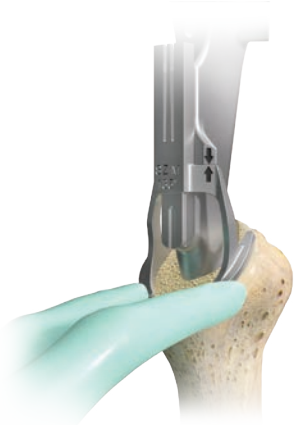


Figure 22

Figure 23

With the Reference Foot in uniform A/P contact with the resection surface (Figure 20), impact the Rasp while maintaining alignment with the bone. The Rasp is fully seated when the Reference Foot engraved arrows make contact with the engraved arrows on the Rasp Inserter (Figure 21). The Reference Foot ensures Rasp seating below the line of resection while maintaining version alignment with the resected surface.

Sequentially rasp the humerus in 1mm increments, ensuring each Rasp is fully seated. Beginning with the second Rasp, use two fingers to hold the Reference Foot in uniform contact with the resection during Rasp impaction (Figure 22). Continue sequentially rasping until the Rasp is stable in the humerus. This generally occurs when the Rasp size is equal to the last Intramedullary Reamer size. However, if the Rasp achieves proper stability within the humerus at one size smaller than the last Intramedullary Reamer, stop at that Rasp size.

If the final Rasp feels unstable, then remove it from the canal and use an Intramedullary Reamer one size larger than previously used. Now rasp using one size larger Rasp.

Disengage the Rasp Inserter from the Rasp, leaving the Rasp in place (Figure 23).

Figure 24a

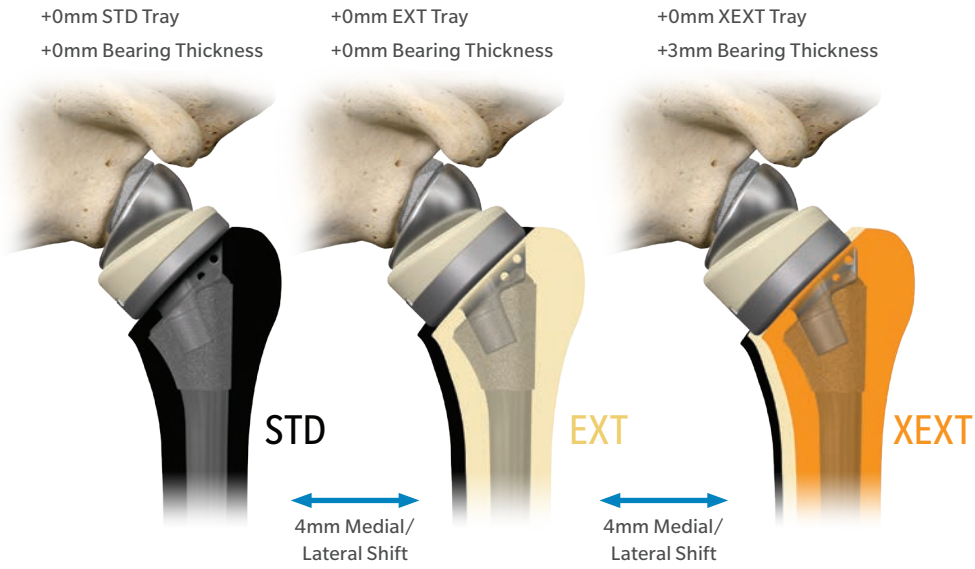


Figure 24b

Figure 24c

Figure 24d

Place the appropriately-sized Humeral Protector over the resection during glenoid preparation (Figure 24a). If necessary, gently use a mallet to achieve full seating.

Reverse Glenoid Preparation

The Identity Shoulder System reverse humeral bearings are compatible with glenospheres from the Comprehensive® Reverse Shoulder System, the Trabecular Metal® Reverse (TMR) Shoulder System, and Trabecular Metal® Reverse Plus (TMR+) Shoulder System. The Uniform Thickness Bearings are only compatible with the Comprehensive® Reverse Shoulder System and the TMR+ Shoulder System. For glenoid preparation and trialing instructions, refer to the respective surgical techniques posted on zimmerbiomet.com.

Note: When selecting a Uniform Thickness Bearing, selection of a lateralized glenosphere and baseplate construct should be considered. With this glenoid construct selected, the humeral resection should make firm contact with the glenosphere when the arm is hanging in neutral rotation. Please reference the Glenosphere Lateralization Chart on page 7.

Humeral Trialing

The Identity Shoulder System includes Standard (STD) (Figure 24b), Extended (EXT) (Figure 24c), and Extra Extended (XEXT) (Figure 24d) humeral trays. The Standard trays are onlay trays which do not require proximal humeral reaming. They come in +0mm, +6mm, and +12mm heights. The EXT trays lateralize the humerus by 4mm compared to the STD trays (Figure 24c). They come in -6mm, +0mm, +6mm, and +12mm heights. The -6mm EXT tray is an inset humeral tray which requires proximal humeral reaming with the dedicated white, "N" Tray Reamer Guide. The XEXT Trays lateralize the humerus by 8mm with a +3 Bearing compared to the STD Trays (Figure 24d). They come in -6mm, +0mm and +6mm heights. The -6mm XEXT tray is also inset which requires proximal humeral reaming using a dedicated orange, "XEXT" Tray Reamer Guide.

If implanting the -6mm EXT or -6mm XEXT inset humeral tray, proceed to APPENDIX 1 for proximal reaming instructions.

Note: Proximal humeral reaming is only required for the inset trays (-6mm EXT and -6mm XEXT).

Figure 25

Tray & Bearing Trial Selection: To determine tray and bearing height, ensure the +0 bearing is mated to the +0 EXT tray trial and ensure the construct is mated to the rasp. (Figure 25). Gently reduce with bearing in place with the arm externally rotated 10-20 degrees. Assess deltoid tension and range of motion. If the joint is lax, use the +0 XEXT Tray Trial with a +0 bearing trial and reduce the joint. To disengage the bearing trial, use thumb pressure on "Push" engraving on the medial side of the trial. Reduce joint until achieving the desired deltoid tension and range of motion.

If the joint feels too tight with the +0 Tray/+0 Bearing, then proceed to APPENDIX 1 for instructions on implanting a -6mm inset tray.

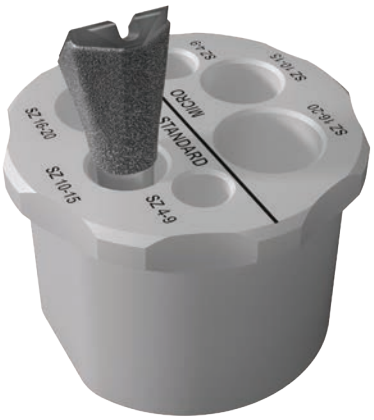


Figure 26

Figure 27a

Figure 27b

The joint should be stable throughout the range of motion. If the joint feels too lax, then use a +3mm Bearing Trial. To disengage the bearing trial, use thumb pressure on "Push" engraving on the medial side of the trial. Assemble the +3mm bearing trial and reduce the joint to assess deltoid tension and range of motion. If the joint is still lax, repeat the assessment by progressively building up height with the available Tray Trial/ Bearing Trial combinations until attaining appropriate tension. If the joint feels too tight, then decrease the Tray/Bearing Trial height combination by 3mm. Alternately, the humerus can be medialized by moving from a XEXT to an EXT tray or from an EXT tray to a STD tray (Figure 24b-24d).

Note: There are no Retentive Uniform Thickness Bearings. For cases of instability, switch to a 12° bearing or a 12° Retentive bearing. Retentive Bearings capture more of the glenosphere and have polyethylene walls which are 2–3 mm higher than standard bearings but do not add joint tension.

Humeral Component Implantation

Disengage the Humeral Tray and Bearing Trials from the Rasp. After removing the Reference Foot from the Rasp Inserter, attach the Rasp Inserter to the Rasp and remove it from the humerus. If the Rasp Inserter will not engage the Rasp, then go to APPENDIX 5 - Removing a stuck Rasp/Stem.

If press-fitting, select a humeral stem implant size that matches the last Rasp used. If cementing, select a humeral stem two size smaller than the last Rasp used. Place the humeral stem into the appropriate hole in the Back Table Assembly Block (Figure 26). The assembly block has 3 holes each for standard and micro length stems, labeled with the humeral stem sizes that fit into each hole. Take care to place the stem in the correct hole for your desired stem length.

Caution: If the stem is inserted into a hole which is too small in diameter, the stem may get stuck in the Assembly Block.

Select a humeral tray implant that corresponds to the final Humeral Tray Trial used previously. Using the Humeral Tray Inserter with the handle fully open (Image 27a), attach the humeral tray implant to the Inserter with the medial etch mark on the Inserter aligned to the anti-rotation tab on the Humeral Tray implant (Image 27b). Close the Inserter handle to rigidly affix the implant in place.

Figure 28

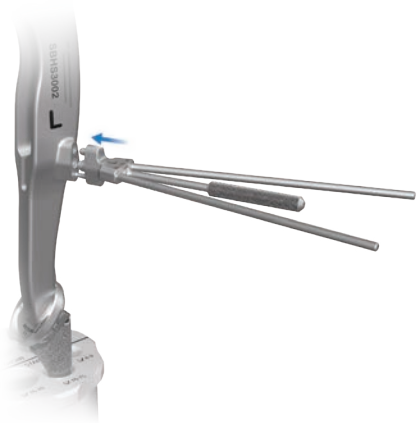


Figure 29

Figure 30

Figure 31

Place the Humeral Tray implant into the Humeral Stem with the suture hole fin aligned laterally (Figure 28). Using a mallet, firmly strike the Inserter until the taper junction is secure. Remove the Humeral Stem/ Humeral Tray construct from the Back Table Assembly Stand. If desired, thread the Version Rod Coupling into the Humeral Tray Inserter hole with the appropriate side engraving ("R" for right shoulder, "L" for left shoulder) (Figure 29).

If press-fitting, insert the implant into the canal. Impact until the stem/tray assembly is fully seated (Figure 30).

If cementing, use lavage and suction to clean the humeral canal. Dry the canal and retrograde fill it with doughy cement. Insert the implant into the canal. Impact until the stem is fully seated. Remove all excess cement. Allow the cement to fully cure prior to implanting the Humeral Bearing.

Align the selected Humeral Bearing implant double etch marks to the medial double etch marks on the Humeral Tray implant (Figure 31).

Figure 32

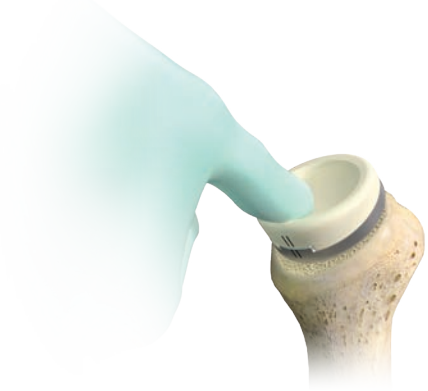


Figure 33

Figure 34

Figure 35

Tilt the Bearing so that the lateral "toe" engages into the lateral undercut of the Humeral Tray (Figure 32). Using finger pressure, press down on the medial side of the Bearing to seat the implant (Figure 33). The Humeral Bearing will make an audible click when it fully seats into the Humeral Tray.

Note: There is some evidence that the subscapularis improves the stability of the implant. When possible, the subscapularis should be repaired at the completion of the procedure, as long as it does not significantly reduce external rotation [3].

APPENDIX 1 - HUMERAL PREPARATION AND TRIALING – INSET HUMERAL TRAY

Remove the Humeral Protector. Place a Neutral Tray Reamer Guide into the oval taper of the Humeral Rasp (Figure 34). The white "N" Tray reamer guide corresponds to the EXT Tray and the orange "XEXT" Tray Reamer Guide corresponds to the XEXT Tray. Attach the Humeral Tray Reamer to power or a T-Handle. Slide the Humeral Tray Reamer over the Reamer Guide. Lift the Reamer off the resection surface and begin rotating prior to contacting bone. Ream until bottoming out on the smooth proximal surface of the Rasp (Figure 35).

Disengage the Tray Reamer Guide from the Rasp. If implanting a small humeral stem, there may be a thin wafer of A/P bone adjacent to the Rasp. Use Rongeurs to remove the bone wafer.

[3]Werner BC. Wong AC. Mahony GT. Craig EV, Dines DM, Warren RF, Gulotta LV. Clinical Outcomes After Reverse Shoulder Arthroplasty With and Without Subscapularis Repair: The Importance of Considering Glenosphere Lateralization. J Am Acad Orthop Surg. 2018 Mar 1:26(5)e114-e119

Figure 36

Figure 37

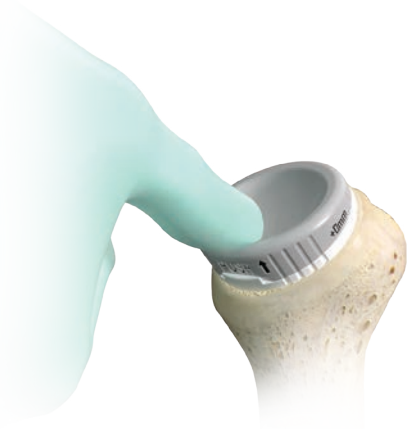


Figure 38

Insert humeral tray trial into the rasp that corresponds with the tray reaming guide used (Figure 36). Humeral Bearings are size-matched to the chosen Glenosphere size (36 or 40mm) and come in +0mm and +3mm heights. Tilt the Bearing Trial so that the "lateral toe" tucks into the lateral undercut in the Tray Trial (Figure 37). Using thumb pressure, push down on the medial lip to snap the Bearing Trial in place (Figure 38).

Reduce the joint to assess deltoid tension and range of motion. The joint should be stable throughout the range of motion. If the joint feels too lax, then switch to a +3mm Bearing Trial. To disengage the bearing trial, use thumb pressure on "Push" engraving on the medial side of the trial. If the joint still feels lax, then insert a +0mm Humeral Tray Trial. Continue progressively building up height in the Tray/Bearing Trials until attaining appropriate tension. If additional lateralization is needed use the +3 bearing. If the joint feels too tight, then decrease the Tray/Bearing Trial height combination. Continue progressively reducing height until attaining appropriate tension.

Note: There are no retentive Uniform Thickness Bearings. For cases of instability, switch to a 12° bearing or a 12° Retentive bearing. Retentive Bearings capture more of the glenosphere and have polyethylene walls which are 2–3 mm higher than standard bearings but do not add joint tension.

Figure 39

Figure 40

Figure 41

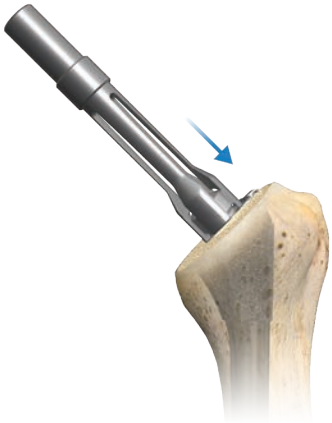


Figure 42

APPENDIX 2 - CONVERSION FROM ANATOMIC TO REVERSE

Conversion Introduction

A properly aligned and well-fixed Identity humeral stem implant may be utilized when converting from anatomic to reverse. Ensure the stem is aligned properly especially if using Uniform Thickness Bearings. A varus stem must be corrected to 135° of inclination when combined with Uniform Thickness Bearings or use of a 12° bearing should be considered. If keeping the stem, the head and head adapter must be removed following the instructions below. If removing the stem, that may be completed after head and head adapter removal.

Humeral Head and Adapter Removal (Conversion introduction)

From the anterior side of the humerus, align the Humeral Head Remover Base to the head implant underside (Figure 39). Using a mallet, strike the Remover Base to advance it along the Head underside until the slot in the instrument makes contact with the humeral adapter implant. Slide the Thin Humeral Head Remover into the Base and strike with a mallet until the head dissociates (Figure 40). If necessary, progress to the Thick Humeral Head Remover. Discard the humeral head implant.

With the humeral adapter exposed, use the Straight Osteotome to clear away bone or cement around the proximal medial area around the humeral stem. The full anterior, posterior and medial surfaces of the Stem must be visible for the Remover to work (Figure 41). Slide the Adapter Remover Collet over the adapter taper until it snaps into place (Figure 42). The base of the adapter implant taper has a circumferential groove. The Collet has an internal lip that will engage this groove.

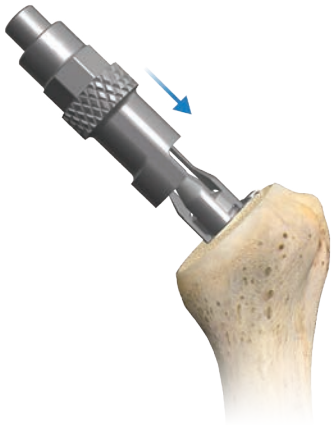


Figure 43

Figure 44

Figure 45

Figure 46

The Adapter Remover Sleeve comes in 135° and 125° versions. The 125° version is used to explant a 125° humeral adapter. All other adapter implants require use of the 135° Remover Sleeve. Place the appropriate Adapter Remover Sleeve over the Remover Collet (Figure 43). The Remover Sleeve should be oriented with the flange aligned medially. The Sleeve should bottom out when contacting the anterior, posterior and medial surfaces of the humeral stem.

Thread the Humeral Revision Nut onto the Remover Collet until hand tight (Figure 44). If the Nut will not thread onto the Collet, either the parts are rotationally misaligned or there is bone or cement that must be removed around the A/P or medial sides of the stem.

With a Revision Wrench aligned medial, slide the Wrench onto the Remover Sleeve with flat sides mating (Figure 45). Place a second Wrench onto the Revision Nut at 45° counterclockwise to the first Wrench (Figure 46). Holding the bottom Wrench stationary in one hand, rotate the top Wrench medially in an effort to disengage the adapter from the stem. Do not rotate the top wrench past the bottom wrench. If necessary, reposition the top wrench to its original 45° position and repeat until adapter disengagement.

(EXT Guide) (XEXT Guide)

Figure 47

Figure 48a

Figure 48b

Proximal Humeral Preparation

If humeral stem version is acceptable, place the appropriate humeral tray reamer guide into the oval taper of the humeral stem. (Figure 47).

- **If implanting an inset humeral tray**, then attach the silver Humeral Tray Reamer to power or a T-Handle. Slide the Humeral Tray Reamer over the Reamer Guide. Lift the Reamer off the resection surface (Figure 48a) and begin rotating prior to contacting bone. Ream until bottoming out on the Reamer Guide. Proceed to the **Proximal Humeral Trialing – inset Humeral Trays** section of the technique for subsequent surgical steps.
- **If implanting an onlay humeral tray**, then attach the gold Humeral Tray Onlay Reamer to power or a T-Handle (Figure 48b). Slide the Humeral Tray Reamer over the Reamer Guide. Lift the Reamer off the resection surface and begin rotating prior to contacting bone. Ream until bottoming out on the Reamer Guide. Proceed to the **Proximal Humeral Trialing – Onlay Humeral Trays** section of the technique for subsequent surgical steps.

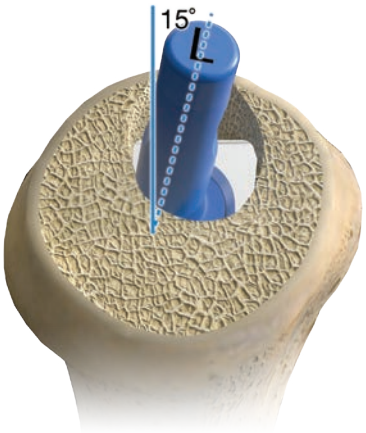


Figure 49a

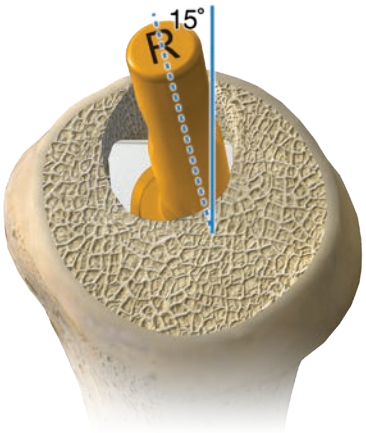


Figure 49b

If humeral stem version needs to be reduced, place the side appropriate (Right or Left, based on operative arm) Humeral Tray Reamer Guide into the oval taper of the humeral stem. The Left "L" (Figure 49a) and Right "R" (Figure 49b) Reverse Reamer Guides will decrease retroversion by 15°. Ream the proximal bone with the silver Humeral Tray Reamer. Note: The left and right Humeral Tray trials and implants come in -6mm and +0mm heights. Be certain to select the appropriate side humeral tray trial and implant

Place the appropriate Humeral Tray Trial into the Humeral Stem. Humeral Bearings are size-matched to the chosen Glenosphere size (36 or 40mm) and come in +0mm and +3mm heights. Tilt the Bearing Trial so that the "lateral toe" tucks into the lateral undercut in the Tray Trial. Using thumb pressure, push down on the medial lip to snap the Bearing Trial in place.

Reduce the joint to assess deltoid tension and range of motion. The joint should be stable throughout the range of motion. If the joint feels too lax, then switch to a +3mm Bearing Trial. To disengage the bearing trial, use thumb pressure on "Push" engraving on the medial side of the trial. If the joint still feels lax, then insert a taller Humeral Tray Trial. Continue progressively building up height in the Tray/Bearing Trials until attaining appropriate tension. If the joint feels too tight, then decrease the Tray/Bearing Trial height combination. Continue progressively reducing height until attaining appropriate tension.

Note: There are no retentive Uniform Thickness Bearings. For cases of instability, switch to a 12° bearing or a 12° retentive bearing. Retentive Bearings capture more of the glenosphere and have polyethylene walls which are 2–3 mm higher than standard bearings but do not add joint tension.

Figure 50

Using the Humeral Tray Inserter with the handle fully open, attach the selected humeral tray implant to the Inserter with the medial etch mark on the Inserter aligned to the anti-rotation tab on the Humeral Tray implant. Close the Inserter handle to rigidly affix the tray implant in place.

Place the Humeral Tray implant into the Humeral Stem with the suture hole fin aligned laterally (Figure 50). Using a mallet, firmly strike the Inserter until the taper junction is secure.

Align the selected Humeral Bearing implant double etch marks to the medial double etch marks on the Humeral Tray implant. Tilt the Bearing so that the lateral "toe" engages into the lateral undercut of the Humeral Tray. Using finger pressure, press down on the medial side of the Bearing to seat the implant. The Humeral Bearing will make an audible click when it fully seats into the Humeral Tray.

Figure 51

Figure 52

Figure 53

Figure 54

APPENDIX 3 - HUMERAL STEM REMOVAL

If the humeral stem needs to be explanted, use the Osteotomes to dissociate proximal bone from the implant. The Straight Osteotome can be used along the anterior, lateral and posterior sides of the implant (Figure 51). The Curved Osteotome can be used along the medial side of the implant (Figure 52).

Over the back table, thread the Extractor Bolt into the Humeral Rasp/Stem Extractor. In axial alignment to the humeral canal, thread the Rasp/Stem Extractor to the humeral stem using the Extractor Bolt (Figure 53), tightening by hand. If necessary, use the 3.5mm Hex Driver to fully tighten the Extractor Bolt. Using a mallet, strike the underside of the Extractor to remove the humeral stem (Figure 54). If greater force is required to remove the stem, the Comprehensive Shoulder System Slide Hammer can be threaded into the Extractor.

Figure 55

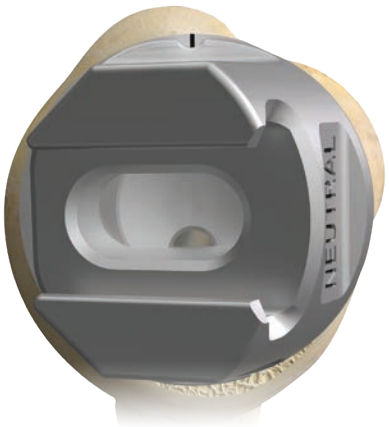


Figure 56

Figure 57

APPENDIX 4 - REVERSE REVISION

If a reverse humeral tray needs to be revised, use an osteotome to lever out the bearing implant. Use caution to avoid the medial anti-rotation tab on the humeral tray.

Determine which humeral tray implant is in place based on the etch marking: Neutral, Left or Right. Select a Humeral Tray Remover Base that corresponds to the tray implant (Figure 55).

Position the Remover Base so that the cut-in aligns, with the single etch mark on the lateral side of the humeral tray (Figure 56). Rotate the Remover Base clockwise 90° so that the side etching (Neutral, Left or Right) is aligned medially (Figure 57).

Figure 58

Figure 59

Figure 60

Figure 61

Using one hand, insert the Tray Remover Slider into the Remover Base channel (Figure 58). Using the other hand, insert the Tray Remover Threaded Rod through the Slider and into the humeral tray implant (Figure 59). Tighten the Threaded Rod by hand until fully seated into the humeral stem.

Caution: The Tray Remover Base does not have a stop to prevent the Slider from disengaging. Manually hold the Slider in place while inserting the Threaded Rod to establish definitive engagement.

Place a Humeral Revision Wrench on the Slider aligned medially (Figure 60). Place a second Wrench on the Threaded Rod aligned clockwise (Figure 61) at a 45° angle to the first wrench. Rotate the top Wrench medially in an effort to disengage the humeral tray from the stem. Do not rotate the top wrench past the bottom wrench. If necessary, reposition the top wrench to its original 45° position and repeat until tray disengagement.

Figure 62

Figure 63

APPENDIX 5– REMOVING A STUCK RASP/STEM

In the event a Rasp gets stuck in the humerus, it can be removed using the Rasp/Stem Extractor from the Revision Instrument case. Thread the Extractor Bolt through the Rasp/Stem Extractor (Figure 62). Thread the Rasp/Stem Extractor to the Rasp and tighten using the Hex Driver (Figure 63). Using a mallet, strike the underside of the Rasp/Stem Extractor to remove the Rasp. If greater force is required to remove the stem, the Comprehensive Shoulder System Slide Hammer can be threaded into the Extractor.

Magnet Usage and Symbols

MAGNET USAGE

Warning: Some instruments in the Identity Shoulder System contain magnets. These include the 135° and 125° Resection Guide Carriages, Resection Block Extension Post and Hex Pin Driver. **All magnetic instruments should be kept at a safe distance from a patient's active implantable medical device(s) (i.e. pacemaker)**. These types of devices may be adversely affected by magnets. Instruments containing magnets should be kept on an appropriate table or stand when not in use at the surgical site.

SYMBOLS

Symbols have been established for the following:

LEFT	L
RIGHT	R
NEUTRAL	N, NEU
SIZE	SZ
SMALL	S
MEDIUM	M
LARGE	L
BEARING	BRNG
RETENTIVE	RET
MICRO	MIC
STANDARD	STD
EXTENDED	EXT
EXTRA EXTENDED	XEXT

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