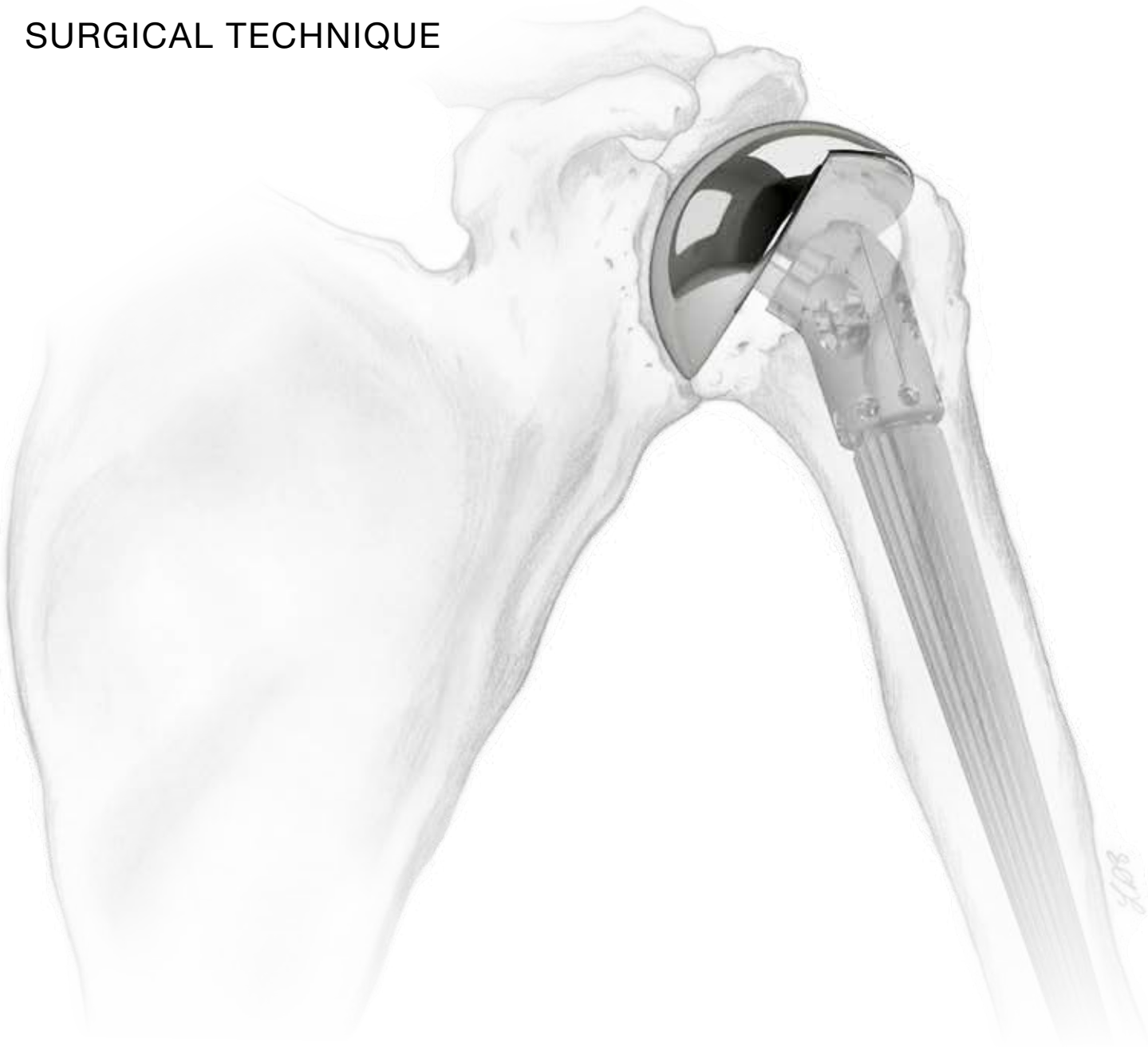
SMR

MODULAR SHOULDER REPLACEMENT

SMR REVISION

SURGICAL TECHNIQUE



Lima Corporate

Orthopaedic motion

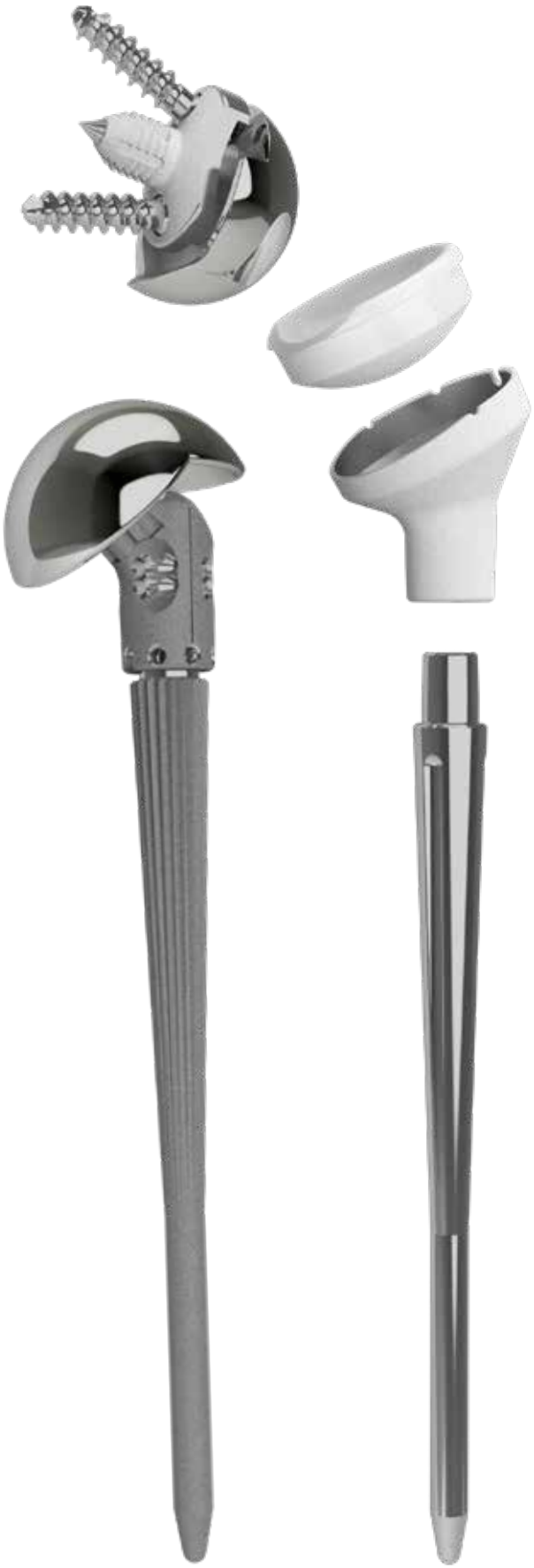
SMR REVISION SURGICAL TECHNIQUE
Index

Limacorporate S.p.A., as manufacturer of prosthesis device, does not practice medicine. This surgical technique brochure has been developed in consultation with an experienced surgeons team and provides the surgeon with general guidance when implanting SMR REVISION. Proper surgical procedures and techniques are necessarily the responsibility of the medical professional. Each surgeon must evaluate the appropriateness of the surgical technique used based on personal medical training, experience and clinical evaluation of each individual patient. For further information about our products, please visit our web site at www.limacorporate.com

SMR

MODULAR SHOULDER REPLACEMENT

SMR SYSTEM



The clinically proven LimaCorporate SMR Modular Shoulder System allows the choice of shoulder prosthesis to evolve with the pathology encountered whether it is fracture hemi, total shoulder, reverse shoulder or revision[1,2,3,4,5,6,7].

SMR Revision provides a series of long cemented and cementless stems to enable distal fixation in revision and bone loss cases.

The stem has a dual conicity to provide a good press-fit in the humeral canal. The revision stems could be coupled with reverse or anatomical components in order to have the optimal configuration according to the clinical situation.

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[6] K. Mohammed, A. Slaven. Reliable osteointegration of a metal back glenoid in conventional total shoulder arthroplasty at minimum 3 years follow up. J Bone Joint Surg Br. 2012; 94-B (Supp XXI): 57-57.

[7] R. Postacchini, A. Castagna, M. Borroni, G. Cinotti, F. Postacchini, S. Gumina. Total shoulder arthroplasty for the treatment of failed hemiarthroplasty in patients with fracture of the proximal humerus. J Shoulder Elbow Surg. 2012 Mar 3.

Indications, contraindications and warnings

INDICATIONS

The SMR Shoulder System is intended for partial or total, primary or revision shoulder joint replacement in skeletally mature patients.
The SMR Anatomic Shoulder System is indicated for partial or total, primary or revision shoulder joint replacement in patients suffering from disability due to:

- non-inflammatory degenerative joint disease including osteoarthritis and avascular necrosis;
- inflammatory degenerative joint disease such as rheumatoid arthritis;
- treatment of acute fractures of the humeral head that cannot be treated with other fracture fixation methods;
- revision of a failed primary implant;
- cuff tear arthropathy (CTA Heads);

The Large Resection Stems are indicated for oncology applications.
The SMR Reverse Shoulder System is indicated for primary, fracture or revision total shoulder replacement in a grossly rotator cuff deficient joint with severe arthropathy (disabling shoulder). The patient's joint must be anatomically and structurally suited to receive the selected implants and a functional deltoid muscle is necessary to use the device.

The Modular SMR Shoulder System allows the assembly of components in various humeral and glenoid constructs. The constructs are intended for cemented and uncemented use as specified in the following table.

In the Anatomic shoulder the humeral construct consists of the humeral stem, the humeral body, the adaptor taper and the humeral head.
In the Reverse shoulder the humeral construct consists of the humeral stem, the reverse humeral body and the reverse liner. On the humeral side the fixation of the humeral stem determines if the construct is cemented or uncemented.

The Anatomic glenoid construct consists of an all polyethylene glenoid or a metal back assembled with a liner while the Reverse glenoid construct consists of the metal back, the connector and the glenosphere. On the glenoid side, the fixation of the all polyethylene glenoid or the metal back determines if the construct is cemented or uncemented.

Consult instruction for use provided in the product package

System				Use	
Anatomic	Reverse	Components	Material	Cem	Not Cem
•	•	SMR Stems (Cemented, Cemented Revision)	Ti6Al4V	X	
•	•	SMR Stems (Cementless Finned, Cementless Revision)	Ti6Al4V		X
•	•	SMR Large Resection stems	Ti6Al4V	X	
•	•	SMR Modular Augments	Ti6Al4V	X	
•		SMR Humeral Bodies (Trauma, Finned)	Ti6Al4V	X	X
	•	SMR Reverse Humeral Body	Ti6Al4V	X	X
	•	SMR Reverse HA Coated Humeral Body	Ti6Al4V+HA		X
•		SMR Humeral Heads (Standard, CTA)	CoCrMo	X	X
			Ti6Al4V	X	X
•		SMR Adaptor Tapers (Neutral, Eccentric)	Ti6Al4V	X	X
•	•	SMR CTA Head Adaptor for Reverse Humeral Body	Ti6Al4V	X	X
	•	SMR Glenospheres	CoCrMo		X
			Ti6Al4V		X
			UHMWPE X-Lima +Ti6Al4V		X
	•	SMR Connectors	Ti6Al4V		X
	•	Reverse Liners	UHMWPE X-Lima	X	X
			CoCrMo	X	X
•		SMR Cemented Glenoids	UHMWPE	X	
•		SMR 3 Pegs Cemented Glenoids	UHMWPE X-Lima	X	
•	•	SMR Metal Back Glenoids	Ti6Al4V+PoroTi+HA		X
•		SMR Metal Back Liner	UHMWPE		X
•	•	SMR Bone screws	Ti6Al4V		X
	•	SMR Glenoid Plates	Ti		X
Material Standards					
Ti6Al4V (ISO 5832-3 - ASTM F1472) - CoCrMo (ISO 5832-12 - ASTM F1537) - Ti (ASTM F67) - UHMWPE (ISO 5834-2) - PoroTi Titanium Coating (ASTM F1580) – HA Hyroxyapatite Coating (ISO 13779)					

Indications, contraindications and warnings

WARNINGS

In selecting patients for surgery, the following factors can be critical to the eventual success of the procedure:

- **Partial Shoulder replacement:** in cases with a deficient or unreconstructable rotator cuff, a CTA-head is indicated;
- **Total Shoulder replacement:** the rotator cuff must be intact or reconstructable. In cases with a deficient and unreconstructable rotator cuff, a hemiprosthesis with a CTA head or a Reverse Total Shoulder Arthroplasty is indicated.
- **Reverse Shoulder replacement:** the bone stock of the glenoid and humerus must be able to support the implant. In cases with significant bone loss and in which adequate fixation on the glenoid side cannot be obtained, a hemiarthroplasty with a CTA-head should be preferred.

Note. With CTA heads the use of Trauma Humeral Bodies is recommended to avoid possible impingement between the head and the body when using the Finned Humeral Body and the eccentric tapers in the lower position.

Note. The size Large metal back is not suitable for coupling with 36 mm and 40 mm glenospheres.

Note. The Dia. 50, 52 and 54 mm Humeral Heads with + 3mm increased height cannot be coupled to the Long Adaptor Tapers (both concentric and eccentric). The Dia. 52 and 54 mm Humeral Heads with + 2mm increased height cannot be coupled to the Long Adaptor Tapers (both concentric and eccentric).

CONTRAINDICATIONS

Absolute contraindications include

1. local or systemic infection;
2. septicaemia;
3. persistent acute or chronic osteomyelitis;
4. confirmed nerve lesion compromising shoulder joint function;
5. deltoid muscle insufficiency.

Relative contraindications include:

- vascular or nerve diseases affecting the concerned limb
- poor bone stock (for example due to osteoporosis or extended previous revision surgery) compromising the stability of the implant;
- metabolic disorders which may impair fixation and stability of the implant;
- any concomitant disease and dependence that might affect the implanted prosthesis;
- metal hypersensitivity to implant materials.

In cases of bone tumors, use an appropriate system designed to treat cases requiring large bone resections (SMR Large Resections stems). The use of primary or revision implants not designed and intended for use in cases of bone resection may result in a poor outcome and / or failure of the implant or implant fixation.

RISK FACTORS

The following risk factors may result in poor results with this prosthesis:

- overweight;
- strenuous physical activities (active sports, heavy physical work);
- incorrect implant positioning;
- muscle deficiencies;
- wrong size of components;
- multiple joint disabilities;
- refusal to modify postoperative physical activities;
- patient history of infections or falls;
- systemic diseases and metabolic disorders;
- local or disseminated neoplastic diseases
- drug therapies that adversely affect bone quality, healing, or resistance to infection
- drug use or alcoholism;
- marked osteoporosis or osteomalacia;
- patient's resistance to disease generally weakened (HIV, tumour, infections);
- severe deformity leading to impaired anchorage or improper positioning of implants;
- use our combinations with products, prosthesis or instruments of another manufacturer
- error of operative technique

FOREWORD

Lima Corporate, as manufacturer of prosthesis device, does not practice medicine. This surgical technique brochure has been developed in consultation with an experienced surgeon team and provides the surgeon with general guidance when implanting SMR System. Proper surgical procedures and techniques are necessarily the responsibility of the medical professional.

Each surgeon must evaluate the appropriateness of the surgical technique used based on personal medical training, experience and clinical evaluation of each individual patient.

PREOPERATIVE PLANNING

Standard X-rays are used to assist with planning of the operation. It is recommended to use a normal ap-view in internal and external rotation as well as an axillary view, Bernageau or Morrison view. It is recommended to use a CT-Scan with three-dimensional reconstruction in fracture case and for planning the glenoid insertion.

If required an MRI can be used for clear examination of the extent of the bone deficit and to see the muscle/capsule quality. In post-traumatic cases, such as in special cases of disabling shoulder, a neurological exam is helpful for decision making.Templates are used in all osteoarthritic cases; they can also be used in fracture cases but often in a limited mode, depending on the type of fracture.

The x-ray templates provided for SMR have a 105% scale; digital templates are available as well.

The preoperative planning helps the surgeon to determine the size and alignment of the implant. The final decision should be made intraoperatively.

ANAESTHESIA

Shoulder surgery is one of the areas in which an understanding of the surgery and participation by the anaesthesiologist is extremely important for the outcome of the surgery. This applies to accurate preoperative evaluation of the patient as well as intra op techniques. They should have a good understanding of positioning of the patient on the table and postoperative pain management.

Shoulder prosthetic replacement can be performed with regional (scalenus) anaesthesia combined with sedation and/or with general anaesthesia. The modern technique of interscalenus block was introduced by Winnie in 1970 and soon became the standard for anaesthesia and postoperative pain management of shoulder surgery. Requested surgical positioning (beach chair position) must be accurately followed by the anaesthetic staff to avoid hypotension and consequent brain hypoperfusion. Artificial hypotension during surgery can only be performed under accurate anaesthetic control.

Postoperative analgesia is important and can be performed by intravenous, single-injection or "on demand" application of analgesics. Patient-controlled analgesia (PCA) is recommended.

POSITIONING

Shoulder arthroplasty is normally performed in a “beach-chair” position; the surgeon needs complete access to the shoulder joint. The arm is free or stabilized by arm-holders. The shoulder must be positioned off the edge of the table to afford unobstructed arm extension.

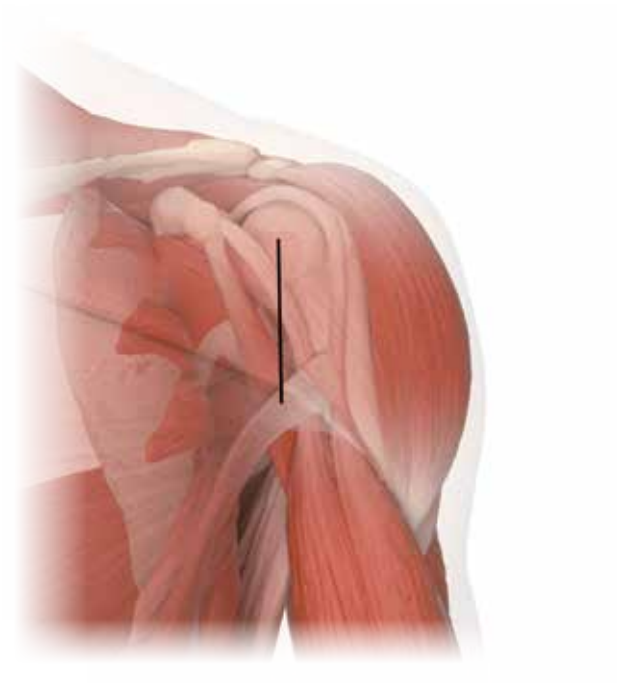
The patient’s head must be supported and stabilized in the neutral position. Nerve injury due to brachial plexus traction during positioning and surgery must be avoided. If possible, one assistant stays behind the shoulder, the second on the opposite side of the patient, so the surgeon has a complete anterior view of the shoulder and can move the joint without any obstacles.

ACCESS

We recommend two types of surgical approach to the shoulder joint. As in every surgical procedure, the access depends not only on diagnosis and planned surgical treatment but also on the experience of the surgeon.

Ranges of glenohumeral motion are evaluated with the patient under anaesthesia to confirm the preoperative assessment and the extent of capsular release needed to restore ROM postoperatively.

DELTO-PECTORAL APPROACH



Anterior vertical incision, starting 1 cm laterally of the coracoid bone, slanting towards the axillary's pouch.
If there is a metaphyseal fracture, slanting laterally towards the deltoid insertion at the humerus.

The cephalic vein is retracted laterally with the deltoid muscle.

The clavipectoral fascia is incised along the lateral edge of the conjoined tendon up to the coracoacromial ligament. With the clavipectoral fascia incised, a retractor can easily be placed over the superolateral aspect of the humeral head to retract the deltoid.

The conjoined tendon is retracted medially.
The musculocutaneous nerve penetrates the lateral coracobrachialis muscle between 3 and 8 cm distal to the tip of the coracoid process. The position of the axillary nerve should be indentified along the anterior surface of the subscapularis muscle, deep to the conjoined tendon. The axillary nerve crosses the inferolateral border of the subscapularis 3 to 5 mm medial to its musculotendinous junction and has an intimate anatomic relation with the inferior capsule of the shoulder joint.

The anterior humeral circumflex artery and veins are visualized, ligated and divided.

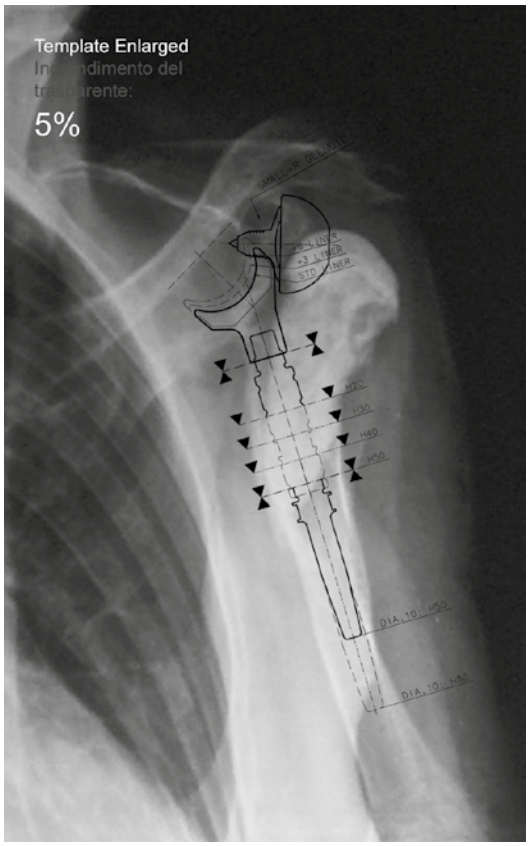
The subscapularis tendon is released, divided 1 cm medial to its attachment or with some bone chip of the lesser tuberosity. Separate the subscapularis from the capsule and the incision of the capsule is performed to the inferior border of the glenoid rim, protecting the axillary nerve with a blunt retractor. Release of the subscapularis and 360° capsular release.

Closure: In fracture cases, accurate reconstruction of the minor and major tubercles by suture, bone anchors or cerclage is mandatory. If the long head of the biceps tendon is intact, reconstruct also the biceps groove to avoid the impingement. Closure of delto-pectoral groove.

LATERAL (DELTOID SPLITTING) APPROACH

Begin the incision at the anterolateral tip of the acromion and carry it distally over the deltoid muscle about 5 cm. Define the tendinous interval 4 to 5 cm long between the anterior and middle thirds of the deltoid; splitting the muscle here provides an avascular approach to underlying structures.

Incise the thin wall of the subdeltoid bursa and explore the rotator cuff as desired by rotating and abducting the arm to bring different parts of it into view in the floor of the wound.



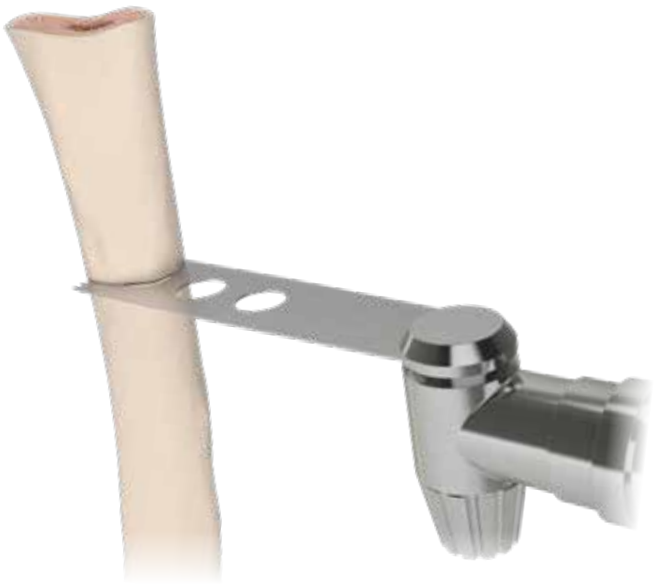


figure 1

FOREWORD

The technique described in this section deals with instrument set 9013.80.000 for large bone resections related to a primary implant on tumor or other prosthetic implant that has led to a consistent bone loss.
In this latter case, the described steps presume the prior removal of the existing implant.

LARGE RESECTIONS SYSTEM

CHOICE OF STEM SIZE

First perform a humeral osteotomy (Fig. 1). Assess the dimension of the final cemented stem by using the *trial resection stems (B8)*. Then assess the size of the *trial modular spacers (D8)* by marking a comparison with the resected bone portion. This assessment is useful for a preliminary evaluation of the spacer size to be used.

Note. If a reverse implant is performed, the glenoid part should be carried out before the preparation of the humerus. Proceed with glenoid preparation as described in chapter: "SMR Reverse Glenoid" on page 40.

figure 2

figure 3

FINAL STEM IMPLANT

Remove the stem of the selected size from the sterile packaging. Then fill the canal with cement and using the *stem impactor (C1)* insert the stem into the canal (Fig. 2). Pay special attention when cleaning any cement around the stem proximal portion (thread and taper) that can hinder spacer assembly on the stem. Wait for a few minutes for the cement to set and then proceed with the surgical sequence.

CHOICE OF SPACER SIZE

Assemble the selected trial spacer on the previously inserted stem using the *13 mm wrench (C8)*; it is also possible to combine more spacers in case of consistent resections (Fig. 3). Hold the inferior wrench in order to avoid the transmission of torsion to the humerus.

Note. Once the stem size and the spacer size have been determined, the choice of using a reverse prosthesis or a CTA head on the basis of the clinical case specifications can be made thanks to the implant modularity. Both cases are described in the present document: "Large Resections System - CTA Head" section on page 17 and "Large Resections System - Reverse" section on page 19.

figure 4

figure 5

LARGE RESECTIONS SYSTEM - CTA HEAD

INSERTION OF THE TRIAL IMPLANT

Insert the Medium, Long or Short *trial humeral body (G2)* with the corrected retroversion, fastening the screw with force using the *allen wrench (L2)*. Use the special *body stopper (H2)* inserted on the humeral body taper to avoid any humeral torsion. Insert the *STD trial adaptor (E2)* to the *trial head (B9)* of the desired size by hand and attach it to the cephalic taper of the trial humeral body (Fig. 4). Assess tension and coverage of the new joint in different motions and adjust the adaptors accordingly. Check the ratio with the glenoid and with the sub-acromial arch. Once the trial reduction has been carried out, remove the CTA trial head, the trial body and the trial spacer.

ASSEMBLE OF THE FINAL SPACER AND HUMERAL BODY

From the sterile package take out the spacer of the selected size and couple it with the stem first by screwing it manually and then by fastening it with the specially provided *13 mm wrench (C8)*. This way the spacer is permanently installed. If an additional spacer is installed, repeat the operation following the same procedure.

Insert the final humeral body on the spacer, applying the alignment rod to the introducer handle and line it up with the forearm again to obtain correct retroversion.

Assemble the implant complete with the *prosthesis introducer (A2)* (Fig.5).

Using the *body stopper (H2)* to prevent any humeral torsion, tighten the safety screw of the humeral body to lock the system.

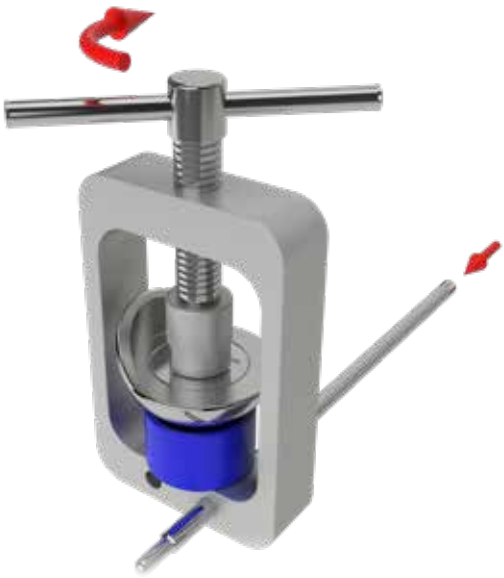


figure 6

figure 7

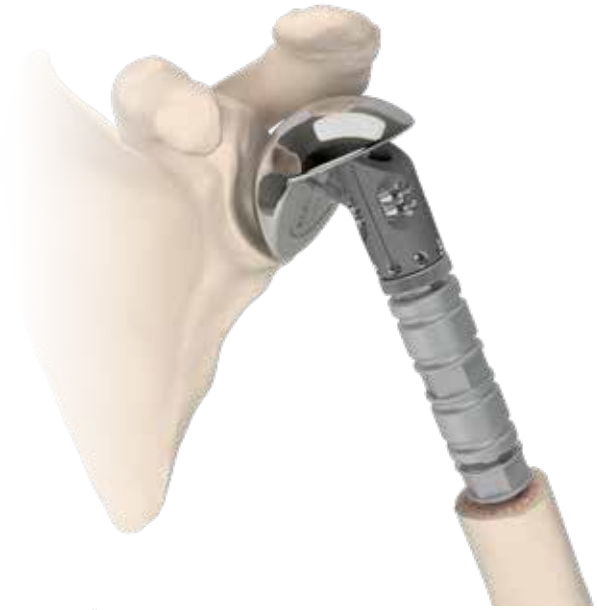


figure 8

ASSEMBLE OF THE FINAL CTA HEAD AND ADAPTOR

Take the adaptor taper and CTA head of the required size from the sterile package and fit the components together using the *humeral head press (R2)* (Fig. 6). If an eccentric adaptor is used, make sure that the marking is aligned with the lateral interline for cranial positioning of the head, or medial interline for caudal positioning (Fig. 7).

Use an intermediate position to increase or reduce the posterior offset of the head.

HUMERAL HEAD INSERTION AND REDUCTION

Apply the selected humeral head on the humeral body taper.

If an eccentric adaptor is used, apply the head making sure that the selected offset is observed. Make sure that the coupling surfaces are properly cleaned and that the head or adaptor do not interfere with the bone, which could compromise the stability of the morse coupling.

Make the coupling sturdy by gently tapping with the *humeral head impactor (Q2)*.

Reduce the joint and perform the usual articular movements (Fig. 8). Check that any glenoid osteophytes are carefully removed.

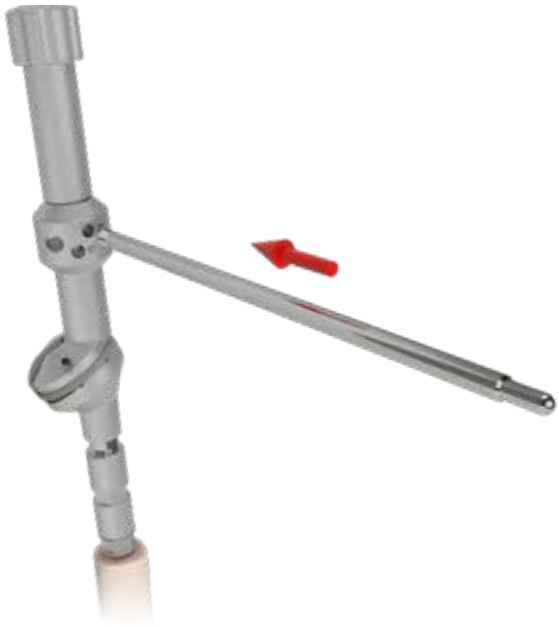


figure 9

figure 10

LARGE RESECTIONS SYSTEM - REVERSE

In the event of reverse prosthetic implant the glenoid part is carried out before preparation of the humerus.
If no Metal back glenoid has been implanted previously, please refer to "SMR Reverse Glenoid" on page 40.

INSERTION OF THE TRAIL REVERSE IMPLANT

Take the *trial reverse humeral body (H4)* from the instrument set and assemble it on the trial spacer (tapered fit).
Apply the mobile plastic part to the bottom of the *humeral body impactor (L4)* and assemble it by screwing the superior portion of the humeral impactor. Correct version is obtained using the alignment rod again (Fig. 9).
Choose the *trial liner (O4)* of the desired thickness and insert it by hand (Fig. 10). Reduce the trial glenosphere that has been implanted and assess the joint tension.

If required, make up for any deficit by inserting a +9 mm humeral extension.
Remove the trial reverse body using the following method: screw the *humeral body extractor (C4)* on the trial reverse humeral body and then the *universal extractor stem (D4)* in it; when resistance is felt, hold the knurled part tightly and screw in with force using the T handle. This splits the trial humeral body away from the trial spacer. Remove the trial spacer from the implanted stem using the 13 mm wrench.

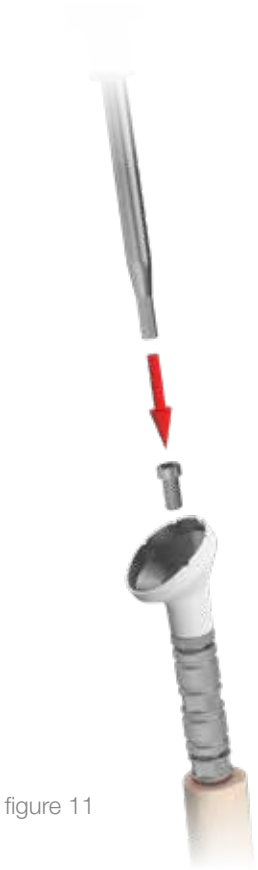


figure 11

figure 12

ASSEMBLY OF THE FINAL HUMERAL COMPONENTS AND REDUCTION

From the sterile package take out the spacer of the selected size and couple it with the stem first by screwing it manually and then by fastening it with the specially provided *13 mm wrench (C8)*. This way the spacer is permanently installed. If an additional spacer is installed, repeat the operation using the same procedure. Then manually screw the ring on the spacer proximal thread. The purpose of this component is purely aesthetic; if it is not implanted, prosthesis stability is not compromised.

Assemble the final humeral body on the final spacer with the use of the *humeral body impactor (L4)*. Correct version is obtained by using the alignment rod again. Screw the impactor tightly to join the spacer and humeral body.

The hole passing through the impactor can be used to insert the alignment rod, which is used here as a counter-torque.

Afterwards insert the safety screw of the reverse body and tighten with the dedicated *allen wrench (E4)* (Fig. 11).

Insert the previously decided liner and impact it with the *cemented glenoid impactor (E3)* (Fig. 12).

Reduce the joint and carry out the standard joint manoeuvres on the glenosphere previously implanted. Check that any humeral and glenoid osteophytes are carefully removed to avoid the risk of impingement.

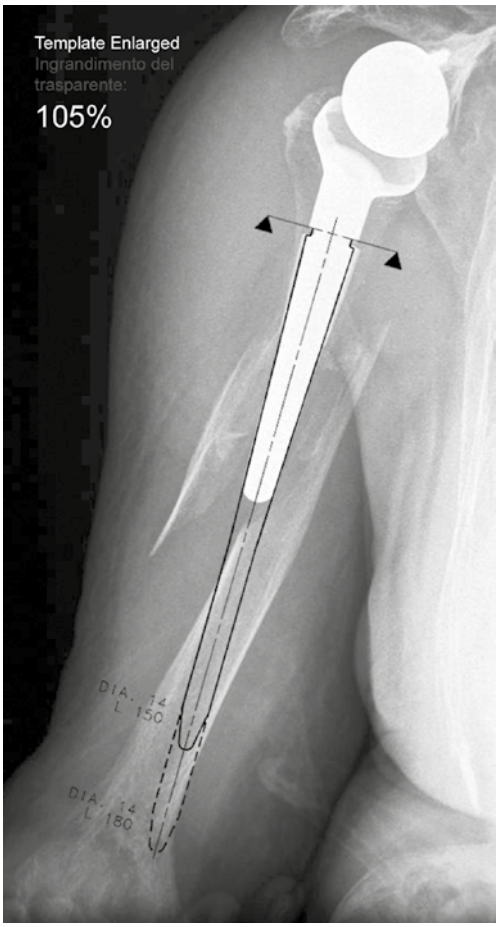


figure 1

FOREWORD

The technique described in this section deals with instrument set 9013.80.000 during a Lima Corporate SMR shoulder implant revision or other prosthetic implant.
The described phases involve prior removal of the existing prosthesis and implant of an SMR modular prosthesis with long cemented or cementless revision stem.

REVISION WITH LONG CEMENTLESS STEM

CHOICE OF STEM SIZE

Screw the *trial revision stem (A8)* onto the *stem impactor (C1)* as preoperative planning and gently tap it into the canal. Check that the component holds by pulling with decisive movements (Fig. 1). If it sinks in, repeat with increasing sizes until the correct size is found. Remove the device once the right stem size has been found.

If necessary, insert the *centimetre gauge (S2)* in its seat on the impactor handle and taking a specific point on the humeral stump, check the measurement indicated by the gauge. This measurement is then reproduced during the final stem insertion.

Note. Once the stem size has been determined the choice of using a reverse prosthesis or a CTA head on the basis of the clinical case specifications can be made thanks to the implant modularity. Both cases are described in the present document: "Revision with long cementless stem - CTA Head" section on page 22 and "Revision with long cementless stem - Reverse" section on page 24.

figure 2

figure 3

REVISION WITH LONG CEMENTLESS STEM - CTA HEAD

INSERTION OF THE TRIAL IMPLANT

Apply the Medium *trial humeral body (G2)* to the selected trial stem and secure the screw with force using the *allen wrench (L2)*. Insert the trial implant in the *prosthesis introducer (A2)* and fasten it by tightening the proximal screw (Fig. 2).

Before inserting in the canal, screw the *alignment rod (O2)* into the threaded hole on the prosthesis introducer and with the arm flexed at 90°, position the rod so that it is parallel with the forearm. In this position the implant will have a 30° retroversion. If a smaller retroversion angle is required, the rod should be externally rotated by the angle of choice.

Insert the stem into the canal, then remove the introducer by undoing the proximal screw.

Insert the *STD trial adaptor (E2)* to the *trial head (B9)* of the desired size by hand (Fig. 3) and attach it to the cephalic taper of the trial humeral body. Assess the soft tissue balancing and coverage of the new joint in different motions and adjust the adaptors accordingly until a good fit is found.

Once the trial reduction has been carried out, remove the CTA trial head, the trial body and the trial stem using the stem impactor.

figure 4

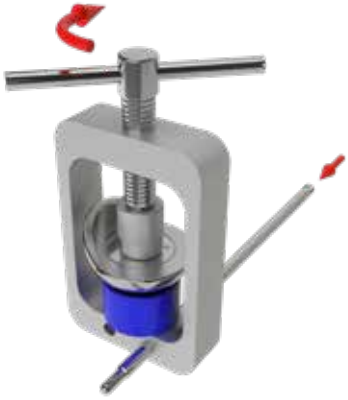


figure 5

figure 6

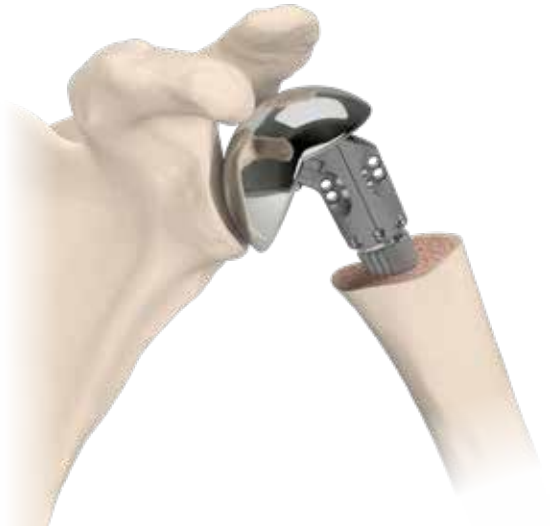


figure 7

INSERTION OF THE FINAL STEM AND HUMERAL BODY

Remove the stem and the Trauma humeral body of the size required from the sterile package. Assemble the final humeral body on the long stem using the *stem impactor (C1)* and tighten the safety screw with the allen wrench on a T-handle. Assemble the implant with the *prosthesis introducer (A2)*, tightening the proximal screw to lock the system. Before inserting the implant, apply the alignment rod to the introducer handle and line it up with the forearm again to obtain correct retroversion (Fig. 4). Tap the implant into the canal; loosen the proximal screw and remove the introducer.

ASSEMBLY OF THE FINAL CTA HEAD AND ADAPTOR

Take the adaptor taper and CTA head of the required size from the package and fit the components together using the *humeral head press (R2)* (Fig. 5). If an eccentric adaptor taper is used, make sure that the marking is aligned with the lateral interline for cranial positioning of the head, or medial interline for caudal positioning (Fig. 6). Use an intermediate position to increase or reduce the posterior offset of the head.

HUMERAL HEAD INSERTION AND REDUCTION

Apply the selected humeral head on the humeral body taper. If an eccentric adaptor is used, apply the head making sure that the selected offset is observed. Make sure that the coupling surfaces are properly cleaned and that the head or adaptor do not interfere with the bone, which could compromise the stability of the Morse coupling. Make the coupling sturdy by gently tapping with the *humeral head impactor (Q2)*. Reduce the joint and perform the usual articular movements (Fig. 7). Check that any glenoid osteophytes are carefully removed.

figure 8

figure 9

REVISION WITH LONG CEMENTLESS STEM - REVERSE

In the event of reverse prosthetic implant the glenoid part is carried out before preparation of the humerus. If no Metal back glenoid has been implanted previously, please refer to "SMR Reverse Glenoid" on page 40.

INSERTION OF THE TRIAL REVERSE HUMERAL BODY

Take the *trial reverse humeral body (H4)* from the instrument set and assemble it on the trial stem (tapered fit). Apply the mobile plastic part to the bottom of the *humeral body impactor (L4)* and assemble it by screwing the superior portion of the humeral impactor. Using the impactor, gently tap it into the metaphysis (Fig. 8) with the help of the alignment rod to obtain the version angle.

Choose the *trial liner (O4)* on the desired thickness and insert it by hand (Fig. 9).
Reduce the trial glenosphere that has been implanted and assess the joint tension. If required, make up for any deficit by inserting a +9 mm humeral extension. Remove the trial implant using the *stem impactor (C1)*.

Note. To disassemble the reverse humeral body from the trial stem use the following method: screw the *humeral body extractor (C4)* on the trial reverse humeral body and then the *universal extractor stem (D4)* in it; when resistance is felt, hold the knurled part tightly and screw in with force using the T handle. This separates the trial stem from the trial humeral body.

figure 10

figure 11

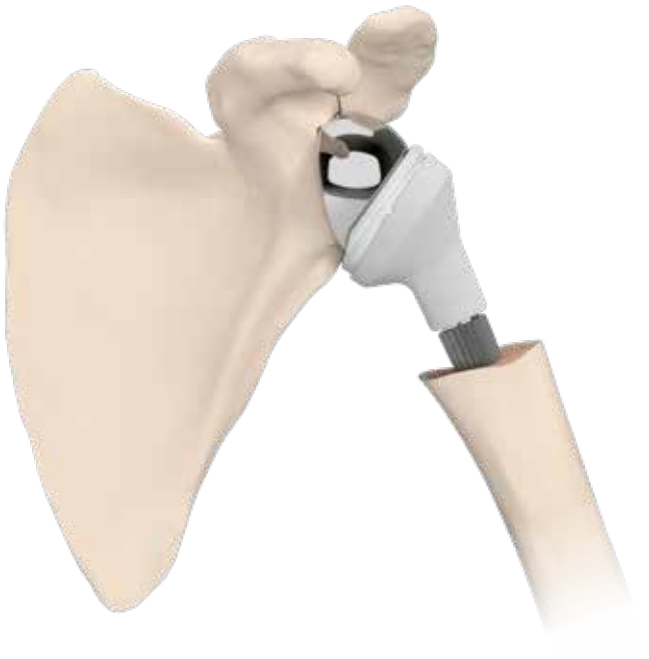


figure 12

ASSEMBLY OF THE FINAL STEM AND REVERSE HUMERAL BODY

Assemble the final humeral body and stem on the back table with the use of the *humeral body impactor (L4)*. Screw the impactor tightly to join the stem and humeral body. The hole passing through the impactor can be used to insert the alignment rod, which is used here as a counter-torque (Fig. 10). Slightly loosen the fastening to avoid risky torsion that may damage the humerus when removing the impactor.

INSERTION OF THE FINAL HUMERAL COMPONENTS AND REDUCTION

Tap the implant into the canal. Correct version is obtained by using the alignment rod again. Once the reverse body has been inserted fully to the desired level, unscrew the impactor handle, insert the safety screw of the reverse body and tighten with the dedicated *allen wrench (E4)* (Fig. 11).

Insert the previously decided liner and impact with the *cemented glenoid impactor (E3)*. Reduce the joint and carry out the standard joint manoeuvres on the glenosphere previously implanted (Fig. 12). Check that any humeral and glenoid osteophytes are carefully removed to avoid the risk of impingement.

SMR Revision with long stem

figure 13

USE OF THE LONG CEMENTED STEM

When bone trophism does not allow implanting a cementless stem, the SMR system modularity allows the use of a cemented revision stem (Fig. 13). In this case the surgical technique requires a few simple variations.

Proceed as previously described. Replace the “stem” with a “cemented stem” as described in the previous paragraphs.

Use a stem with a smaller diameter than that of the trial stem.

Instruments and methods remain unaltered.

Fill the canal with cement and insert the assembled components.

Proceed with the surgical technique only when the cement has polymerized.

figure 1

figure 2

COMPONENT REMOVAL

REMOVAL OF HUMERAL HEAD AND ADAPTOR

Insert the *head extractor (B4)* between the humeral head and the humerus and lever (Fig. 1). Remove the head and adaptor still assembled.

REMOVAL OF SMR HUMERAL BODY

By means of *allen wrench (E4)*, remove the safety screw inside the humeral body whilst using the *body stopper (H2)* to prevent the stem twisting in the humerus. Screw the *extractor for humeral body (C4)* tightly inside the humeral body while keeping the stem axis direction.
Now insert the *universal stem for extractor (D4)*, and screw down.

When the advance motion starts to get difficult, insert the *manual snap wrench (U4)* onto the hexagonal couplings and hold the humeral body extractor tightly with the alignment rod. Then tighten the universal stem for extractor until the disassembly operation has been completed (Fig. 2).

After removal of the anatomic humeral body proceed with the glenoid preparation. If no metal back glenoid has been implanted previously, proceed with section "SMR Reverse Glenoid" on page 40.
If there is already a Metal Back glenoid currently in place, proceed to section "Previous Metal Back Glenoid" on page 28.

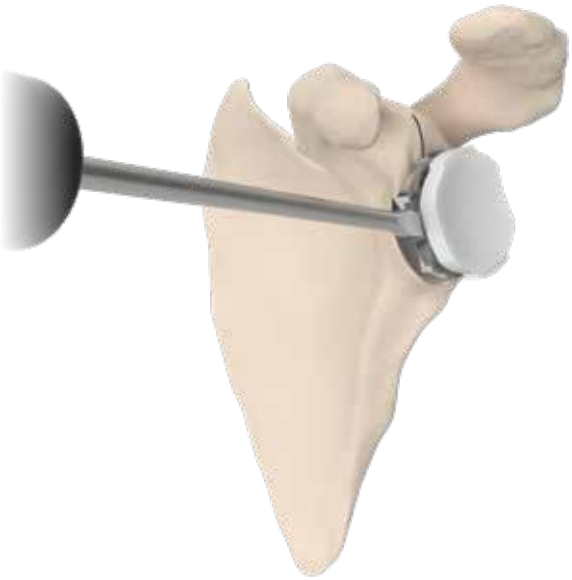


figure 3

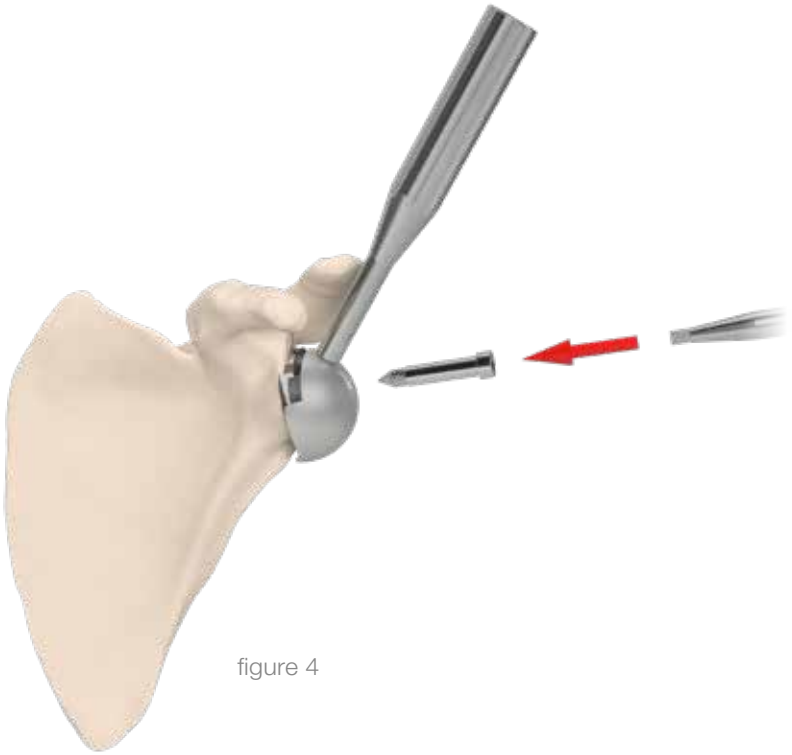


figure 4

PREVIOUS METAL BACK GLENOID

Remove the polyethylene liner by inserting a small osteotome between the liner and the MB glenoid (Fig. 3).

USE OF 36 mm GLENOSPHERE (CONCENTRIC OR ECCENTRIC)

INSERTION OF THE TRIAL GLENOSPHERE

Apply the trial glenosphere by screwing the *glenosphere impactor-extractor (T4)* into the appropriate hole and position it on the implanted glenoid Metal Back.
The *trial glenosphere screw* (*R4* grey color; *P4* golden color for the Metal Back Small-R) is inserted through the central hole using the screwdriver (Fig. 4).

Note. The size Large Metal Back is not suitable for coupling with 36 mm and 40 mm glenospheres.

figure 5

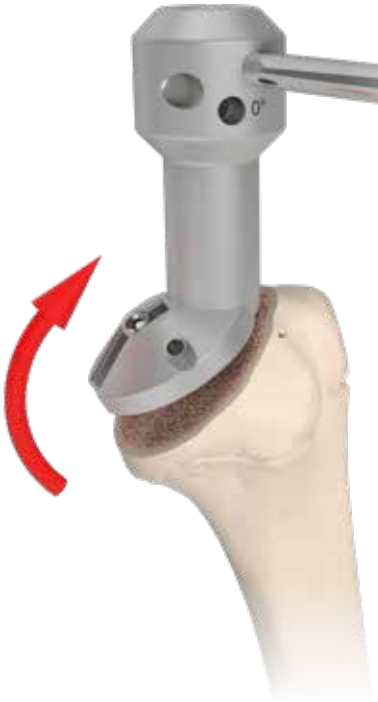


figure 6

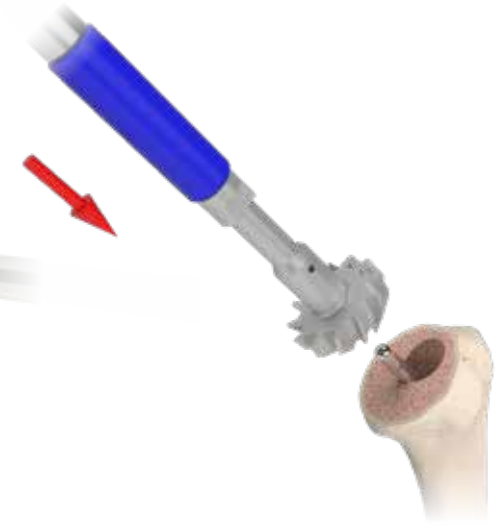


figure 7

PREPARATION OF THE HUMERUS

PREPARATION OF THE PROXIMAL HUMERUS FOR REVERSE BODY

Take the plastic base off the *humeral body impactor (L4)* (Fig. 5) and attach the *guide for conical reamer (J4)* by pressing the proximal end until the peg clicks in. Screw the alignment rod into the preferred version hole (0° or 20° retroversion) of the humeral impactor and insert the guide for conical reamer into the humeral canal until it connects to the previously implanted stem. Tighten the superior portion of the humeral impactor. This will engage the morse taper. The humeral body impactor is removed by unscrewing the top part and then flexing the handle sideways a little before lifting it (Fig. 6).

Ream the proximal humerus using the *conical reamer (K4)* mounted on the manual snap wrench T handle (Fig. 7).
This step must be carried out carefully by hand and without any power tool.
To make sure that the humeral part has been completely prepared, insert a Kirschner wire in the reamer hole near the cutting teeth. If the K wire passes through, then the humeral reaming has not been completed.
Disassemble the reamer guide peg from the stem by screwing the *humeral body extractor (C4)* into the reamer guide peg. Then screw the *universal extractor stem (D4)* into it. Once resistance is felt, hold the humeral body extractor tightly with the alignment rod and screw in with force using the T handle. This separates the reamer guide from the stem.

SMR Conversion from Anatomical to Reverse

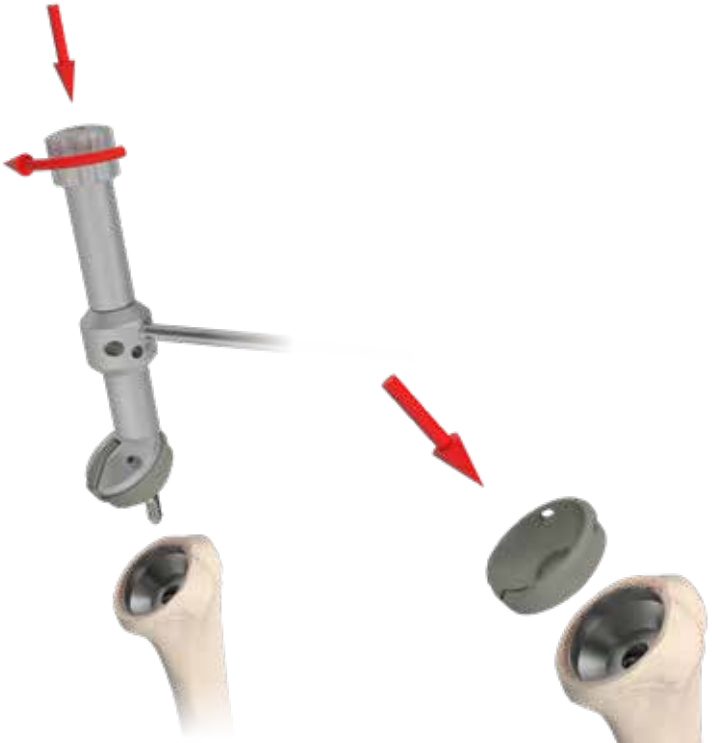


figure 8

figure 9

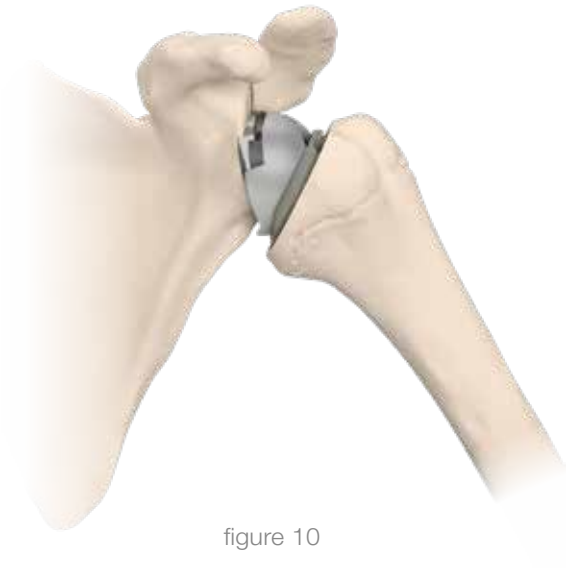


figure 10

INSERTION OF THE TRIAL REVERSE HUMERAL BODY

Take the *trial reverse humeral body (H4)* from the instrument set and assemble it on the implanted stem (conical coupling). Apply the mobile plastic part to the bottom of the *impactor-positioner (L4)* and assemble it to the stem in the same way as the reamer guide peg with the help of the alignment rod to obtain the version angle (Fig. 8).

TRIAL SURGICAL REDUCTION AND MODIFICATION OF THE COMPONENTS

Expose the humerus and insert the *STD trial liner (O4)* by hand (Fig. 9). Reduce the joint (Fig. 10).
Assess the joint tension and address any laxity by replacing the STD size with a +3 or +6 liner.

Check that any humeral and glenoid osteophytes are carefully removed to avoid the risk of impingement.

To remove and replace a trial liner, insert a Kocher clamp through one of the holes or use a pointed chisel on the side edge as a lever.
Assess the stability with the standard movements with the arm abducted and adducted. In case of eccentric trial glenosphere the surgeon can rotate the glenosphere on the Metal back to enhance the joint stability, if necessary.
Find the best position for the liner to give stability without restricting the range of motion. Note the last position used for the liner and the eccentric glenosphere in order to reproduce the correct position with the final implant.

To remove the trial reverse body, use the *extractor for humeral body (C4)* in the same way as the reverse reamer guide.

figure 11

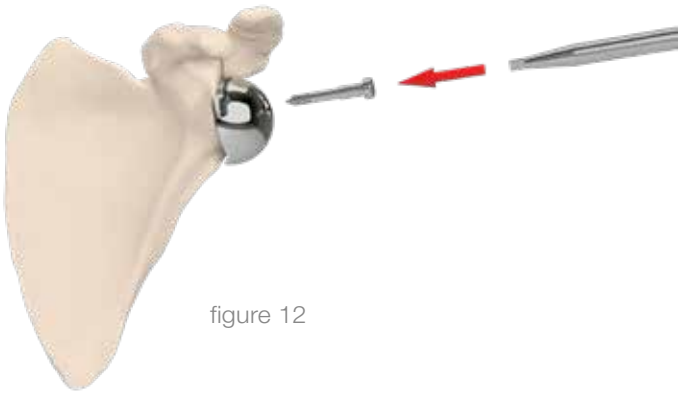


figure 12

REDUCTION OF THE FINAL IMPLANT

GLENOSPHERE INSERTION

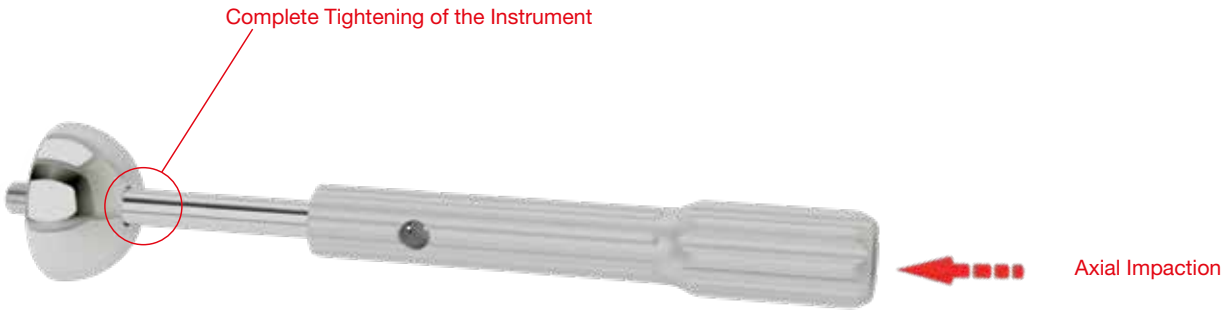
Remove the trial glenosphere using the screwdriver.
Take the final glenosphere (concentric or eccentric), peg and safety screw.

Insert the peg into the conical bore on the glenosphere and secure the components by tapping. Screw the *glenosphere impactor-extractor (T4)* into the glenosphere apex hole (Fig.11) and impact the assembly into the Metal Back using a mallet. Unscrew the impactor and check by hand that the Morse taper is stable; tighten the safety screw (Fig. 12 - see note page 32).

INSERTION OF THE FINAL REVERSE HUMERAL BODY

Remove the reverse humeral body from the sterile packaging and implant it onto the stem using the *humeral body impactor (L4)*. Correct version is obtained using the alignment rod again. Tighten the proximal part of the impactor to fix the coupling.
Afterwords remove the impactor handle, insert the safety screw of the reverse body and tighten with the dedicated *allen wrench (E4)*.

SMR Conversion from Anatomical to Reverse



Correct use of the instrument

Note. Below, are described some important additional instructions to reduce the risk of intra-operative breakage of the instrument.

When the SMR Glenosphere Impactor-Extractor is used to impact the definitive glenosphere into the metal back:

- *The threaded tip of the instrument must be completely tightened into the apex hole of the glenosphere, before tapping in the morse taper coupling with the mallet; the tightening of the instrument must be stopped only when the surgeon feels high resistance to continue the tightening action.*
- *When impacting the glenosphere, the mallet must be used along the direction (axis) of the SMR Glenosphere Impactor-Extractor, avoiding as much as possible the onset of unexpected multi-axial forces during impaction.*

Please refer to picture (red circle and red arrow). If both of the above conditions are not verified, the threaded section of the instruments is subjected to increased unexpected stresses that can lead to its breakage.

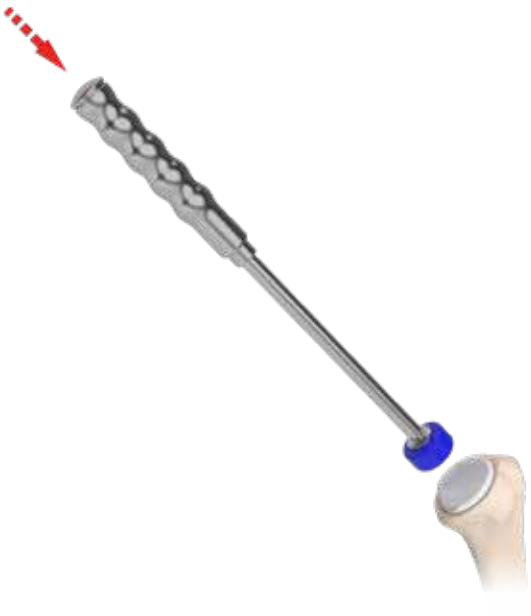


figure 13

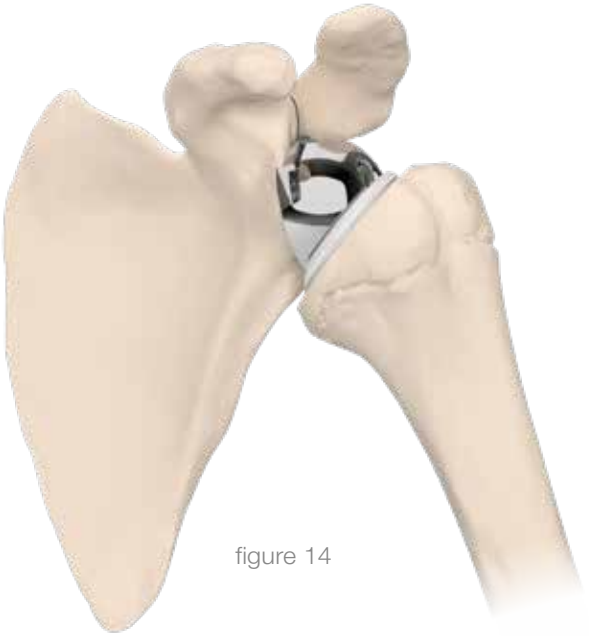


figure 14

INSERTION OF FINAL REVERSE LINER

From the sterile box take out the reverse liner of the size previously set with the trial reductions.
The internal part of the reverse humeral body must be clean and dry. Insert the selected polyethylene liner into the reverse humeral body by hand.
Remember the position previously decided with the trial reduction.
Impact the liner by means of the *cemented glenoid impactor (E3)* (Fig. 13).

FINAL IMPLANT REDUCTION

Reduce the joint and carry out a final assessment of joint stability and range of motion (Fig. 14).

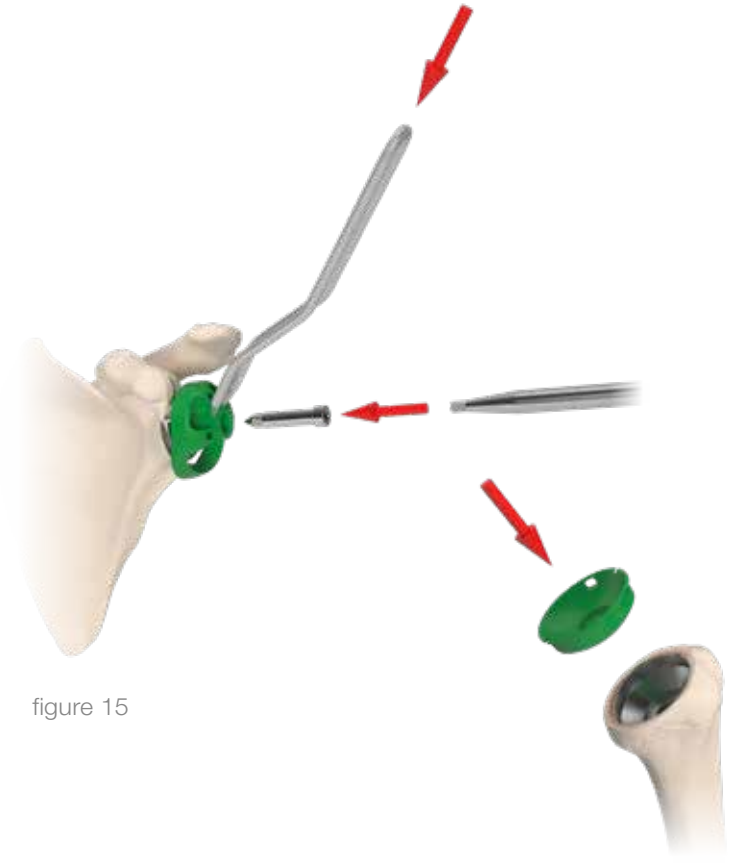


figure 15

figure 16

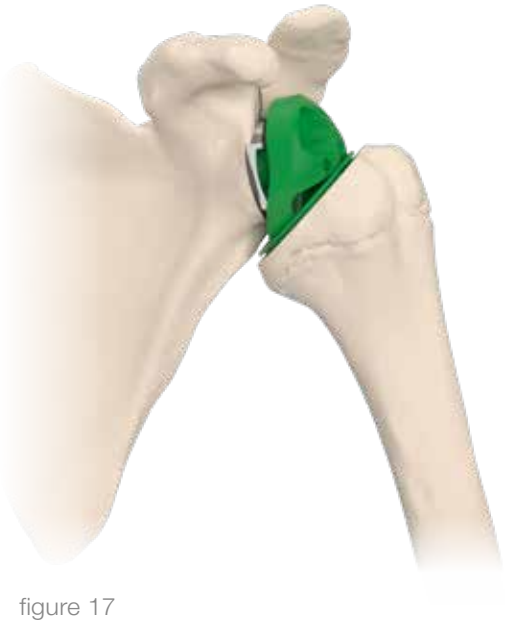


figure 17

USE OF 40 OR 44 mm GLENOSPHERE

INSERTION OF THE TRIAL 40 OR 44 mm GLENOSPHERE

Apply the *trial glenosphere (E42 or F42)* and position it near the glenoid Metal Back (Fig. 15) using the *trial glenosphere positioner (H42)*.
Slide the *trial glenosphere screw (C42 or D42)* through the central hole and tighten until reaching the end stop.

If necessary, the system allows a corrective version of the 44 mm diameter size with a 4 mm eccentric component. Maintain the eccentricity of the component in one of the bottom quadrants of the glenoid and tighten the module in the same way as for the concentrical 44 mm glenosphere.

TRIAL SURGICAL REDUCTION AND MODIFICATION OF THE COMPONENT

Expose the humerus, insert the *SHORT trial liner (A42 or B42)* in the proper position by hand (Fig. 16) and reduce the joint. Assess the joint tension and avoid any laxity by replacing the Short size with a Medium or Long one. To remove and replace a trial liner insert a sharp object through one of the two holes or use a pointed chisel on the side edge as a lever. If necessary, make up any deficit by replacing a +9 *humeral extension (G4)* in between. Reverse liner of 44 mm glenosphere do not have the classical chamfer along the outer profile. Therefore, the position of the liner on the reverse humeral body does not influence joint stability.

Perform the usual articular movements, check that any humeral and glenoid osteophytes are carefully removed (Fig. 17).

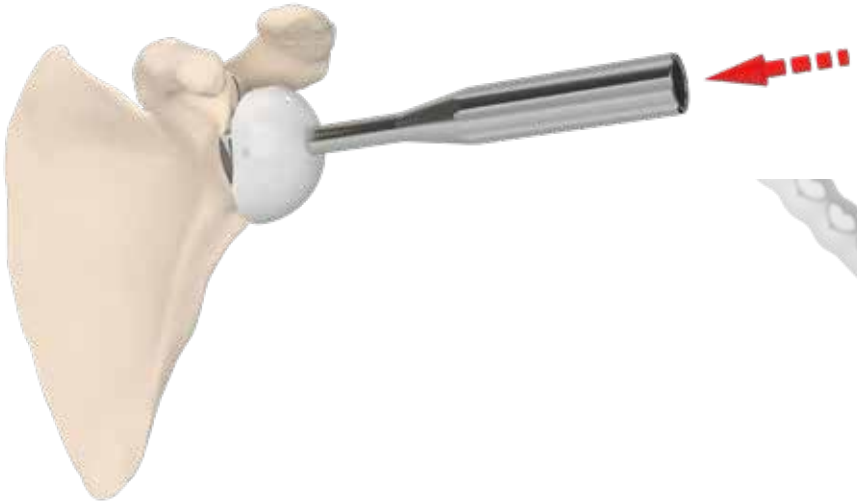


figure 18

figure 19

INSERTION OF THE FINAL 44 OR 40 mm GLENOSPHERE

Open the package containing the peg and screw relating to the size of the implanted metal back, then the selected glenosphere package. Assemble the peg on the glenosphere by tapping. Screw the *glenosphere impactor-extractor (T4)* in the central hole of the glenosphere and implant the system in the Metal Back (Fig. 18) by tapping (see note page 32). Unscrew the impactor and fasten by tightening the safety screw. Press-fit the central cap in the central hole of the implanted component using the *positioner for glenosphere plug (G42)*.

INSERTION OF THE FINAL 40, 44 mm REVERSE LINER

The final liner in CoCrMo will be positioned on the top of the reverse humeral body. Impact the liner by means of the *cemented glenoid impactor (E3)* (Fig. 19).

If necessary a lateralizing liner is available to increase the joint stability.

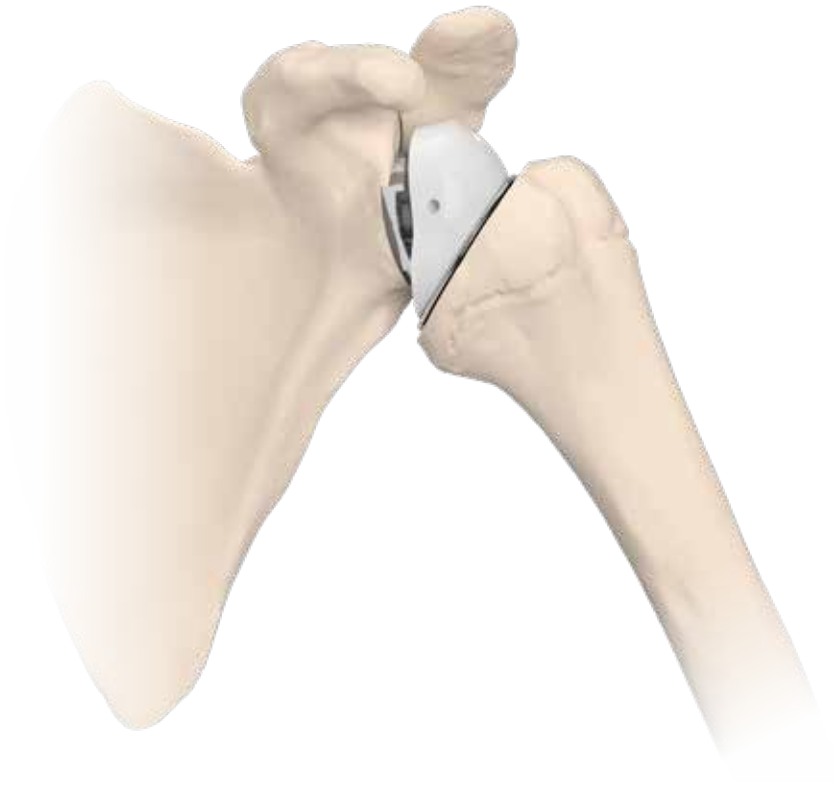


figure 20

REDUCTION

Reduce the joint and carry out a final assessment of joint stability and range of motion (Fig. 20).
Palpating the axillary nerve should find a normal structure tension as before surgery. This test also avoids postoperative axillary neuropathic lesions.

figure 1

figure 2

REMOVAL OF THE GLENOID IMPLANT

Expose the glenoid by means of appropriate retractors and remove the glenoid components (glenosphere, Metal Back and screws).
By means of *screwdriver (L3)*, remove the safety screw inside the glenosphere. Screw the *glenosphere impactor-extractor (T4)* on the previously implanted glenosphere and disassemble it from the metal back with the help of the *manual snap wrench (V4)* (Fig. 1).
Once the glenosphere has been removed screw the *glenoid extractor (A3)* inside the metal back and remove the metal back using the *stem impactor (C1)*.

REMOVAL OF THE HUMERAL LINER

Place a chisel between the liner and the humerus and with the help of a hammer, tap until removing the component from the cavity of the reverse humeral body (Fig. 2).
Clean the body cavity carefully and assess the implant height in relation to the glenoid residual bone portion and to the sub-acromial arch.

figure 3

figure 4

TRIAL REDUCTION

From the CTA Instrument Set take out the *36 mm trial adaptor (C9)* and insert it into the previously implanted reverse body; choose and position the correct *trial CTA head (B9)* and reduce to check the positioning with respect to glenoid and acromion.

Make sure that the bone rim does not interfere with the head lateral extension. In case of interference, remove part of the bone tissue by means of a bone nibbler device.

INSERTION OF THE FINAL HUMERAL HEAD

From the sterile box take out the final adaptor, screw the *extractor for humeral body (J2)* into it, and gently insert the adaptor in the reverse humeral body (Fig. 3).
Apply the final CTA head of the selected size on the final adaptor. Impact the head using the *humeral head impactor (Q2)* (Fig. 4). In the revision implant with CTA head, the eccentricity of the cephalic component cannot be changed with respect to the cervico-diaphyseal axis.

Note. If there is excessive joint laxity, before implanting the 36 mm adaptor, insert a + 9 mm humeral extension according to the same procedure followed for the 36 mm adaptor.

figure 1

figure 2

GLENOID PLATE

Warning. The glenoid plate (Fig. 1) is intended for use only with 40 mm or 44 mm glenospheres in reverse shoulder arthroplasty.

The glenoid plate is indicated for patients suffering from disability due to:

- severe glenoid bone loss in revision surgery of hemi, anatomic or reverse total shoulder arthroplasty
- displastic glenoid
- treatment of glenoid fracture (plurifragmental glenoid fracture or intra-op glenoid fracture)
- insufficient primary fixation of metal back glenoid

GLENOID EXPOSURE

Expose the glenoid with suitable retractors.

Fukuda retractor (F3) keeps the humerus proximal portion outside the joint area while maintaining optimal exposure of the glenoid surface. Generally, the retractor is anchored to the rear glenoid neck rim in delto-pectoral approach or on the lower rim in supero-lateral approach (transdeltoid).

Take care to remove any adhesion from the glenoid surface.

The described phases involve prior removal of the existing glenoid implant.

If necessary reconstruction of the glenoid is carried out by bony transplant or artificial bone to have a sufficient bone stock to implant the metal back glenoid.

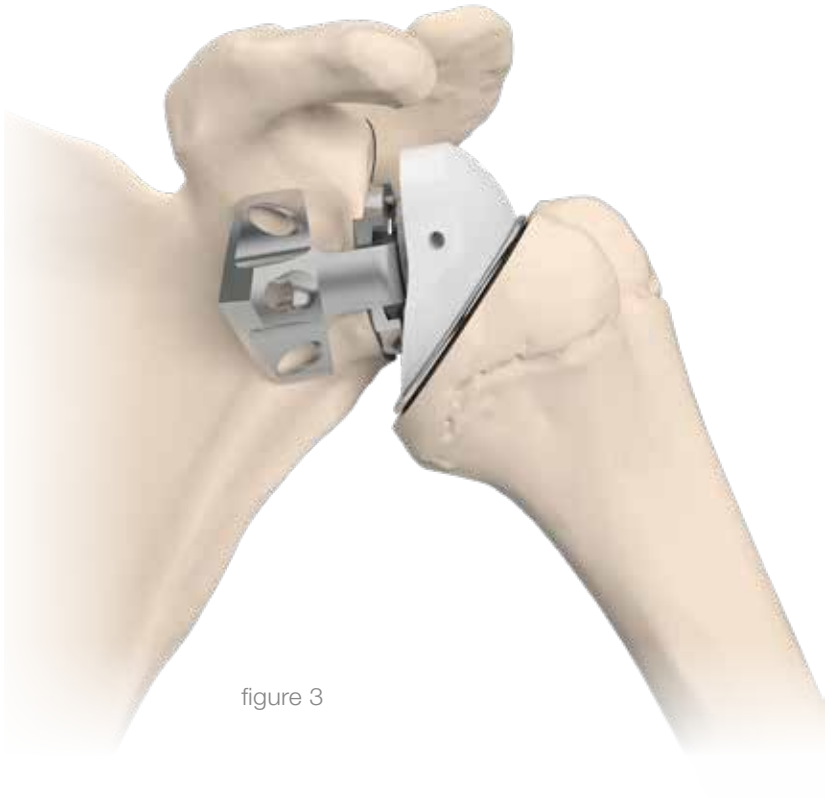


figure 3

GLENOID PREPARATION AND METAL BACK IMPLANTATION

To prepare the glenoid surface and implant the final Metal Back component follow the steps as described at page 40.

GLENOID PLATE IMPLANTATION

Assemble the glenoid plate at the *alignment rod (O2)* and insert the connector of the plate into the taper of metal back glenoid. Using a mallet tap in the morse taper coupling. Unscrew the alignment rod and check by hand that the morse taper is stable.

If necessary for fixation of a fragment or insufficient primary stability there are available cortical screws 4.5 mm. Drill the sites for the fixing screws using 3.5 mm drill.

FINAL GLENOSPHERE INSERTION

Proceed to implant the final 40 or 44 mm glenosphere (Fig. 2) and complete the implant as described at page 46.

Reduce the joint (Fig. 3) and perform the usual articular maneuvers, taking care to evaluate humerus impingment against the acromion.

Please note that for the final glenosphere implantation the connector is not necessary as the glenosphere will be engaged directly to the glenoid cage by morse taper coupling.

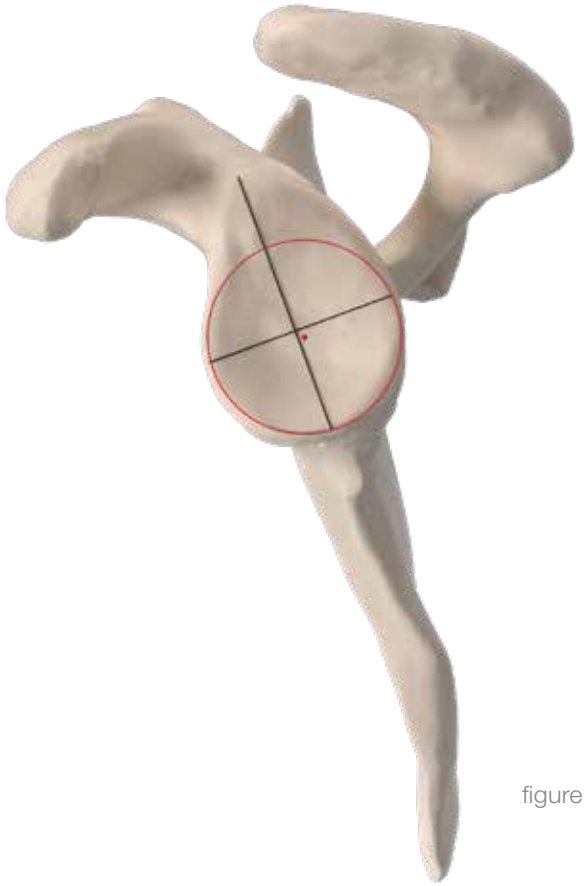


figure 1

SMR REVERSE GLENOID

Glenoid preparation of a reverse shoulder replacement is carried out after the humeral head has been resected and before insertion of the final humeral prosthesis.

EXPOSURE

Expose the glenoid with suitable retractors.
The *Fukuda retractor (F3)* keeps the humerus proximal portion outside the joint area while maintaining optimal exposure of the glenoid surface. Generally, the retractor is anchored to the rear glenoid neck rim in delto-pectoral approach or on the lower rim in supero-lateral approach (transdeltoid).

METAL BACK CEMENTLESS GLENOID IMPLANT

The cementless Metal Back SMR implant is recommended where there is good bone quality which is sufficient to achieve fixation of the peg and the two screws.

DETERMINATION OF THE GLENOID CENTRE

After having completely exposed the glenoid, trace two orthogonal lines in a cross shape along the main, longitudinal and transversal axes (Fig. 1) using an electric scalpel. This operation does not require any particular measurement as its only purpose is to determine more or less the centre of the glenoid and to avoid errors when positioning the implant.

Note. Take care to remove any osteophytes around the bone edge beforehand.

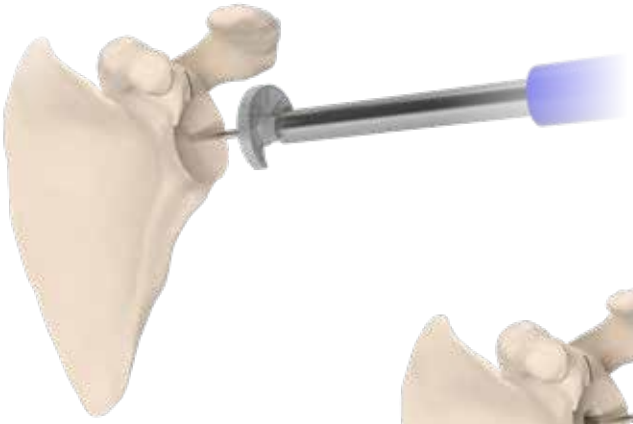


figure 2

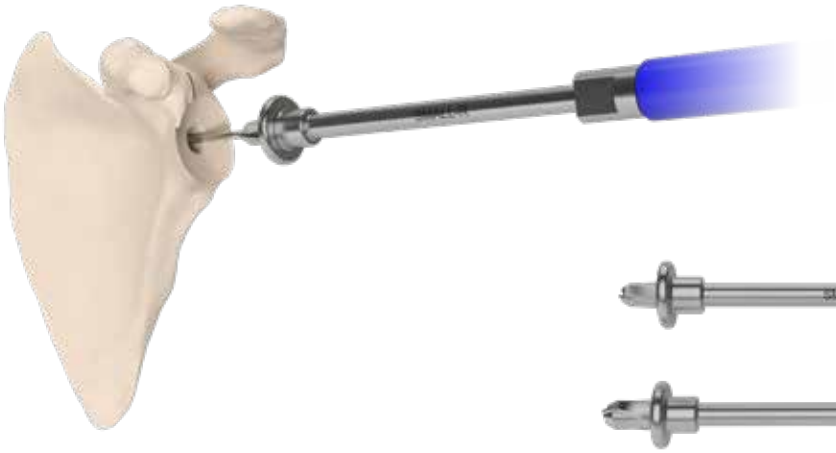


figure 3

figure 4

INSERTION OF THE GUIDEWIRE

For the glenoid seat preparation use a 15 cm long, 2.5 mm dia. guidewire (not included in the instrument set).
Direct the wire slightly off-centre and insert it into the bone up to a depth of 25 mm. The direction taken by the guidewire will determine the next version of the glenoid component (Metal Back). Therefore, perform a CT beforehand to evaluate any deformations in the articular surface caused by degenerative pathologies or traumas. Any corrections in the wire direction should be made at this point as no corrections can be made in the implant afterwards.

Option: for vertical ascending glenoids, correct the anatomic variant by bending the wire just slightly before fixation to the bone.

PREPARATION OF THE GLENOID SURFACE

Once the Kirschner wire has been fixed, apply the *Small or STD glenoid reamer (G3)* on it depending on the glenoid dimensions. Apply the *glenoid reamers shaft (H3)* and ream the bone surface (Fig. 2). The purpose of this operation is to remove the cartilage and expose the subchondral bone.
Remove the reamer used and follow on with drilling using the *Small-R glenoid drill (D3)* on the guide wire that was implanted beforehand (Fig. 3).
Insert until it comes to the reamer baseplate. For a Metal Back (M-B) Small-R component implant continue with the sequences. If a component with larger peg is required (M-B Small) or a component with larger peg and surface is required (M-B STD), insert the *Small/STD glenoid drill (D3)* (Fig. 4) on the wire and widen the hole.

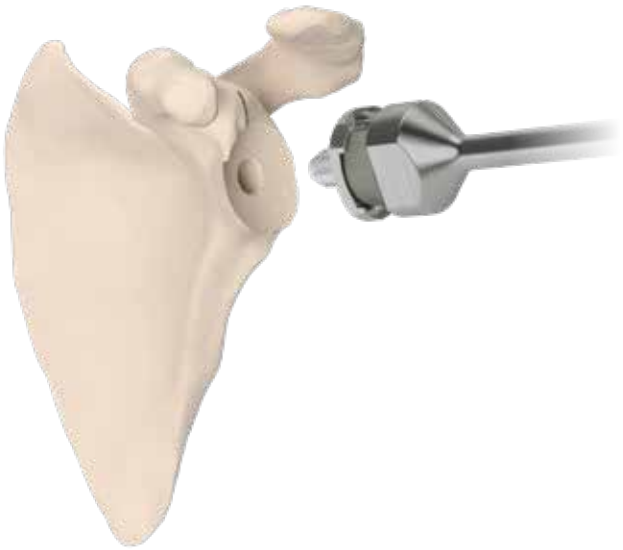


figure 5

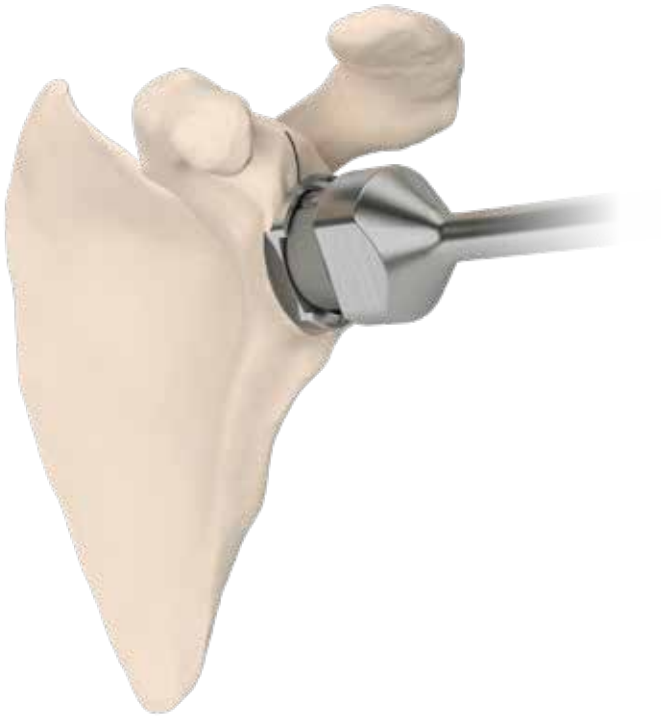


figure 6

INSERTION OF CEMENTLESS GLENOID

Remove the M-B component of the chosen size from the sterile packaging and apply it to the *M-B glenoid impactor (C3)* (Fig. 5).

Caution! The glenoid prosthesis does not lock onto the impactor. Pay attention during this surgical phase.

Push the central peg of the prosthesis into the hole made beforehand by tapping it in with the positioner handle.
The long axis of the prosthesis must coincide with the larger axis of the glenoid (Fig. 6).

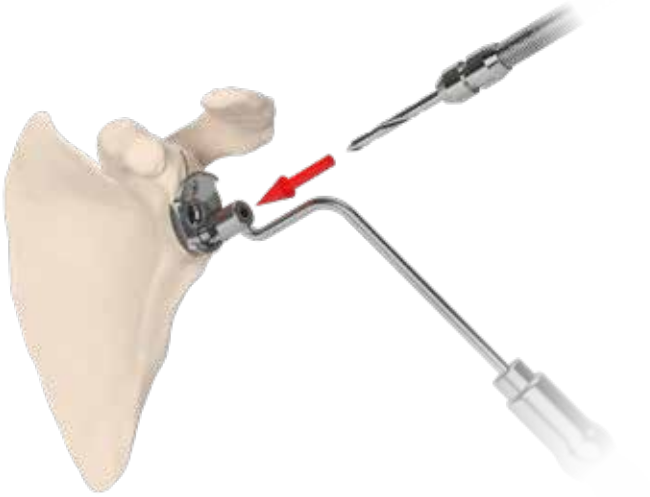


figure 7

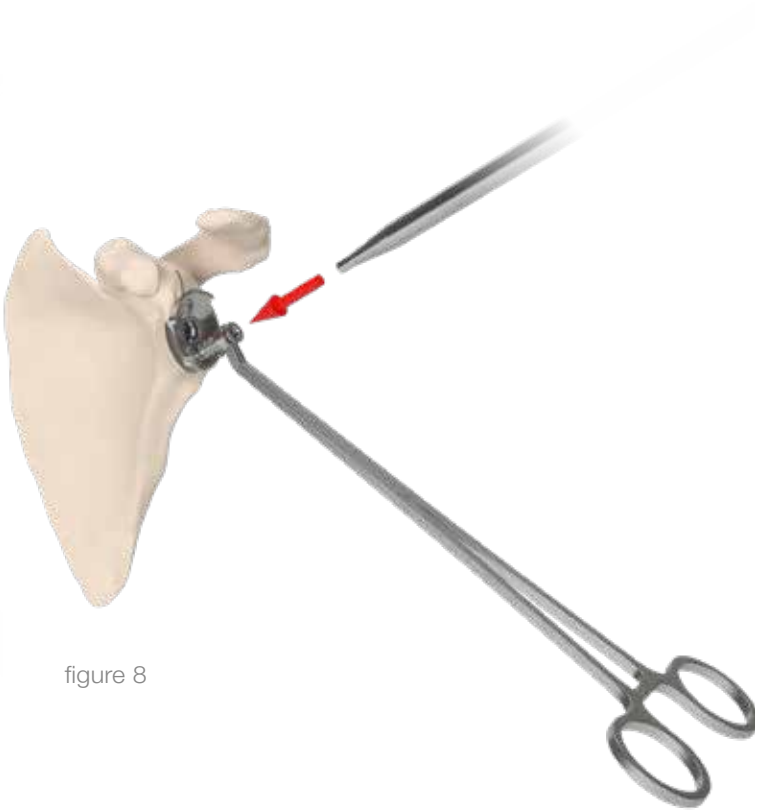


figure 8

INSERTION OF BONE SCREWS

Once the cementless glenoid has been positioned, drill the sites for the fixing screws using the *flexible mandrel (K3)* with a *3.5 mm helix drill bit (M3)* inserted on the *drill guide (I3)* (Fig. 7).

The screwhead seat on the metal shell is spherical and therefore the fitting direction can be chosen within a certain angular range.
Nevertheless, the superior screw is recommended to be directioned to the base of the coracoid, while the inferior screw dorsally.

After having prepared the seat of the first screw, insert the screw using the *screwdriver (L3)* but do not tighten fully until the next one has been prepared and another screw has been inserted (Fig. 8).

The screws must be tightened at the same time to guarantee the best fit of the metal glenoid in the prepared bone seat.

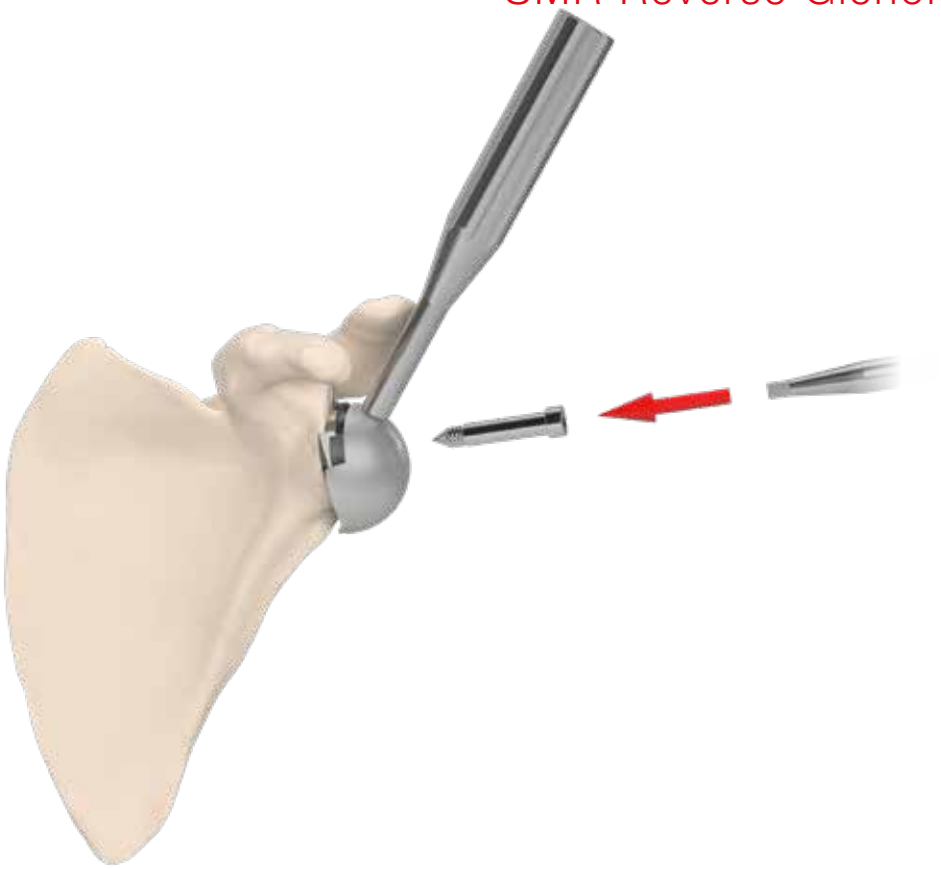


figure 9

USE OF 36 mm GLENOSPHERE (CONCENTRIC OR ECCENTRIC)

INSERTION OF THE TRIAL GLENOSPHERE

Apply the trial glenosphere by screwing the *glenosphere impactor-extractor (T4)* into the appropriate hole and position it on the implanted glenoid Metal Back.
The *trial glenosphere screw* (*R4* grey color; *P4* golden color for the Metal Back Small-R) is inserted through the central hole using the screwdriver (Fig. 9).

Note. The size Large Metal Back is not suitable for coupling with 36 mm and 40 mm glenospheres.

Note. The 36 mm glenospheres are not suitable for coupling with the glenoid plates.

In case of eccentric trial glenosphere the surgeon can rotate the glenosphere on the Metal back until the most stable position for the new joint has been obtained. Note the last position used for the eccentric glenosphere and trace a reference point in order to reproduce the correct position with the final implant.

figure 10

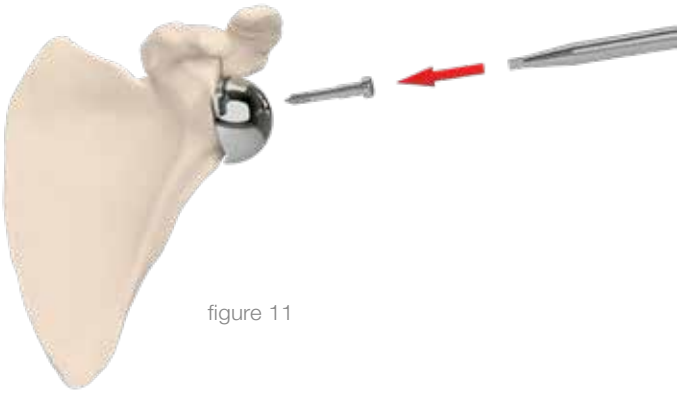


figure 11

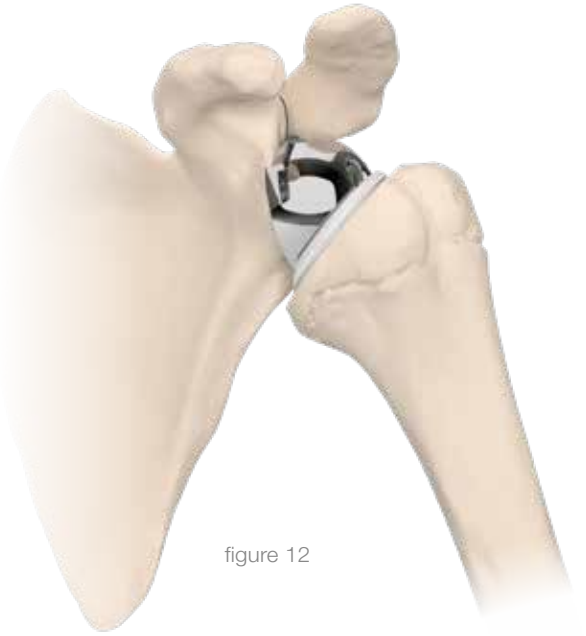


figure 12

INSERTION OF THE FINAL IMPLANT

GLENOSPHERE INSERTION

Remove the trial glenosphere using the screwdriver.
Take the final glenosphere (concentric or eccentric), peg and safety screw.

Insert the peg into the appropriate taper on the glenosphere and secure the components by tapping.
Screw the *glenosphere impactor-extractor (T4)* into the glenosphere hole (Fig. 10) and impact the assembly into the Metal Back using a mallet. Unscrew the impactor and check by hand that the Morse taper is stable.
Tighten the safety screw (Fig. 11- see note page 32).

FINAL IMPLANT REDUCTION

Reduce the joint (Fig. 12) and perform the usual articular maneuvers, taking care to evaluate humerus impingment against the acromion. With slight longitudinal traction there should be no disassembling of the humeral body to glenosphere.

Check that any humeral and glenoid osteophytes are carefully removed to avoid the risk of impingement.

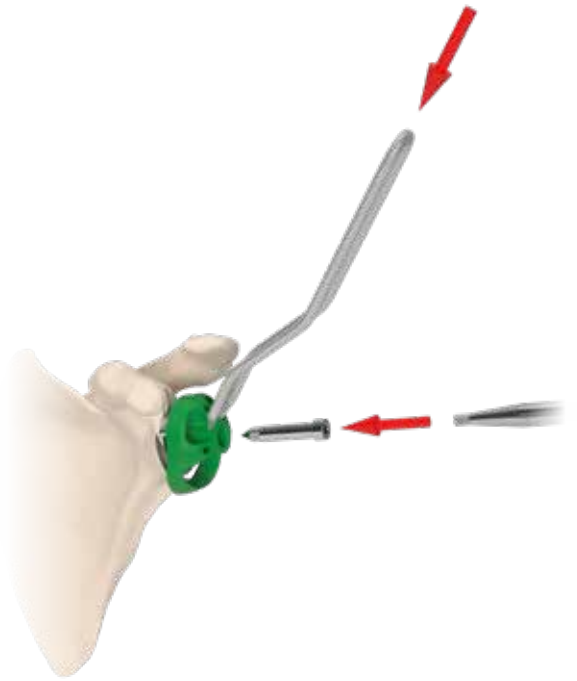


figure 13

figure 14

USE OF 40 OR 44 mm GLENOSPHERE

INSERTION OF THE TRIAL 40 OR 44 mm GLENOSPHERE

After the insertion of the cementless glenoid as described at page 40, apply the *trial glenosphere (E42 or F42)* and position it near the glenoid Metal Back (Fig. 13).

Slide the *trial glenosphere screw (C42 or D42)* through the central hole and tighten until reaching the end stop.
If a correction is required due to anatomic variation or to surgical malpositioning of the metal back, the system allows a corrective version of the 44 mm diameter size with a 4 mm *eccentric component (F42)*.
Maintain the eccentricity of the component in one of the bottom quadrants of the glenoid and tighten the module in the same way as for the concentrical 44 mm glenosphere.

INSERTION OF THE FINAL 44 OR 40 mm GLENOSPHERE

Open the package containing the peg and screw relating to the size of the implanted metal back, then the selected glenosphere package (STD or corrective).

Assemble the peg on the sphere by tapping.
Screw the *glenosphere impactor-extractor (T4)* in the central hole of the glenosphere and implant the system in the metal back (Fig. 14) by tapping (see note page 32).
Unscrew the impactor handle and fasten by tightening the safety screw. Press-fit the central cap in the central hole of the implanted component using the *positioner for glenosphere plug (G42)*.

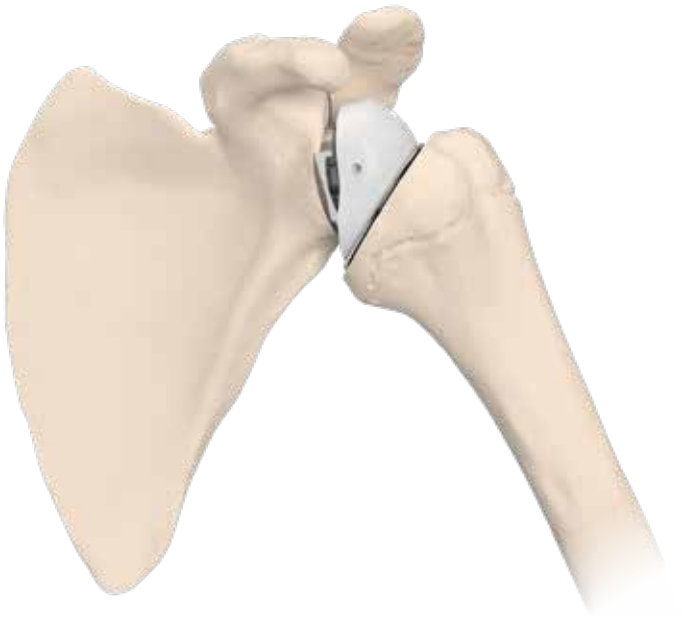


figure 15

REDUCTION

Reduce the joint and carry out a final assessment of joint stability and range of motion (Fig. 15).
Palpating the axillary nerve should find a normal structure tension as before surgery. This test also avoids postoperative axillary neuropathic lesions.

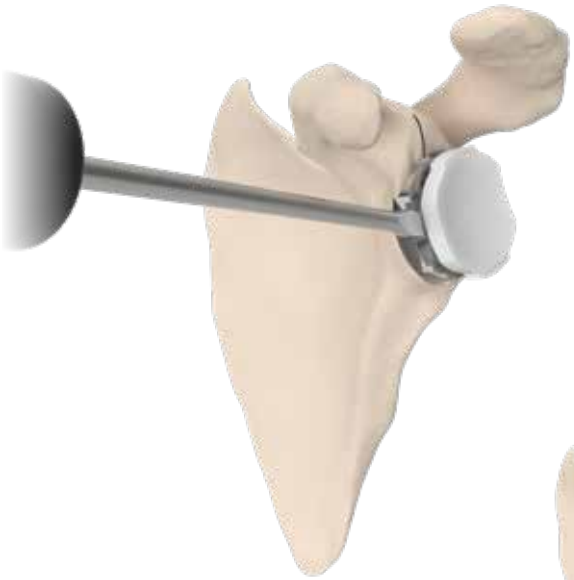


figure 17

figure 18

REMOVAL OF PREVIOUSLY IMPLANTED METAL BACK GLENOID

ANATOMIC IMPLANT (LINER)

Expose the glenoid by means of appropriate retractors to remove the glenoid components. Remove the polyethylene liner by inserting a small osteotome between the liner and the MB glenoid (Figure 17).
Then remove the two screws with the screwdriver and remove the metal back as described in the following page.

REVERSE IMPLANT (GLENOSPHERE)

Expose the glenoid by means of appropriate retractors to remove the glenoid components (glenosphere and screws). By means of *screwdriver (L3)*, remove the safety screw inside the glenosphere. Screw the *glenosphere impactor-extractor (T4)* on the previously implanted glenosphere and disassem- ble it from the metal back with the help of the *manual snap wrench (V4)* (Fig. 18).
Once the glenosphere has been removed screw the *glenoid extractor (A3)* inside the metal back and remove the metal back as described in the following page.

Removal of Glenoid Components

figure 19

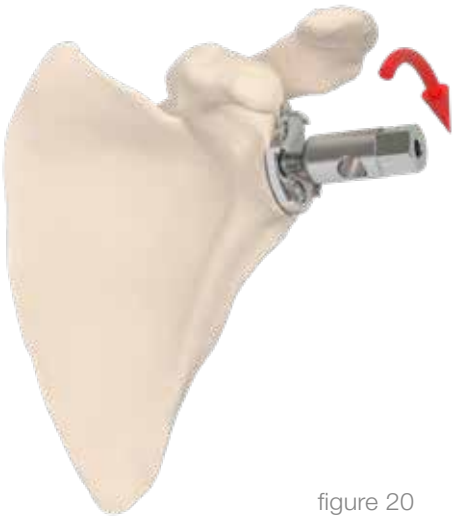


figure 20

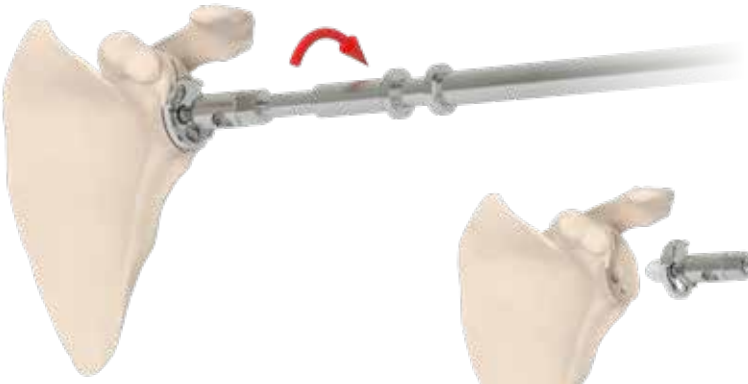


figure 21

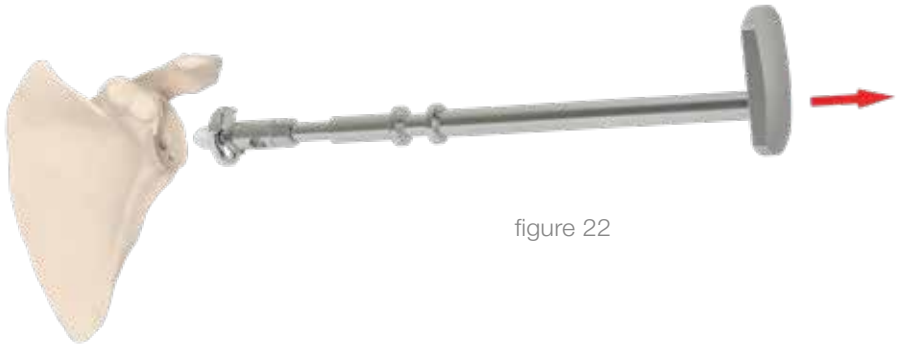


figure 22

METAL BACK REMOVAL

Select the proper glenoid extractor (A3) from the Glenoid instrument set (Small-R or Small/Std, Figure 19).

Then screw first the extractor into the metal back (Figure 20) then screw in the extractor the stem impactor (C1, Figure 21).

Once this assembly is securely fixed, tap onto the impactor flange to pull out the metal back peg from the glenoid (Figure 22) .

figure 23

figure 24

REMOVAL OF ANATOMIC HUMERAL COMPONENTS

REMOVAL OF HUMERAL HEAD AND ADAPTOR

Insert the *head extractor (B4)* between the humeral head and the humerus and lever (Fig. 23). Remove the head and adaptor still assembled.

REMOVAL OF SMR HUMERAL STEM

By means of *allen wrench (E4)*, remove the safety screw inside the humeral body whilst using the *body stopper (H2)* to prevent the stem twisting in the humerus. Screw the *stem impactor (C1)* inside the humeral body while keeping the stem axis direction. Gently tap onto the impactor to extract the humeral components out from the bone (Figure 24).

Note. *In case of well osteo-integrated stem, it is recommended to disengage the humeral body from the stem (as described at page 21) before proceeding with the extraction (always using the stem impactor).*
Eventually, before tapping the stem out from the bone, insert a long K-wire to remove the integrated bone from the stem to facilitate the removal

figure 25

figure 26

REMOVAL OF REVERSE HUMERAL COMPONENTS

REMOVAL OF REVERSE LINER

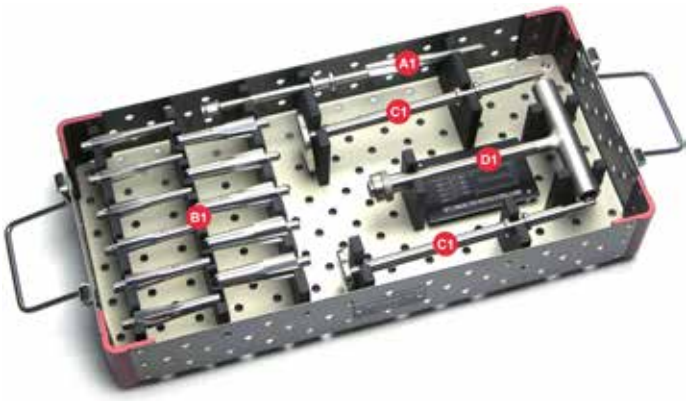
Place a chisel between the liner and the humerus and with the help of a hammer, tap until removing the component from the cavity of the reverse humeral body (Fig. 25).
Clean the body cavity carefully and assess the implant height in relation to the glenoid residual bone portion and to the sub-acromial arch.

REMOVAL OF SMR HUMERAL STEM

By means of *allen wrench (E4)*, remove the safety screw inside the humeral. Screw the *stem impactor (C1)* inside the reverse humeral body while keeping the stem axis direction.
Gently tap onto the impactor to extract the humeral components out from the bone (Figure 26).

Note. In case of well osteo-integrated stem, it is recommended to disengage the reverse humeral body from the stem (by means of the expansion extractor, M4) before proceeding with the extraction (always using the stem impactor).
Eventually, before tapping the stem out from the bone, insert a long K-wire to remove the integrated bone from the stem to facilitate the removal.

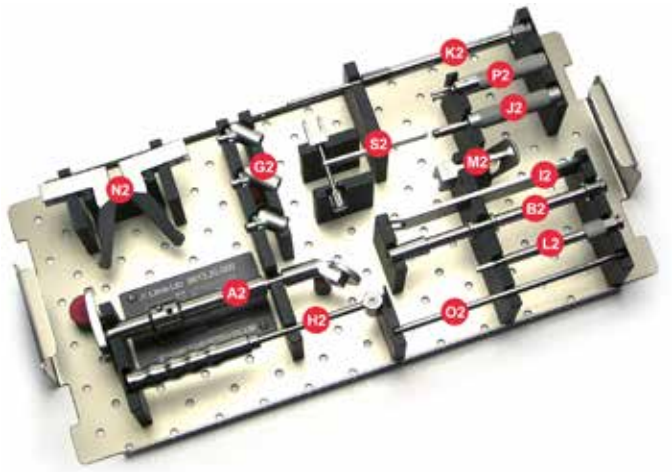
9013.10.000 'Common' Instrument Set for SMR Shoulder Prosthesis



Ref.	CODE	DESCRIPTION	Qt.
A1	9013.02.014	Reamer	1
B1	9013.02.140	Conical Trial Stem Dia. 14	1
B1	9013.02.150	Conical Trial Stem Dia. 15	1
B1	9013.02.160	Conical Trial Stem Dia. 16	1
B1	9013.02.170	Conical Trial Stem Dia. 17	1
B1	9013.02.180	Conical Trial Stem Dia. 18	1
B1	9013.02.190	Conical Trial Stem Dia. 19	1
B1	9013.02.200	Conical Trial Stem Dia. 20	1
B1	9013.02.210	Conical Trial Stem Dia. 21	1
B1	9013.02.220	Conical Trial Stem Dia. 22	1
B1	9013.02.230	Conical Trial Stem Dia. 23	1
B1	9013.02.240	Conical Trial Stem Dia. 24	1
C1	9013.02.300	Stem Impactor	2
D1	9095.10.110	Manual Snap Wrench	1
	9013.10.950	Sterilizable Box	1

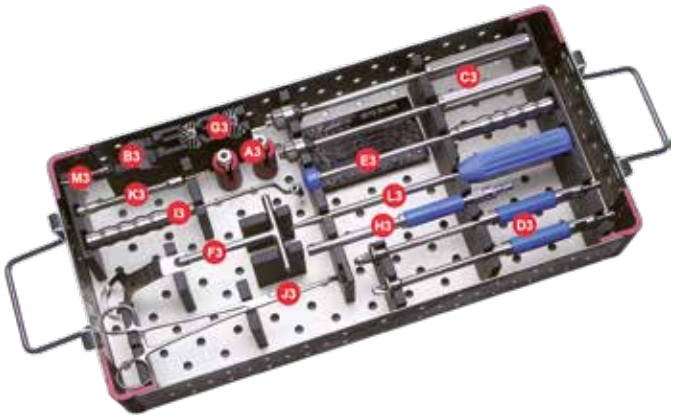
SMR REVISION SURGICAL TECHNIQUE
Instrument set

▼ 9013.20.000 'Endoprosthesis' Instrument Set for SMR Shoulder Prosthesis



Ref.	CODE	DESCRIPTION	Qt.
A2	9013.02.320	Prosthesis Introducer	1
B2	9013.02.400	Wrench for Knurled Stems	1
C2	9013.22.420	Trial Humeral Head Dia. 42 mm	1
C2	9013.22.440	Trial Humeral Head Dia. 44 mm	1
C2	9013.22.460	Trial Humeral Head Dia. 46 mm	1
C2	9013.22.480	Trial Humeral Head Dia. 48 mm	1
C2	9013.22.500	Trial Humeral Head Dia. 50 mm	1
C2	9013.22.520	Trial Humeral Head Dia. 52 mm	1
C2	9013.22.540	Trial Humeral Head Dia. 54 mm	1
D2	9013.22.750	Head Gauge	1
E2	9013.30.010	Trial Neutral Adaptor STD	1
E2	9013.30.015	Trial Ecc. 2 mm Adaptor STD	1
E2	9013.30.020	Trial Ecc. 4 mm Adaptor STD	1
E2	9013.30.030	Trial Ecc. 8 mm Adaptor STD	1
E2	9013.31.010	Trial Neutral Adaptor Long	1
E2	9013.31.015	Trial Ecc. 2 mm Adaptor Long	1
E2	9013.31.020	Trial Ecc. 4 mm Adaptor Long	1
E2	9013.31.030	Trial Ecc. 8 mm Adaptor Long	1
F2	9013.30.100	Pliers for Trial Adaptor	1
G2	9013.50.010	Trial Humeral Body Medium	1
G2	9013.50.020	Trial Humeral Body Long	1
G2	9013.50.030	Trial Humeral Body Short	1
H2	9013.50.100	Body Stopper	1
I2	9013.50.120	Head Extractor	1
J2	9013.50.160	Extractor for Humeral Body	1
K2	9013.50.170	Universal Stem for Extractor	1
L2	9013.50.200	Allen Wrench	1
M2	9013.50.250	45° Stop Guide	1
N2	9013.50.300	Right Resection Mask	1
N2	9013.50.310	Left Resection Mask	1
O2	9013.50.315	Alignment Rod	1
P2	9013.52.160	Expansion Extractor	1
Q2	9075.10.120	Humeral Head Impactor	1
R2	9075.10.135	Humeral Head Press	1
S2	9075.10.800	Centimeter	1
	9013.20.950	Sterilizable Box	1

9013.30.000 'Glenoid' Instrument Set for SMR Shoulder Prosthesis



Ref.	CODE	DESCRIPTION	Qt.
A3	9013.02.305	Extractor for SMALL-R M-B Glenoid	1
A3	9013.02.310	Extractor for M-B Glenoid	1
B3	9013.50.150	Humeral Cover	1
C3	9013.75.100	SMALL-R M-B Glenoid Impactor	1
C3	9013.75.110	SMALL/STD/LARGE M-B Glenoid Impactor	1
D3	9013.75.115	SMALL-R Glenoid Drill	1
D3	9013.75.120	Glenoid Drill	1
E3	9075.10.140	Cemented Glenoid Impactor	1
F3	9075.10.280	Fukuda Retractor	1
G3	9075.10.300	Glenoid Reamer - SMALL	1
G3	9075.10.310	Glenoid Reamer - STD	1
H3	9075.10.350	Glenoid Reamers Shaft	1
I3	9075.10.400	Drill Guide	1
J3	9095.10.115	Pliers for Screws	1
K3	9095.10.180	Flexible Mandrel	1
L3	9095.10.222	Screwdriver	1
M3	9095.10.249	Helix Drill - Dia. 3.5 x 50mm	1
	9013.30.950	Sterilizable Box	1

SMR REVISION SURGICAL TECHNIQUE
Instrument set

▼ 9013.40.000 'Reverse' Instrument Set for SMR Shoulder Prosthesis

Ref.	CODE	DESCRIPTION	Qt.
A4	1350.15.001	Screw for Humeral Body	2
B4	9013.50.120	Head Extractor	1
C4	9013.50.160	Extractor for Humeral Body	1
D4	9013.50.170	Universal Stem for Extractor	1
E4	9013.50.200	Allen Wrench	1
F4	9013.50.315	Alignment Rod	1
G4	9013.52.001	Trial Extension for Humeral Reverse Body	1
H4	9013.52.010	Trial Reverse Humeral Body	1
I4	9013.52.100	Resection Mask for Reverse Prosth.	1
J4	9013.52.115	Guide for Conical Reamer	1
K4	9013.52.130	Conical Reamer	1
L4	9013.52.140	Humeral Body Impactor	1
M4	9013.52.160	Expansion Extractor	1
N4	9013.52.200	30° Stop Guide	1
O4	9013.60.010	STD Trial Liner	1
O4	9013.60.015	+3 Trial Liner	1
O4	9013.60.030	+6 Trial Liner	1
P4	9013.74.105	Guide Screw SMALL-R Trial Glenosphere	2
Q4	9013.74.110	Trial Glenosphere Dia. 36mm	1
R4	9013.74.120	Guide-Screw for Trial Glenosphere	2
S4	9013.74.130	T Driver for Trial Glenosphere	1
T4	9013.74.140	Glenosphere Impactor-Extractor	1
U4	9013.76.030	Trial Ecc. Glenosphere Dia. 36mm	1
V4	9095.10.110	Manual Snap Wrench	1
	9013.40.950	Sterilizable Box	1

9013.42.000 SMR Reverse HP

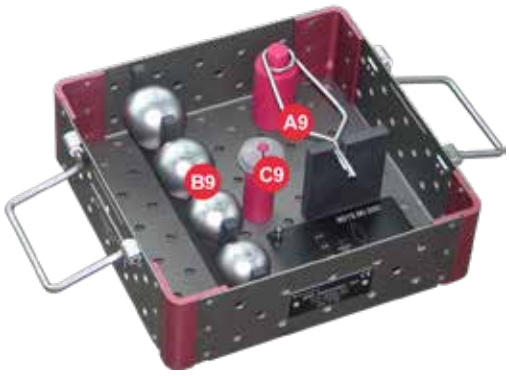
Ref.	CODE	DESCRIPTION	Qt.
A42	9013.62.010	Trial Liner SHORT Dia. 44mm	1
A42	9013.62.015	Trial Liner MEDIUM Dia. 44mm	1
A42	9013.62.020	Trial Liner LONG Dia. 44mm	1
A42	9013.62.115	Trial Liner Lateralizing MEDIUM Dia. 44mm	1
A42	9013.62.120	Trial Liner Lateralizing LONG Dia. 44mm	1
B42	9013.65.010	Trial Liner SHORT Dia. 40mm	1
B42	9013.65.015	Trial Liner MEDIUM Dia. 40mm	1
B42	9013.65.020	Trial Liner LONG Dia. 40mm	1
B42	9013.65.115	Trial Liner Lateralizing MEDIUM Dia. 40mm	1
B42	9013.65.120	Trial Liner Lateralizing LONG Dia. 40mm	1
C42	9013.74.105	Guide-Screw SMALL-R Trial Glenosphere	2
D42	9013.74.120	Guide-Screw Trial Glenosphere	2
E42	9013.74.401	Trial Glenosphere Dia. 40mm	1
F42	9013.74.440	Trial Glenosphere Dia. 44mm	1
F42	9013.74.444	Trial Glenosphere Dia. 44mm Corrective	1
G42	9013.74.605	Positioner for Glenosphere Plug	1
H42	9013.74.650	Trial Glenosphere Positioner	1
	9013.42.950	Sterilizable Box	1

SMR REVISION SURGICAL TECHNIQUE
Instrument set

9013.80.000 'Revison+Resection' Instrument Set for SMR Shoulder Prosthesis

Ref.	CODE	DESCRIPTION	Qt.
A8	9013.08.134	Trial Revision Stem Dia. 13 h 150mm	1
A8	9013.08.136	Trial Revision Stem Dia. 13 h 180mm	1
A8	9013.08.144	Trial Revision Stem Dia. 14 h 150mm	1
A8	9013.08.146	Trial Revision Stem Dia. 14 h 180mm	1
A8	9013.08.148	Trial Revision Stem Dia. 14 h 210mm	1
A8	9013.08.154	Trial Revision Stem Dia. 15 h 150mm	1
A8	9013.08.156	Trial Revision Stem Dia. 15 h 180mm	1
A8	9013.08.164	Trial Revision Stem Dia. 16 h 150mm	1
A8	9013.08.166	Trial Revision Stem Dia. 16 h 180mm	1
A8	9013.08.168	Trial Revision Stem Dia. 16 h 210mm	1
B8	9013.13.010	Trial Resection Stem Dia. 7mm H50mm	1
B8	9013.13.040	Trial Resection Stem Dia. 7mm H80mm	1
B8	9013.13.110	Trial Resection Stem Dia. 10mm H50mm	1
B8	9013.13.140	Trial Resection Stem Dia. 10mm H80mm	1
C8	9013.13.200	Dia. 13mm Wrench	2
D8	9013.14.020	Trial Modular Spacer H20mm	1
D8	9013.14.030	Trial Modular Spacer H30mm	1
D8	9013.14.040	Trial Modular Spacer H40mm	1
D8	9013.14.050	Trial Modular Spacer H50mm	1
	9013.80.950	Sterilizable Box	1

9013.90.000 'CTA' Instrument Set for SMR Shoulder Prosthesis



Ref.	CODE	DESCRIPTION	Qt.
A9	9013.30.100	Pliers for Trial Adaptor	1
B9	9013.23.420	Trial CTA Head Dia. 42mm	1
B9	9013.23.460	Trial CTA Head Dia. 46mm	1
B9	9013.23.500	Trial CTA Head Dia. 50mm	1
B9	9013.23.540	Trial CTA Head Dia. 54mm	1
C9	9013.23.600	Trial Adaptor Dia. 36mm	1
	9013.90.950	Sterilizable Box	1

FINNED HUMERAL BODY WITH LOCKING SCREW

Ti6Al4V	1350.15.110	Finned Humeral Body Medium

TRAUMA HUMERAL BODIES WITH LOCKING SCREW

Ti6Al4V	1350.15.010	Medium
	1350.15.020	Long
	1350.15.030	Short

CEMENTED STEMS L. 80 MM

Ti6Al4V	1306.15.120	Dia. 12 mm
	1306.15.140	Dia. 14 mm
	1306.15.160	Dia. 16 mm
	1306.15.180	Dia. 18 mm
	1306.15.200	Dia. 20 mm

CEMENTLESS FINNED STEMS L. 60 MM

Ti6Al4V	1304.15.110	Dia. 11 mm	■
	1304.15.120	Dia. 12 mm	■
	1304.15.130	Dia. 13 mm	■

CEMENTLESS FINNED STEMS L. 80 MM

Ti6Al4V	1304.15.140	Dia. 14 mm
	1304.15.150	Dia. 15 mm
	1304.15.160	Dia. 16 mm
	1304.15.170	Dia. 17 mm
	1304.15.180	Dia. 18 mm
	1304.15.190	Dia. 19 mm
	1304.15.200	Dia. 20 mm
	1304.15.210	Dia. 21 mm
	1304.15.220	Dia. 22 mm
	1304.15.230	Dia. 23 mm
	1304.15.240	Dia. 24 mm

■ Upon Request

SMR REVISION SURGICAL TECHNIQUE
Product Codes

LARGE RESECTION STEMS

Ti6Al4V	1313.15.010	Dia. 7 mm, h 50 mm
	1313.15.040	Dia. 7 mm, h 80 mm
	1313.15.110	Dia. 10 mm, h 50 mm
	1313.15.140	Dia. 10 mm, h 80 mm

MODULAR SPACERS FOR LARGE RESECTION STEMS

Ti6Al4V	1314.15.020	h 20 mm
	1314.15.030	h 30 mm
	1314.15.040	h 40 mm
	1314.15.050	h 50 mm

RING

Ti6Al4V	1314.15.200	Ring

CEMENTED REVISION STEMS

Ti6Al4V	1309.15.134	Dia. 13 mm - h 150 mm	
	1309.15.136	Dia. 13 mm - h 180 mm	
	1309.15.138	Dia. 13 mm - h 210 mm	■
	1309.15.154	Dia. 15 mm - h 150 mm	
	1309.15.156	Dia. 15 mm - h 180 mm	
	1309.15.158	Dia. 15 mm - h 210 mm	■

■ Upon Request

CEMENTLESS REVISION STEMS

Ti6Al4V	1308.15.134	Dia. 13 mm - h 150 mm
	1308.15.136	Dia. 13 mm - h 180 mm
	1308.15.144	Dia. 14 mm - h 150 mm
	1308.15.146	Dia. 14 mm - h 180 mm
	1308.15.154	Dia. 15 mm - h 150 mm
	1308.15.156	Dia. 15 mm - h 180 mm
	1308.15.164	Dia. 16 mm - h 150 mm
	1308.15.166	Dia. 16 mm - h 180 mm

NEUTRAL ADAPTOR TAPERS

Ti6Al4V	1330.15.270	0 mm
	1331.15.270	0 mm, Long

ECCENTRICAL ADAPTOR TAPERS

Ti6Al4V	1330.15.272	+ 2 mm
	1330.15.274	+ 4 mm
	1330.15.278	+ 8 mm
		LONG
	1331.15.272	+ 2 mm
	1331.15.274	+ 4 mm
	1331.15.278	+ 8 mm

HUMERAL HEADS

CoCrMo	1322.09.400	Dia. 40 mm	■
	1322.09.420	Dia. 42 mm	
	1322.09.440	Dia. 44 mm	
	1322.09.460	Dia. 46 mm	
	1322.09.480	Dia. 48 mm	
	1322.09.500	Dia. 50 mm	
	1322.09.520	Dia. 52 mm	
	1322.09.540	Dia. 54 mm	

■ Upon Request

SMR REVISION SURGICAL TECHNIQUE

Product Codes

CoCrMo	1321.09.401	Dia. 40 mm H13	
	1321.09.402	Dia. 40 mm H13 ECC2	
	1321.09.404	Dia. 40 mm H13 ECC4	
	1321.09.407	Dia. 40 mm H13 ECC7	
	1321.09.421	Dia. 42 mm H13	
	1321.09.422	Dia. 42 mm H13 ECC 2	
	1321.09.424	Dia. 42 mm H13 ECC 4	
	1321.09.427	Dia. 42 mm H13 ECC 7	
	1321.09.441	Dia. 44 mm H14	
	1321.09.461	Dia. 46 mm H15	
	1321.09.481	Dia. 48 mm H16	
	1322.09.501	Dia. 50 mm H16	
	1322.09.521	Dia. 52 mm H17	
	1322.09.541	Dia. 54 mm H18	
	1324.09.401	Dia. 40 mm H17	
	1324.09.421	Dia. 42 mm H17	
	1324.09.441	Dia. 44 mm H18	
	1324.09.461	Dia. 46 mm H19	
	1324.09.481	Dia. 48 mm H20	
	1324.09.501	Dia. 50 mm H21	
	1324.09.521	Dia. 52 mm H22	
	1324.09.541	Dia. 54 mm H23	

Ti6Al4V	1322.15.420	Dia. 42 mm	■
	1322.15.440	Dia. 44 mm	■
	1322.15.460	Dia. 46 mm	■
	1322.15.480	Dia. 48 mm	■
	1322.15.500	Dia. 50 mm	■
	1322.15.520	Dia. 52 mm	■
	1322.15.540	Dia. 54 mm	■

■ Upon Request

CTA HUMERAL HEADS

CoCrMo	1323.09.420	Dia. 42 mm	
	1323.09.460	Dia. 46 mm	
	1323.09.500	Dia. 50 mm	
	1323.09.540	Dia. 54 mm	
Ti6Al4V	1323.15.420	Dia. 42 mm	■
	1323.15.460	Dia. 46 mm	■
	1323.15.500	Dia. 50 mm	■
	1323.15.540	Dia. 54 mm	■

CTA HEADS ADAPTOR FOR REVERSE HUMERAL BODY

Ti6Al4V	1352.15.200	Adaptor 36 mm for Reverse Humeral Body	■

REVERSE HUMERAL BODIES WITH LOCKING SCREW

Ti6Al4V	1352.20.010	HA Coated Reverse Humeral Body	
	1352.15.005	Reverse Humeral Body - Short	■
	1352.15.050	Finned Reverse Humeral Body for Trauma	■
	1352.15.001	Humeral Extension +9 mm	

REVERSE LINERS 36 MM

UHMWPE X-LIMA	1360.50.010	Standard	
	1360.50.015	+3 mm	
	1360.50.020	+6 mm	
	1361.50.010	Retentive Std.	■
	1361.50.015	Retentive +3 mm	■
	1361.50.020	Retentive +6 mm	■

■ Upon Request

SMR REVISION SURGICAL TECHNIQUE
Product Codes

GLENOSPHERE 36 MM WITH CONNECTOR

CoCrMo	1374.09.105	Glenosphere dia. 36 mm - Small-R
	1374.09.110	Glenosphere dia. 36 mm
	1376.09.025	Eccentrical Glenosphere dia. 36 mm - Small-R
	1376.09.030	Eccentrical Glenosphere dia. 36 mm
	1374.15.010	Glenosphere + Adaptor + “LTO Randelli” Screw

Ti6Al4V	1374.15.105	Glenosphere dia. 36 mm - Small-R	■
	1374.15.110	Glenosphere dia. 36 mm	■
	1376.15.025	Eccentrical Glenosphere dia. 36 mm - Small-R	■
	1376.15.030	Eccentrical Glenosphere dia. 36 mm	■

GLENOSPHERE 36 MM

CoCrMo	1374.09.111	Glenosphere dia. 36 mm
	1376.09.031	Eccentrical Glenosphere dia. 36 mm

Ti6Al4V	1374.15.111	Glenosphere dia. 36 mm
	1376.15.031	Eccentrical Glenosphere dia. 36 mm

■ Upon Request

REVERSE HP LINERS

CoCrMo		DIA. 40 MM	
	1365.09.010	Liner dia. 40 mm - Short	
	1365.09.015	Liner dia. 40 mm - Medium	
	1365.09.020	Liner dia. 40 mm - Long	
	1365.09.115	Lateralizing Liner 40 mm - Medium	■
	1365.09.120	Lateralizing Liner 40 mm - Long	■
		DIA. 44 MM	
	1362.09.010	Liner dia. 44 mm Short	
	1362.09.015	Liner dia. 44 mm Medium	
	1362.09.020	Liner dia. 44 mm Long	
	1362.09.115	Lateralizing Liner 44 mm - Medium	■
	1362.09.120	Lateralizing Liner 44 mm - Long	■

REVERSE HP GLENOSPHERE

UHMWPE X-LIMA + Ti6Al4V		DIA. 40 MM
	1374.50.400	Glenosphere dia. 40 mm
		DIA. 44 MM
	1374.50.440	Glenosphere dia. 44 mm
	1374.50.444	Corrective Glenosphere dia. 44 mm

CONNECTORS WITH SCREW *

Ti6Al4V	1374.15.305	Connector with Screw - Small-R
	1374.15.310	Connector with Screw - Small STD

* Necessary with REVERSE HP, optional with 36 mm glenospheres

■ Upon Request

SMR REVISION SURGICAL TECHNIQUE

Product Codes

CEMENTED GLENOID

UHMWPE	1378.50.005	Small-R
	1378.50.010	Standard
	1378.50.020	Small

CEMENTED GLENOID 3 PEGS

UHMWPE X-LIMA	1379.51.005	X-Small
	1379.51.010	Standard
	1379.51.020	Small
	1379.51.030	Large

METAL BACK GLENOIDS

Ti6Al4V + PoroTi + HA	1375.20.005	Small - R
	1375.20.020	Small
	1375.20.010	Standard
	1375.20.030	Large ■

METAL BACK GLENOID LINER

UHMWPE	1377.50.005	Small - R
	1377.50.020	Small
	1377.50.010	Standard
	1377.50.030	Large ■

■ Upon Request

BONE SCREWS

Ti6Al4V		DIA. 6.5 MM
	8420.15.010	L. 20 mm
	8420.15.020	L. 25 mm
	8420.15.030	L. 30 mm
	8420.15.040	L. 35 mm
	8420.15.050	L. 40 mm

GLENOID PLATES *

Ti CP	1374.15.505	Small-R - Double
	1374.15.510	Small STD - Double

* Glenoid Plates are suitable only for REVERSE HP

CORTICAL BONE SCREWS *

Ti6Al4V		DIA. 4.5 MM
	8430.15.010	L. 32 mm
	8430.15.020	L. 36 mm
	8430.15.030	L. 40 mm
	8430.15.040	L. 44 mm
	8430.15.050	L. 48 mm
	8430.15.060	L. 52 mm

* Cortical Bone Screws are suitable only for GLENOID PLATES

■ Upon Request

Notes

Notes

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