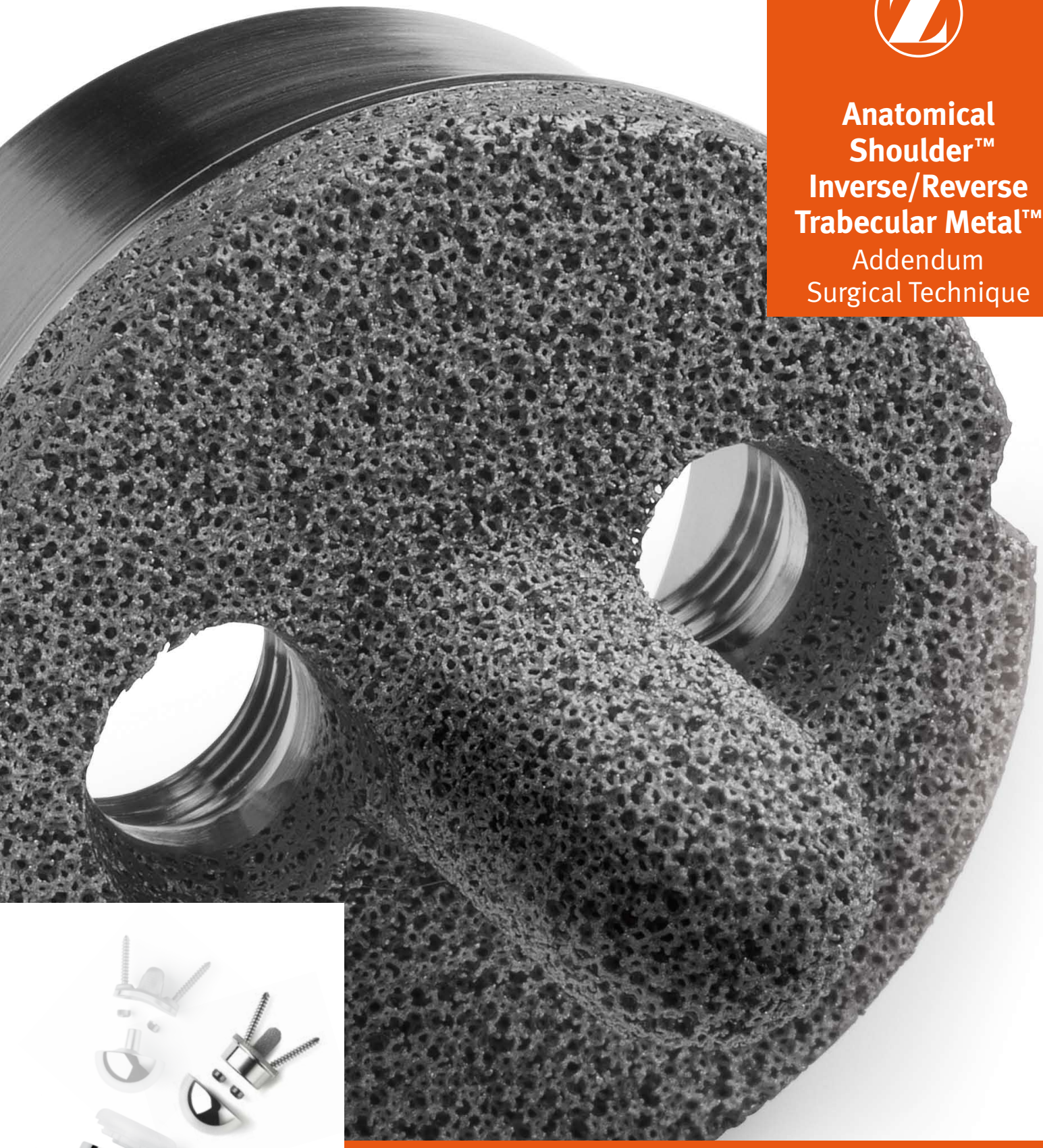
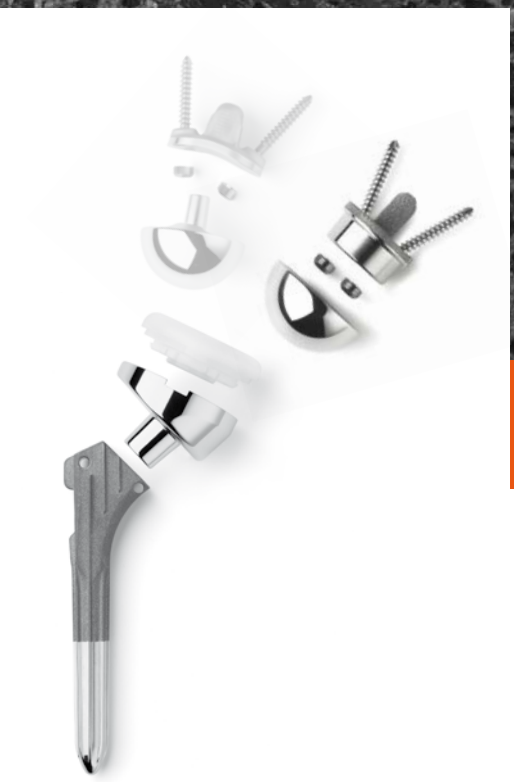
# Anatomical Shoulder™ Inverse/Reverse Trabecular Metal™

Addendum
Surgical Technique





Premium Ingrowth

zimmer

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# Addendum Surgical Technique Anatomical Shoulder Inverse/Reverse Trabecular Metal

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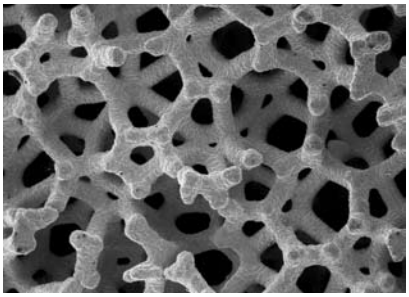
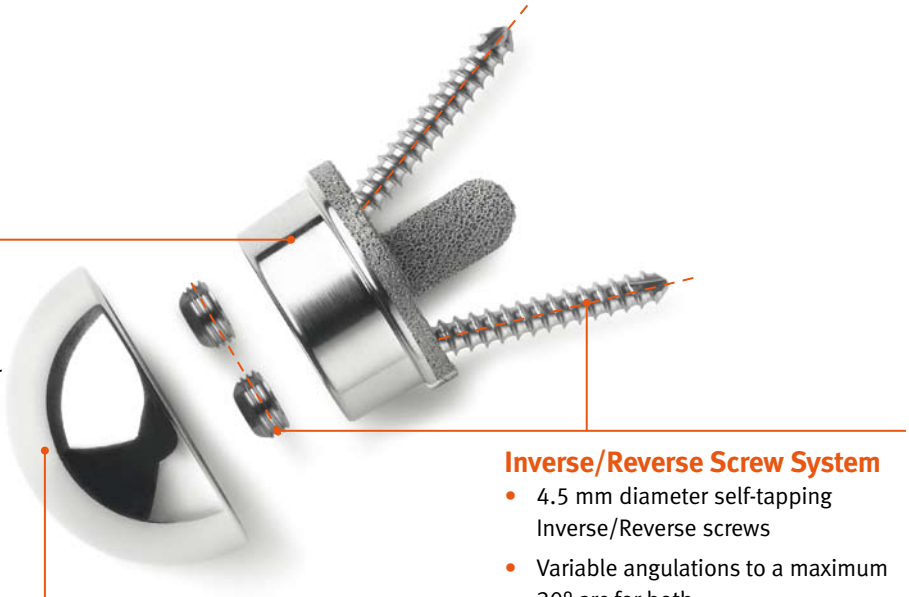


Biological Ingrowth of *Trabecular Metal*

The *Trabecular Metal* Technology is the leading orthopaedic porous fixation biomaterial.

It features a fully interconnected strut configuration and a close approximation of the physical and mechanical properties of trabecular bone.[1, 2] Initial implant stability is provided by the inherent high friction of *Trabecular Metal* Material against bone and soft tissue.[1, 2, 3] In human radiographic clinical studies, postoperative gaps have been shown to reliably fill with bone.[4]

The majority of the *Trabecular Metal* Material construct's void space is filled with bone at eight weeks postoperative.[2] The high-volume porosity and interconnected cellular structure of Trabecular Metal Material supports rapid soft-tissue ingrowth.[5]



### Trabecular Metal Base Plate

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

### Trabecular Metal Reverse Glenoid Heads

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

### Inverse/Reverse Screw System

- 4.5 mm 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
  - 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

# Surgical Technique

## Alternate Glenoid Preparation and Implant Fixation Using the *Zimmer Trabecular Metal* Reverse Shoulder System

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. 36) 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.

Fig. 36

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. 37

**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. 37).**

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. 38). 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. 39). This will place the glenosphere at the edge of the inferior glenoid bone.

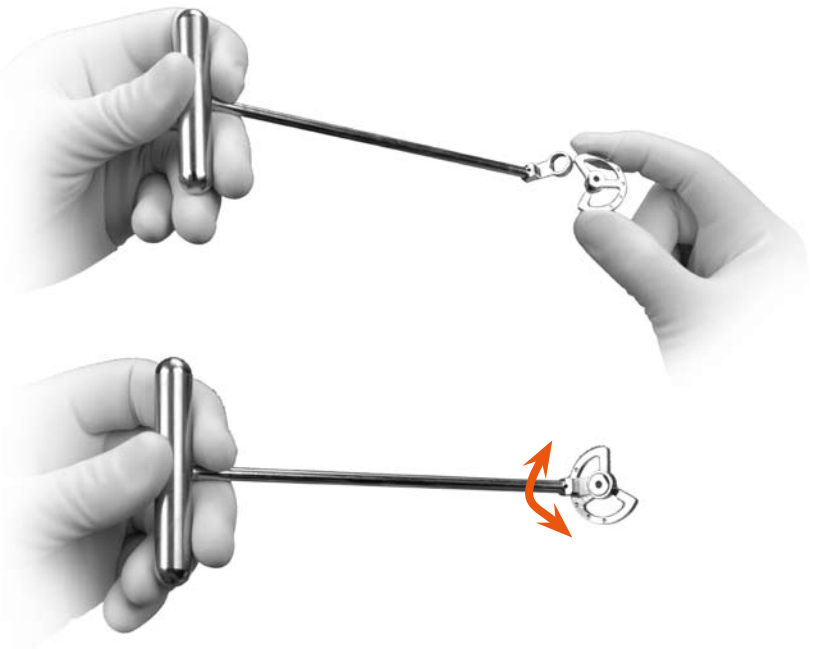


Fig. 38

Fig. 39

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

Load the 2.5 mm Pin into a K-wire driver or Jacobs chuck. The 2.5 mm Pin is marked for the appropriate insertion depth (Fig. 40). Insert the 2.5 mm Pin through Drill Guide 1 until the depth mark indicated on the pin meets the top of Drill Guide 1 (Fig. 41). Release the Pin from the K-wire driver or Jacobs chuck, and lift Drill Guide 1 from the glenoid leaving the 2.5 mm pin in place.

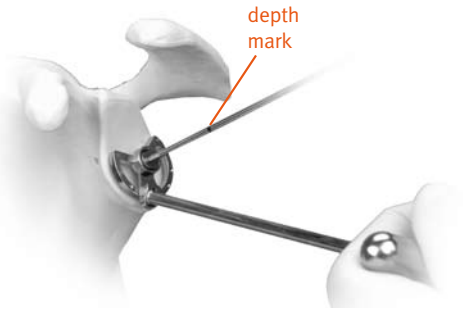



Fig. 40

Fig. 41

The 6 mm 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 6 mm Cannulated Drill. Place the Cannulated Drill assembly over the 2.5 mm Pin and drill until the housing collar is flush to the glenoid face (Fig. 42). The 6 mm Cannulated Drill and the 2.5 mm pin are now removed.

Fig. 42

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. 43 and 44).

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

Fig. 43

Fig. 44

Attach either the 36 mm or the 40 mm Base Plate Reamer 2 to the Cannulated Straight Driver assembly (Fig. 45). 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.

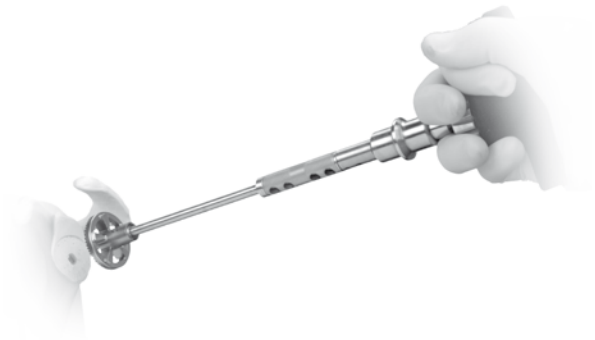


Fig. 45

**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 7.5 mm Drill, a 7.5 mm Cortex Drill and a 7.5 mm Compression plug, to aid in post hole preparation based on bone quality and surgeon preference (Fig. 46). 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.

7.5 mm Drill | 7.5 mm Cortex Drill | 7.5 mm Compression Plug

Fig. 46

## Poor Bone Stock:

When poor bone stock exists, use the 7.5 mm Cortex Drill (Fig. 47) to remove only the first 3 to 4 mm 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 7.5 mm Compression Plug to compress the cancellous bone in the vault prior to implant insertion.

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

Fig. 47

## Good Bone Stock:

Only if there is good hard bone, use the 7.5 mm Drill to ream bone for the full depth of the post of the base plate (Fig. 48).

Fig. 48

**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. 49 and 50). 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. 51). Care should be taken to avoid tipping the Base Plate during insertion thus preventing circumferential contact.

Fig. 49

Fig. 50

Fig. 51

## Screw Insertion

The 2.5mm Drill Guide is inserted into the screw holes and oriented to prepare for screw insertion (Fig. 52).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 2.5 mm drill to power and drill the screw holes through the 2.5 mm drill guide and base plate at the desired orientation (Fig. 53). The 2.5 mm drill has lines corresponding to the screw lengths available.

Fig. 52

Fig. 53

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. 54 & 55).

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

Fig. 54

Fig. 55

Inverse/Reverse Screws are adjustable within a possible 30° arc (Fig. 56) 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. 57). 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.

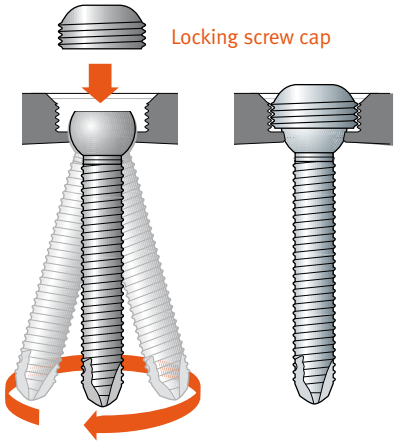



Fig. 56

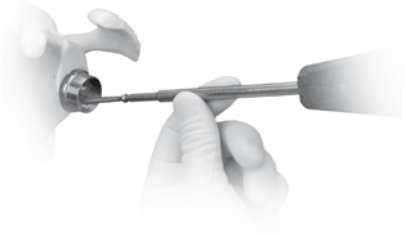


Fig. 57

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. 58). The locking screws are placed over the heads of the Inverse/Reverse Screws and the Locking Screw Holder is slid back (Fig. 59). 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. 60) must be pointing toward the screw. Additionally, to avoid misthreading, 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. 58

Fig. 59

Fig. 60

## 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. 61). If removal is intraoperative, the Base Plate can be removed by levering with an 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. 62). Thread down the bolts until the instrument is securely attached.

Fig. 61

Fig. 62

A Standard Slaphammer should be screwed into the body of the Base Plate Remover (Fig. 63). Repeatedly impact until the Base Plate has been removed.

Fig. 63

If not placed previously, attach a Trial Glenosphere Head to the Base Plate by hand or with the Glenosphere Helmet (Fig. 64).

Fig. 64

# 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 Inserter by threading the dual taper/spacer impactor into either the 36mm (green) or the 40mm (yellow) glenosphere helmet (Fig. 65). 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. 66 and 67). 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. 68). 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.

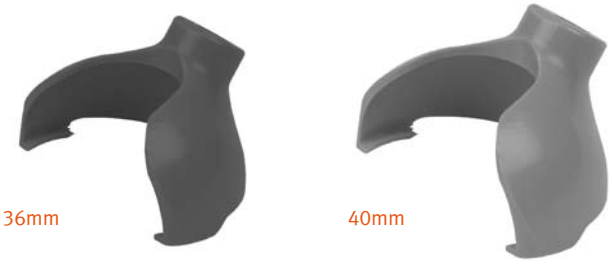



Fig. 65

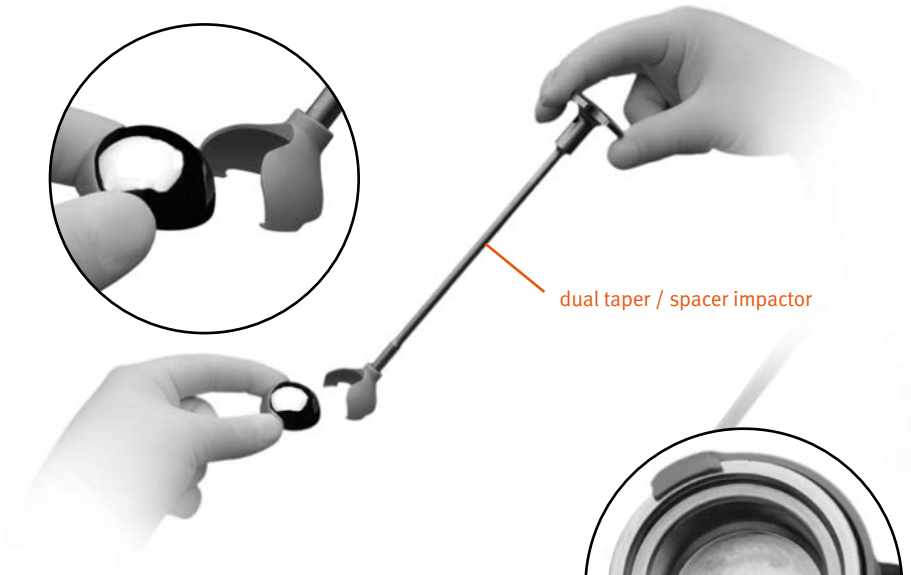



Fig. 66

Fig. 67

Fig. 68

**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. 69).**

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. 70). Pull on the glenosphere to verify the taper is locked. Reconfirm the circumferential engagement with the base plate. Reduce the joint and confirm range of motion.

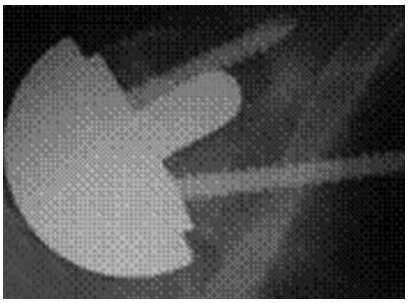


Fig. 69

Fig. 70

## 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. 71). 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.

Fig. 71

# Implants

## Trabecular Metal™ Reverse Glenosphere

Zimaloy® Co-Cr-Mo
ISO 5832-4

STERILE R

| ∅ mm | REF |
|---|---|
| 36 | 00-4349-036-11 |
| 40 | 00-4349-040-11 |

## Trabecular Metal™ Reverse Base Plate

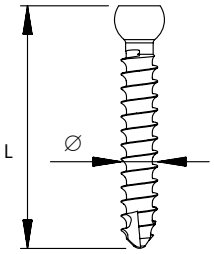
Tivanium® Ti-6Al-4V Alloy
Trabecular Metal™ (Tantalum)
ISO 5832-3

STERILE R

| REF |
|---|
| 00-4349-038-11 |

## Inverse/Reverse Screw System

Protasul®-64WF
ISO 5832-3



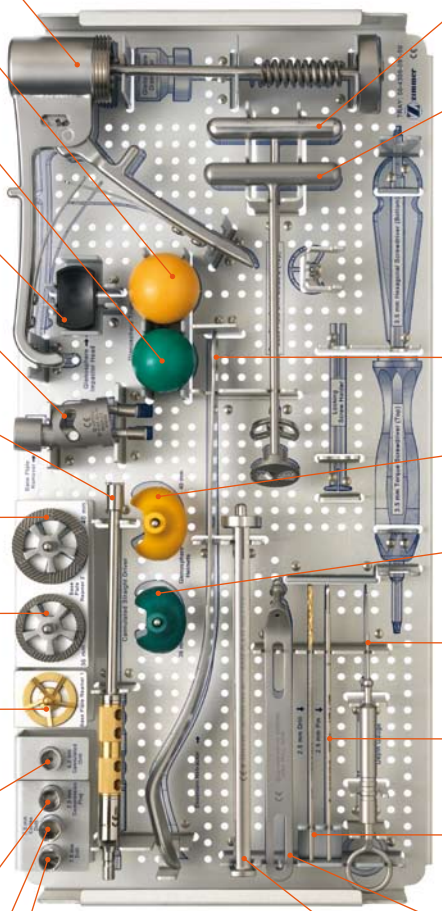

STERILE R

| ∅ mm | L mm | REF |
|---|---|---|
| 4.5 | 18 | 01.04223.018 |
| 4.5 | 24 | 01.04223.024 |
| 4.5 | 30 | 01.04223.030 |
| 4.5 | 36 | 01.04223.036 |
| 4.5 | 42 | 01.04223.042 |
| 4.5 | 48 | 01.04223.048 |

# Instruments

**Trabecular Metal™ Reverse Instrument Case (1 of 2) Upper Tray**
(empty) 00-4309-089-50

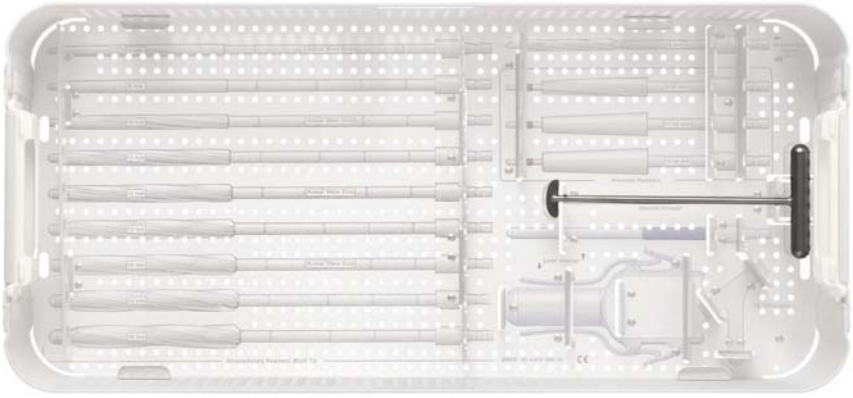
| Article | REF |
|---|---|
| **Glenosphere Distractor** | 00-4309-049-00 |
| **Glenosphere Trial 40 mm** | 00-4309-040-01 |
| **Glenosphere Trial 36 mm** | 00-4309-036-01 |
| **Glenosphere Impactor Head** | 00-4309-031-02 |
| **Base Plate Remover** | 00-4309-026-00 |
| **Straight Driver** | 00-4307-074-00 |
| **Base Plate Reamer 2, 40 mm** | 00-4309-042-01 |
| **Base Plate Reamer 2, 36 mm** | 00-4309-042-00 |
| **Base Plate Reamer 1** | 00-4309-041-00 |
| **Cannulated Drill w/Stop 6.0 mm** | 47-4307-061-00 |
| **Compression Plug 7.5 mm** | 00-4309-045-02 |
| **Cortex Drill 7.5 mm** | 00-4309-045-01 |
| **Base Plate Drill 7.5 mm** | 00-4309-045-00 |



| Article | REF |
|---|---|
| **Drill Guide 1** | 00-4309-043-00 |
| **Drill Guide 2** | 00-4309-022-00 |
| **Shoehorn Retractor** | 00-4309-070-00 |
| **Glenosphere Helmet 40 mm** | 00-4309-071-40 |
| **Glenosphere Helmet 36 mm** | 00-4309-071-36 |
| **Depth Gauge** | 00-4309-048-00 |
| **Pin 2.5 mm** | 00-4309-025-00 |
| **Drill 2.5 mm** | 00-4309-046-01 |
| **Screw Drill Guide** | 00-4309-046-00 |
| **Base Plate Inserter** | 00-4309-044-00 |

## Trabecular Metal™ Reverse Instrument Case (2 of 2) Lower Tray

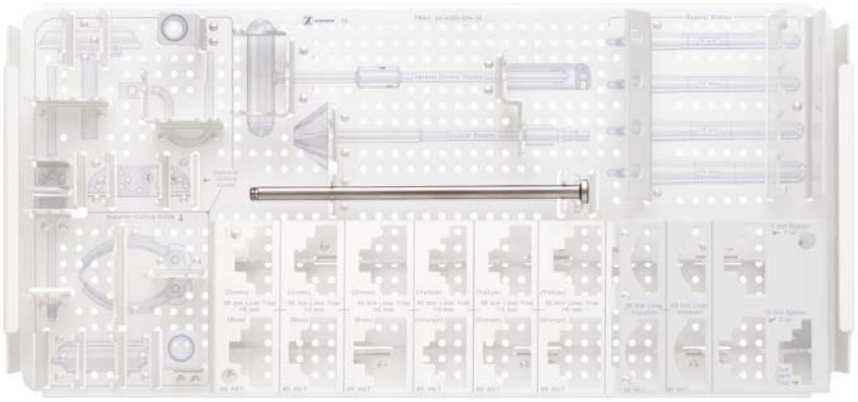
00-4309-089-50



| Article | REF |
|---|---|
| Glenoid Scraper | 00-4301-018-00 |

## Trabecular Metal™ Reverse Instrument Case (1 of 2) Upper Tray

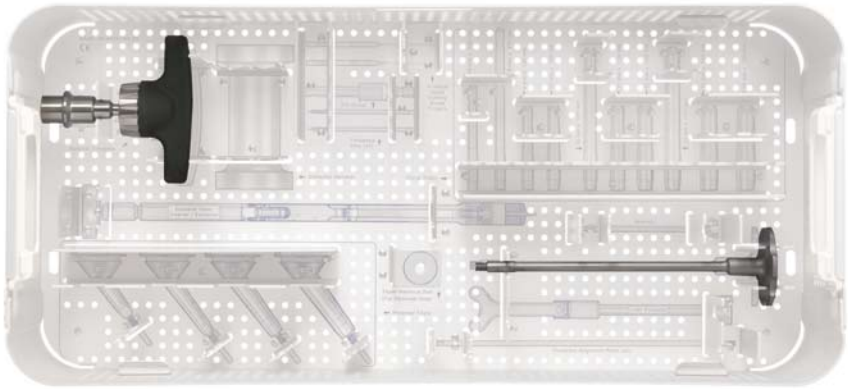
00-4309-092-50



| Article | REF |
|---|---|
| Impactor Handle | 00-4309-029-02 |

## Trabecular Metal™ Reverse Instrument Case (2 of 2) Lower Tray

00-4309-092-50



| Article | REF |
|---|---|
| Ratchet T-Handle | 00-4301-004-00 |
| Dual Taper/Spacer Impactor | 00-4309-039-00 |

Zimmer Shoulder Solutions


1 Bobyn JD, Hacking SA, Chan SP, et al. Characterization of new porous tantalum biomaterial for reconstructive orthopaedics, Scientific Exhibition: 66th Annual Meeting of the American Academy of Orthopaedic Surgeons; Anaheim, CA. Bobyn JD, Stackpool G, Toh K-K, et al. Characteristics of bone ingrowth and interface mechanics of a new porous tantalum biomaterial. JBJS 1999; 81–B: 907–914.

2 Bobyn JD, Hacking SA, Krygier JJ, Chan SP, Toh KK, Tanzer M, "Characterization of a New Porous Tantalum Biomaterial for Reconstructive Surgery", 66th Annual Meeting of the American Academy of Orthopaedic Surgeons; Anaheim, CA, Feburary 4–8. 1999, Scientific Exhibit.

3 Zhang Y, Ahn PB, Fitzpatrick DC, Heiner AD, Poggie RA, Brown TD, "Interfacial frictional behavior: Cancellous bone, cortical bone and a novel porous tantalum biomaterial", Journal of Musculoskeletal Research, 3(4): 245–251, 1999.

4 Gruen T, Hanssen A, Lewallen DG, Lewis R, O'Keefe T, Stulberg SD, Sutherland C, Poggie RA, "Radiographic Evaluation of a Monoblock Acetabular Component – A Multi-Center Study With 2 To 5 Year Results", The Journal of Arthroplasty, Vol. 20, No. 3, April 2005, pp 369–378.

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



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