



TM

HUMELock REVERSED



TRAUMA



SURGICAL TECHNIQUE

CHARACTERISTICS, TIPS AND TRICKS



Index for offset of humeral cup = adaptation to posterior offset or in case of epiphyseal malunion (revision).



Humeral cup:
 Thermocompressed poly UHMWPE in titanium shell
 3 available heights (+3, 6, +9mm)
 + spacer (+9mm)



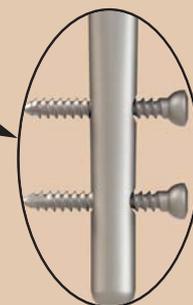
Stem designed with an anatomical shape giving intrinsic stability:
 Fluted in diaphysis,
 Belled in metaphysis,
 Filling in epiphysis.



3 sizes of humeral stems*:

TA6V ELI / Ti + HA coated
 Epiphysis Ø32 mm - diaphysis Ø08 mm
 Epiphysis Ø36 mm - diaphysis Ø10 mm
 Epiphysis Ø40 mm - diaphysis Ø12 mm

Resection at 145° = protection of scapula notching.

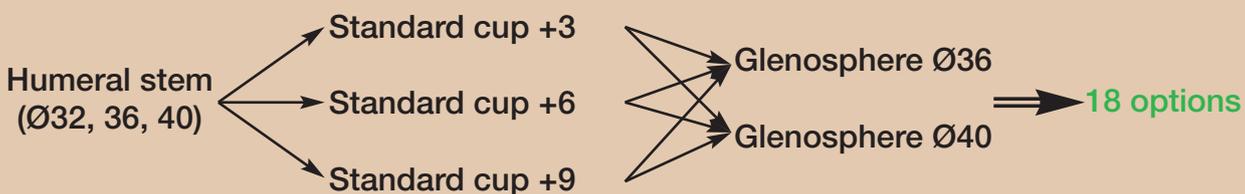


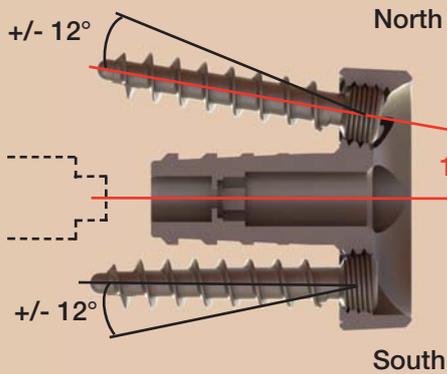
Self-stable but lockable in the event of stem instability in the diaphysis.



T40 cage* allowing molding to fit epiphysis.
 3 sizes: 32/36 mm, 36/40 mm and 40/44 mm.

Modularity of the prosthesis:





Locking screw Ø4.5 TA6V ELI :
 Cortico-cancellous (conical core)
 Conical head
 Non traumatic tip
 5 sizes (20 to 40 mm)

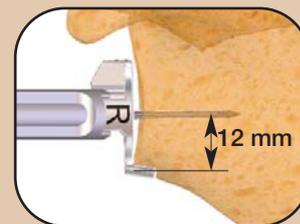
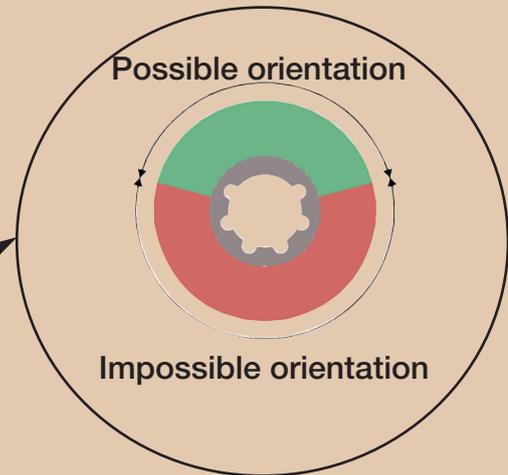


Standard screw Ø4.5 TA6V ELI :
 Cylindrical core
 Conical head
 Non traumatic tip
 5 sizes (20 to 40 mm)

Baseplate Ø24 mm :

Fits all anatomies
 TA6V ELI / Ti + HA coated
 Conical assembly
 4 cylindrical threaded holes
 2 extensions of +6 and +10 mm for lateralization and revisions.

Directive locking & variable angle screw system*

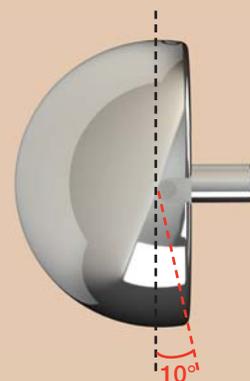


Implantation at 12 mm from inferior edge of the scapula



CoCr glenosphere:

2 sizes: Ø36, Ø40 mm
 Centric or eccentric (3 mm)
 Conical grooved impaction*
 No central hole to limit poly debris.



Tilt = 10°

* Patented or patent pending

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INTRODUCTION

Humelock™ Reversed is a new generation of reversed prosthesis, designed for numerous shoulder pathologies: ranging from offset arthritis to a complex cephalotuberosity fracture in a subject over 70 years. The technical characteristics of this implant have been designed based on computer simulations, correlated to results previously published in medical journals, in order to avoid the disadvantages of traditional reverse prostheses.

A centric or eccentric glenosphere, tilted at 10°, centered on a variable length baseplate post (compatible with positioning techniques), the position of which is guided by an intuitive adaptive instrumentation.

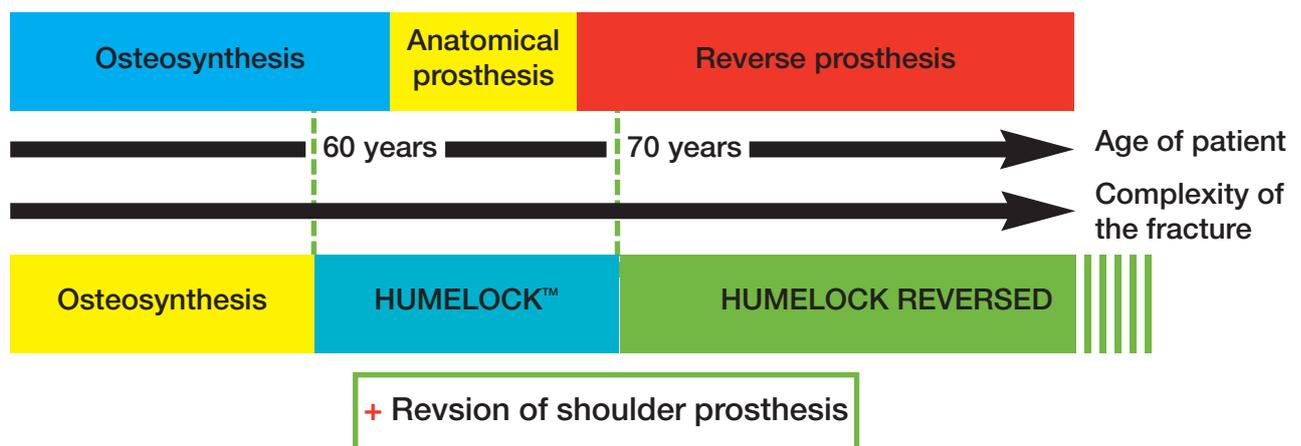
A 145° prosthetic epiphysis allows the pillar of the scapula to be protected while maintaining optimum stability.

The humeral implant is positioned naturally in the center of the epiphysis, preserving the remaining bone as much as possible. However, the options of locking or cementing will allow the surgeon to position the prosthetic stem at the required height, according to the patient's indication and anatomy.

Humelock™ Reversed is a totally modern implant, designed to adapt to the new lifestyles of older, increasingly active, patients for a longer timeframe.

INDICATIONS

Classical indications for anatomical prostheses in cephalotuberosity fractures:



PATIENT POSITIONING

The recommended patient positioning is a beach chair with a member free in the operating area and the head fixed in position.

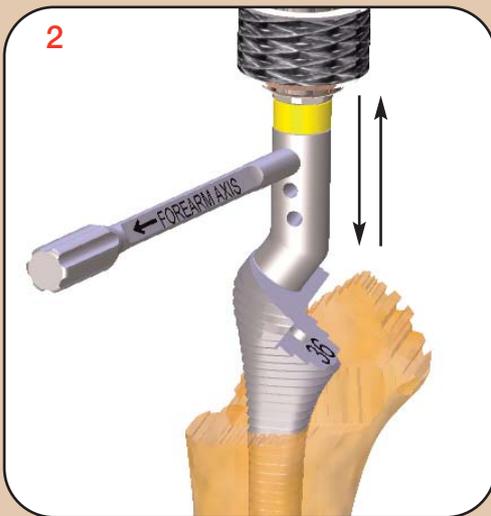
X-ray imaging must be available to confirm implants position intraoperatively.

SURGICAL TECHNIQUE - HUMERUS



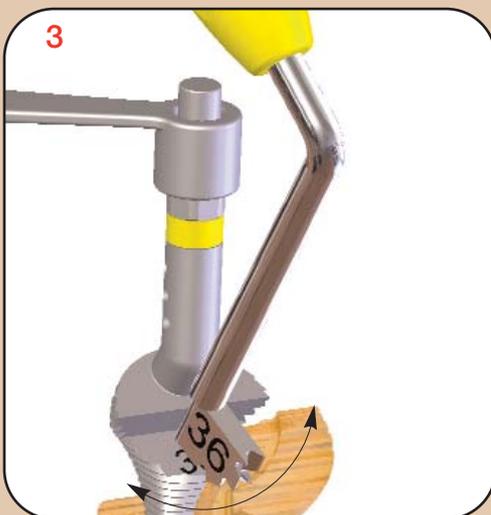
Preparation of the humeral shaft:

Use the reamers in increasing size order on the T handle. Go from one size to the next until the diameter of the reamer meets the diameter of the shaft. The stem choice is made depending on the last reamer size used: Ø08 mm --> Stem with an epiphysis of Ø32 mm; Ø10 mm --> Stem with an epiphysis of Ø36 mm; Ø12 mm --> Stem with an epiphysis of Ø40 mm;



Metaphyseal preparation :

Use the metaphyseal rasps **in order of increasing** size while also checking the retroversion. The size of the metaphysis is determined by the size of the last reamer used. Ø08 mm --> Stem with an epiphysis of Ø32 mm; Ø10 mm --> Stem with an epiphysis of Ø36 mm; Ø12 mm --> Stem with an epiphysis of Ø40 mm; Connect the rasp to the T handle. Screw the retroversion stem onto the rasp. Impact the rasp until it is flush with the height of the resected bone surface.



Epiphyseal preparation:

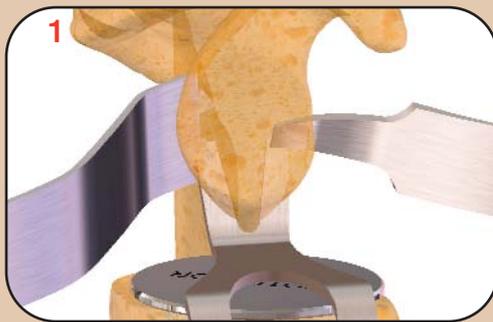
Use the same size epiphyseal rasp as the metaphyseal rasp. The metaphyseal and epiphyseal rasps are color coded. Unfasten the inside part of the rasp and fit the epiphyseal rasp in the designated hole. Maintain the metaphyseal rasp using the special wrench. Shape the epiphysis up to the height of the metaphyseal rasp.



Humerus protection:

Insert the protector into the prepared humerus during the glenoid preparation.

SURGICAL TECHNIQUE - GLENOID



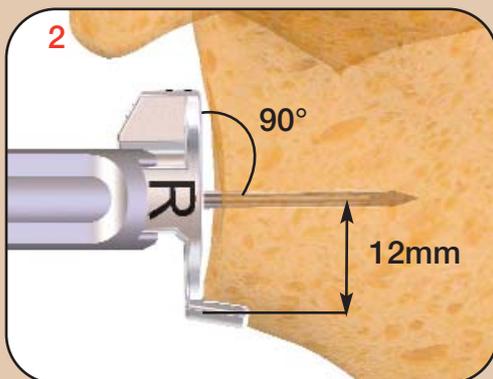
Glenoid exposure :

Expose the glenoid fully using the three types of retractors.

- Anterior retractor,
- Superior retractor,
- Inferior retractor.

Remove the glenoid labrum.

Remove any potential osteophytes to expose the full bone anatomy.



Placing the K-wire:

Three different positions for the guide: Left (L), Right (R) or Superior lateral (S).

Position the K-wire guide on the lower edge of the pillar of the scapular to determine the correct height.

The K-wire is 12mm above the lower edge, according to Kelly¹ and must be centered in the antero-posterior plan.

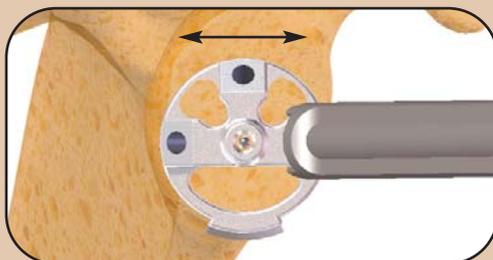
The K-wire guide orientation is important for the glenoid tilt and must be done at 90°.

The glenospheres are tilted (lower lip) by 10°.

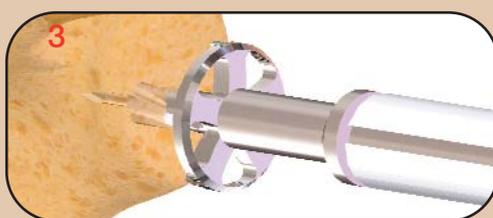
Positioning should be to fit the anatomy of the patient and planned according to pre-operative X ray.

This element must be decided in pre-operative planning. By default, the base plate is perpendicular to the mid plane of the glenoid.

Insert K-wire by power tool.



(1) Kelly JD, Humphrey CS, Norris TR. Optimizing glenosphere position and fixation in reverse shoulder arthroplasty, Part One: the twelve-mm rule. J Shoulder Elbow Surg 2008;17:589-94

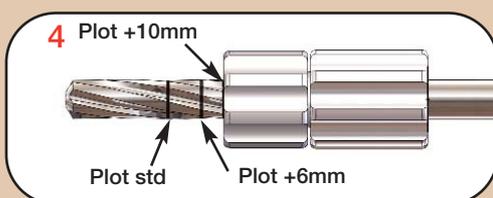


Glenoid reaming:

Drill and ream the glenoid using the K-wire guide.

Ream until the subchondral bone is reached.

This step can be done by power or by hand if the glenoid is porotic.

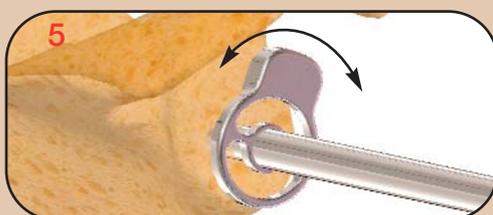


Extension post:

In the case of revision or lateralisation of the center of rotation with a graft from the pillar of the scapula, it is possible to extend the post by 6 or 10 mm.

Tighten the block-stop in the correct position by screwing it onto the drill to either 6 mm or 10 mm, as required.

Drill the post again with block stop in position.



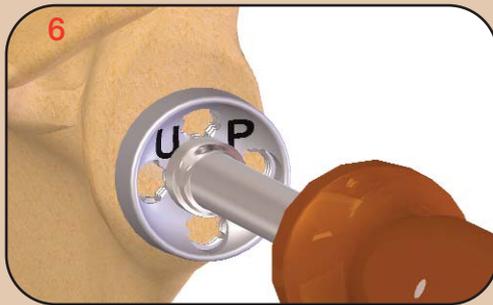
Glenoid clearance:

Remove the K-wire.

To avoid any interference between the glenosphere and the scapula, reaming the superior and inferior parts of the glenoid using the Ø40 mm hand reamer.



Pay attention to avoid making the post hole oval.
360° clearance = successful impaction of the glenosphere.



Positioning the baseplate :

Connect the holder / impactor to the baseplate. Impact the baseplate so that there is pressure over the whole surface. The impactor allows for the upper and lower holes to be placed so that a screw can be positioned in the base of the coracoid and in the pillar of the scapula.



The sign (UP) must be on top under the coracoid basis.

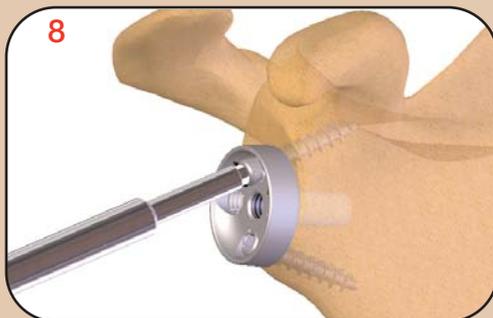


Length of screws (5 sizes from 20 to 40 mm) :

An adapted guide allows for the holes to be drilled and the length of the screws measured with the Ø 3.2 mm drill bit. The length of the screws are measured directly.

It is possible to drill up to the 2nd cortex and use the gauge to measure the screw length.

The screw length is measured from under the head. Two types of screws are available, locking or standard.



Fixation of the baseplate:

Standard screws allow the baseplate to be lagged to the bone, and locking screws fix the mounting.

Each screw allows an angulation of +/-12° around the axial hole.

The upper hole for the first screw is pre-oriented by 10° to optimise its positioning in the base of the coracoid.

OPTION: CAGE AND/OR LOCKING



Choice of the cage size:

Use the trials in order of increasing sizes.

The cage allows for the metaphysis to be increased at the antero-posterior and lateral level.

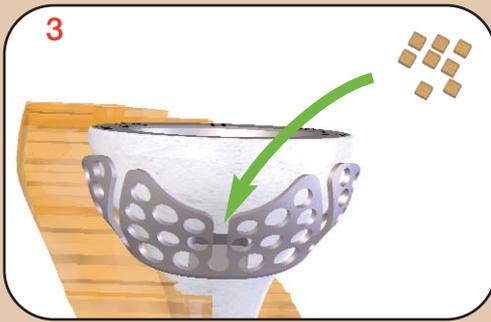
It therefore allows for a homogeneous epiphyseal mass to be reconstructed.



Fitting of the definitive cage:

Fit the appropriate implant to the stem.

Secure using the screw provided with the Hex 3.5 mm screwdriver.



Filling the cage:

Use small autograft cubes (5mm) taken from the native head to fill the cage.

The cage, made of T40 titanium, allows for optimized epiphyseal filling in patients with osteoporosis.

For these patients one may not wish to cement the stem but preserve maximum bone contact.



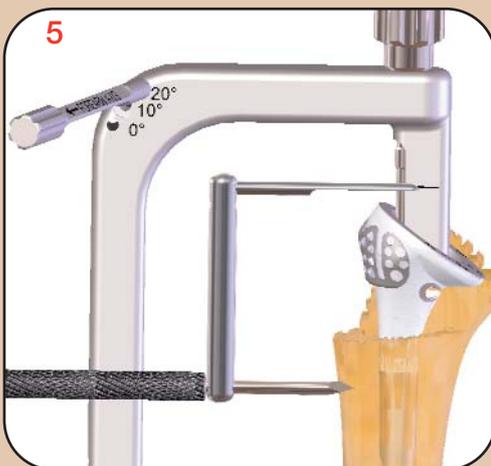
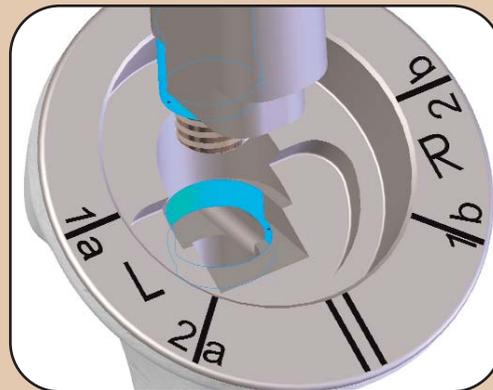
For locked stem option:

Remove the cage screw. It will be replaced after locking is finished.

Insert the aimer (jig) into the taper of the stem.

Check that the pin is correctly located in its housing within the stem.

Tighten the screw of the mounting «implant + aimer (jig)».



The retroversion is determined by screwing the rod into one of 3 positions (0, 10, 20°) and aligning it with the arm.

Use the Muraschosky¹ criteria to set the height of the implant.

(1) Murachowsky J et al. JSES 06; Torrens C et al. JSES 08; Hasan SA et al. Orthopedics 09

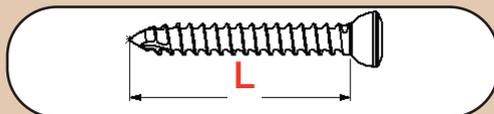
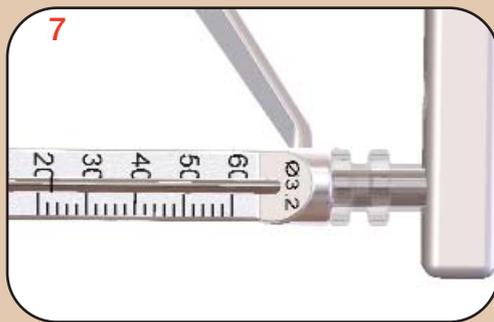


Proximal interlocking:

Carefully dissect the soft tissue using Halstead forceps.

Insert the Ø10mm guide into the top hole of the aimer (jig), using the soft tissue protector, until contact is made with the cortex.

Insert the Ø4.5mm guide into the Ø10mm guide.



Screws length (10 sizes):

a) Without gauge:

Drill through first cortex using marked drill bit.

Stop at second cortex, measure and use a screw size 4 mm longer, ie $L + 4 \text{ mm}$.

Drill through the second cortex.

b) With gauge:

Drill through the first and second cortex

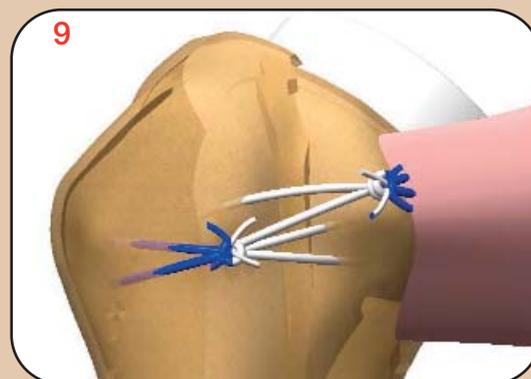
Use the depth gauge to measure the screw length and use a screw 2 mm longer, ie $L + 2 \text{ mm}$.

Screw length is measured from under the head.

Distal interlocking:

Use the same method as proximal interlocking.

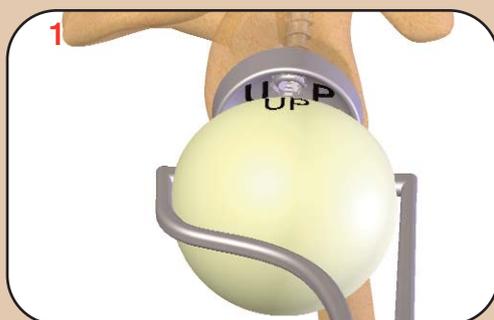
Remove aimer (jig) and replace cage screw.



Fitting of Smartloop sutures:

- 2 traction loops (white)
- 2 plating loops (blue)

TRIAL IMPLANTS



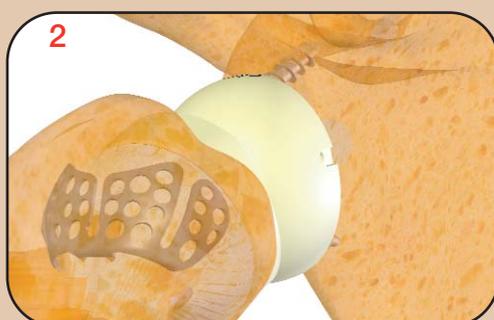
Glenosphere trial (10° tilt):

The choice of glenosphere does not depend on the size of the humeral stem.

All glenospheres are tilted downwards by 10°.

For slim patients ($\text{IMC (P/T2)} \leq 21$), it is recommended to use a glenosphere $\text{Ø } 40 \text{ mm}$, where possible particularly if the subject is male.

Position the glenosphere with the special clamp allowing the humerus to be circumvented by delto-pectoral approach.



Cup trial:

The cup Ø matches Ø of the glenosphere.

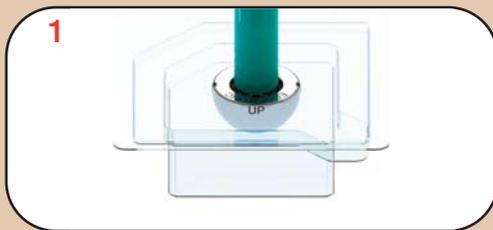
Three heights are available (+3, +6, +9 mm). If required a spacer (+9 mm) is available to add to the cup.

An offset of the wearing surface compared with the metaphyseal part is possible with all cups.

Test for stability and mobility.

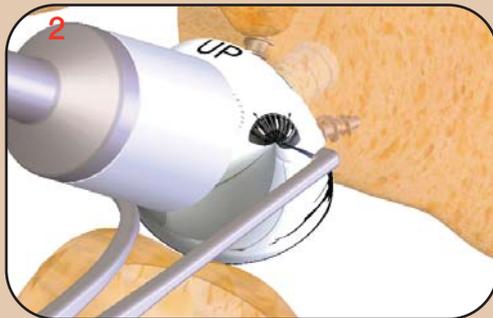
Trials are identical to the final implants.

DEFINITIVE IMPLANTS



Handling of the definitive glenosphere:

Insert the glenosphere implant holder into the definitive implant. On the specially designed clamp, there are notches on the jaws which should be positioned to coincide with those on the middle of the glenosphere implant.



Fitting of the definitive implants:

When positioning the glenosphere, pay attention to the "UP" marking, for eccentric spheres.

Introduce first the guiding post, then the female taper of the glenosphere into the male taper of the baseplate.

Be sure to check that there are no splinters on the baseplate hindering impactation of the morse taper.



Impact the glenosphere and check it before closure.



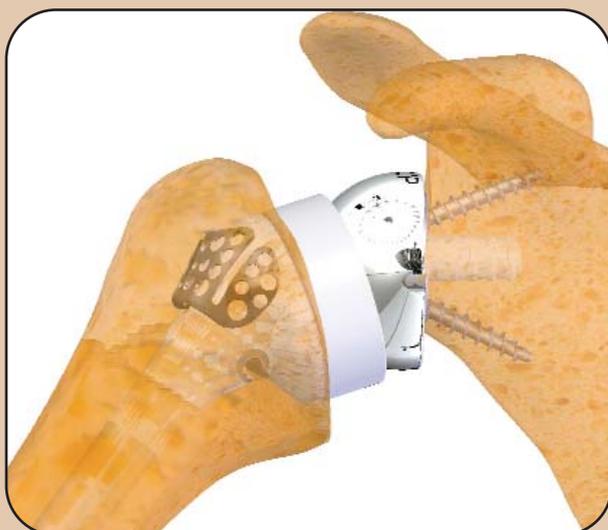
Index of the definitive cup:

Find both index on the definitive cup and stem.

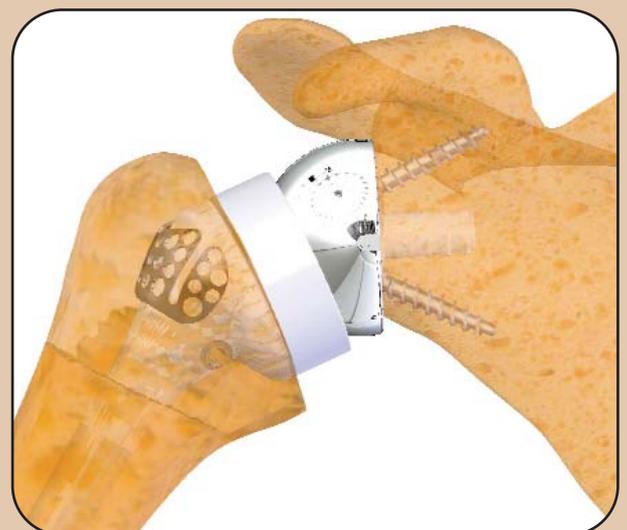
Position the cup so that the index match the index on the stem.

Insert the cup into the taper of the stem so that the index of the cup and stem are correctly aligned.

Optimise the orientation of the cup to match with posterior offset. Check there is nothing impeding it and impact it.



If the neck of the scapula is short, it is recommended to use an offset glenosphere to reduce the risk of notching.



If the neck of the scapula is long, depending on the deltoid tension and the stability of the mounting, a centered glenosphere can be implanted.



IMPLANTS REMOVAL



Glenosphere removal:

Screw the arch with the corresponding \emptyset to remove that of the glenosphere onto the extractor.
Pass the spurs onto the internal face of the glenosphere to fit them in the designed notches.
Separate tapers with the sliding hammer.



Baseplate removal:

Unscrew the baseplate screws with the Hex 3.5 mm screwdriver.
Screw the extractor into the baseplate post and remove it.



Stem removal:

Remove the taper by sliding a Powels blade between the cup and the stem.
Unscrew the cage screw with the Hex 3.5 mm screwdriver.
Lift up the aimer to remove the locking screws if necessary.
Screw the extractor into the stem to remove it with sliding hammer.

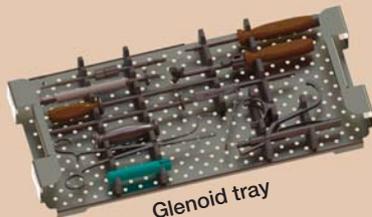
REHABILITATION

Short-term immobilisation (on the surgeon's assesment) with mobilization in neutral rotation to promote recovery of the external rotation.

Promote balneotherapy and specialist rehabilitation, without counter-resistance work until the sixth week, depending on the age and objectives noted in the "patient contract".

IMPLANTS

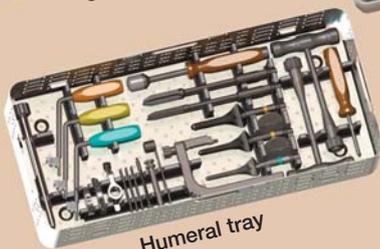
101-0000	Hex. 3.5 screw for OMS / cage
103-0007	Humeral spacer TA6V +9 mm
103-0803	Humeral cup std PE/TA6V Ø36/+3
103-0806	Humeral cup std PE/TA6V Ø36/+6
103-0809	Humeral cup std PE/TA6V Ø36/+9
104-0803	Humeral cup std PE/TA6V Ø40/+3
104-0806	Humeral cup std PE/TA6V Ø40/+6
104-0809	Humeral cup std PE/TA6V Ø40/+9
105-0006	Post extension TA6V +6 mm
105-0010	Post extension TA6V +10 mm
105-0024	Glenoid baseplate TA6V Ti/HA Ø24 mm
105-3600	Centric glenosphere CoCr Ø36 mm
105-3603	Eccentric glenosphere CoCr Ø36 mm
105-4000	Centric glenosphere CoCr Ø40 mm
105-4001	Eccentric glenosphere CoCr Ø40 mm
107-4518/4536	Cortical screw TA6V Ø4.5 mm L.18 to 36 mm inc. 2mm
108-3632	Cage T40 R36/Ø32 mm
108-4036	Cage T40 R40/Ø36 mm
108-4440	Cage T40 R44/Ø40 mm
108-4520/4540	Polyaxial locking screw TA6V Ø4.5 mm L. 20 to 40 mm inc. 5 mm
109-4520/4540	Standard screw TA6V Ø4.5 mm L.20 to 40 mm inc. 5 mm
312-3208	Stem TA6V cementless Ø32/08 Ti/HA
312-3610	Stem TA6V cementless Ø36/10 Ti/HA
312-4012	Stem TA6V cementless Ø40/12 Ti/HA
903-0803/0809	Std trial humeral cups Ø36+3, 6 and 9 mm
903-3600	Trial centric glenosphere Ø36 mm
903-3603	Trial eccentric glenosphere Ø36 mm
903-4000	Trial centric glenosphere Ø40 mm
903-4001	Trial eccentric glenosphere Ø40 mm
903-3632	Trial cage R36/Ø32
903-4036	Trial cage R40/Ø36
903-4440	Trial cage R44/Ø40
903-0700	Trial humeral spacer +9 mm
904-0803/0809	Std trial humeral cups Ø40+3, 6 et 9 mm



Glenoid tray



Trials tray



Humeral tray



1663, rue de Majornas - 01440 Viriat - France
 Tél. : (33) 04 74 55 35 55 - Fax : (33) 04 74 52 44 01
 E-mail: info@fxsolutions.fr - www.fxsolutions.fr

INSTRUMENTS

903-0000	Cutting guides holder
903-0001	Cutting guides holder screw
903-0002	Delto pectoral cutting guide
903-0003	Superior lateral cutting guide
903-0004	Retroversion stem
903-0005	Pin Ø3.2 mm L. 80 mm
903-0006	Stem impactor
903-0007	Protector Ø44
903-0008	Protector Ø44 with guide
903-0009	Cup impactor
903-0012	K-wire guide
903-0013	Guides holder
903-0014	Glenoid resurfacing reamer Ø24 mm/AO
903-0015	Glenoid manual reamer Ø40 mm
903-0016	Drill bit Ø7.0 mm / AO ext. post
903-0017	Stop drill
903-0018	Baseplate impactor
903-0020	Aimer (jig)
903-0021	Screw / aimer
903-0022	Guide Ø10 mm
903-0023	Drilling guide
903-0024	Drill bit Ø3.2 mm L. 250 mm/AO
903-0030	Arch Ø36 mm
903-0031	Arch Ø40 mm
903-0032	Extractor
903-0033	Hammer
903-0034	Pin extractor
903-0040	Glenosphere holder
903-0041	Glenosphere clamp
903-0100	Triangular awl
903-0102	T handle / AO
903-0108	Reamer Ø08 mm
903-0110	Reamer Ø10 mm
903-0112	Reamer Ø12 mm
903-0200	Wrench
903-0232/0240	Metaphyseal rasp Ø32, 36 and 40 mm
903-0332/0340	Epiphyseal rasp Ø32, 36 and 40 mm
604-0003	Complete instrumentation set
604-0004	Instrumentation upper tray