

# MEDACTA SHOULDER SYSTEM

COMPLETE, CONVERTIBLE, INNOVATIVE



## Surgical Technique

Joint

Spine

Sports Med



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## 1. INTRODUCTION

This surgical technique describes how to perform an anatomic shoulder arthroplasty implanting a cemented pegged glenoid.

### CAUTION

Federal law (USA) restricts this device to sale distribution and use by or on the order of physician.

### 1.1 INDICATIONS OF USE

#### Anatomic Shoulder Prosthesis

The Medacta Anatomic Shoulder Prosthesis is indicated for treatment of humeral fractures and for primary or revision total shoulder replacement in patients with an intact or reparable rotator cuff shoulder joint, severe arthropathy or a previously failed joint replacement. The patient's joint must be anatomically and structurally suited to receive the selected implant(s), and a functional deltoid muscle is necessary for the device to offer full function in vivo. The glenoid component is intended for cemented application.

#### Short Humeral Diaphysis

The Medacta Anatomic Shoulder Prosthesis is indicated for primary total shoulder replacement in patients with an intact or reparable rotator cuff shoulder joint and/or severe arthropathy. The patient's joint must be anatomically and structurally suited to receive the selected implant(s), and a functional deltoid muscle is necessary for the device to offer full function in vivo. The glenoid component is intended for cemented application.

### 1.2 CONTRAINDICATIONS

Total joint replacement is contraindicated in cases of:

- Local or systemic infection or sepsis
- Insufficient bone quality which may hinder the stability of the implant
- Muscular, neurological, or vascular deficiencies, which compromise the affected extremity
- Any concomitant disease and dependence that might affect the implanted prosthesis
- Materials (metals, etc.) sensitivity or allergy
- Loss of ligamentous structures that will prevent stabilisation and/or function of the device in vivo
- Non-functional deltoid muscle

### 1.3 PRE-OPERATIVE PLANNING

For planning purposes, standard X-rays are used. The recommended views are:

- antero-posterior view in internal rotation;
- antero-posterior view in external rotation;
- axillary view;
- Morrison or Bernageau view

A CT-Scan with a three dimensional reconstruction is suggested for fracture cases. Further information on bone deficit and on muscle/capsule quality can be gathered with an MRI, recommended in osteoarthritis and osteonecrosis cases. A neurological investigation could be helpful, for patient conditions assessment, especially in post-traumatic cases such as special cases of disabled shoulder.

Templates are used in all osteoarthritic and osteonecrosis cases; they can also be used in fracture cases but may not be sufficient for thorough planning, depending on the type of fracture. The X-ray templates have a 115% scale; different magnifications and digital templates are also available on request.

### 1.4 SURGICAL APPROACH

The patient is usually placed in a beach chair position. Maintain free space for shoulder extension and adduction. Two surgical approaches are most frequently used for anatomic shoulder prosthesis: anterior (or extended delto-pectoral) approach or anterosuperior approach. Both can be used with the standard instrumentation provided, which has been optimised for the extended delto-pectoral approach. Below the basic steps of the extended delto-pectoral approach are described and referred to.

- Incision
  - an incision is made following the line of the delto-pectoral groove
  - a 10-15 cm incision is usual, but should be made in accordance with the surgical need and size of the patient
- Superficial dissection
  - the delto-pectoral fascia is encountered first ; the cephalic vein is surrounded by a layer of fat and is used to identify the interval; the cephalic vein can be mobilised either medially or laterally, depending on patient factors and surgeon preference.
  - fibers of the deltoid are retracted laterally and the pectoralis major is retracted medially
- Deep dissection
  - the short head of the biceps and coracobrachialis arise from the coracoid process and are retracted medially. The musculocutaneous nerve enters the biceps 5-8 cm distal to the coracoid process; care must be taken when retracting the conjoint tendon

- the fascia on the lateral side of the conjoint tendon is incised to reveal the subscapularis; external rotation stretches the subscapularis fibers. The subscapularis may be released from its insertion on the lesser tuberosity through the tendon or via an osteotomy
- the capsule is then incised (as needed) to enter the joint

Exposure of the humeral head can be achieved through extension, external rotation and adduction.

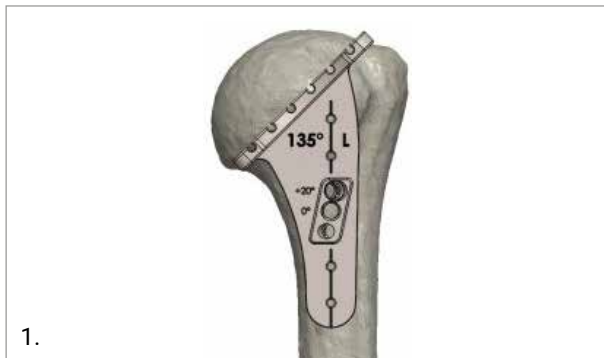
This operating technique is independent of the chosen approach.

## 2. HUMERAL DIAPHYSIS PREPARATION

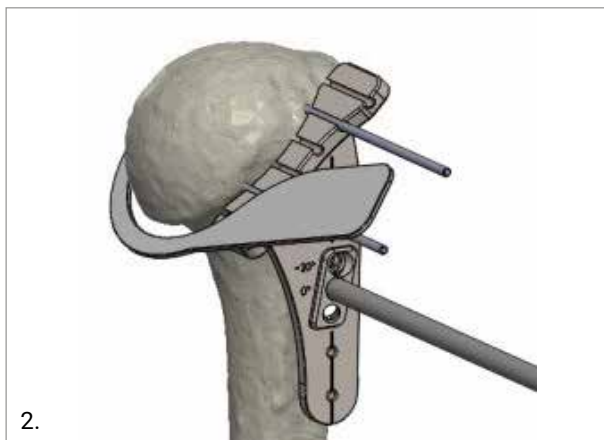
### 2.1 HUMERAL HEAD RESECTION

Expose the relevant landmarks such as the most medial insertion line of the supraspinatus, the bicipital groove and the estimated original location of the anatomical neck.

Position the EM humeral cutting guide so that the resection plane is flush with the most medial insertion line of the supraspinatus and the shaft follows the humeral diaphysis. This will result in an approximate cut inclination of 135°.



Check the cut inclination and retroversion using the humeral sickle and the retroversion rod. Once the desired position is found, fix the guide with two Ø2mm pins.



Perform the cut using an oscillating saw.

### 2.2 MEDULLARY CANAL OPENING

Connect the T-handle to the medullary canal opener and use it to open the humeral canal. Start 8 mm posterior to the deepest point of the bicipital groove and close to the medial insertion of the supraspinatus.

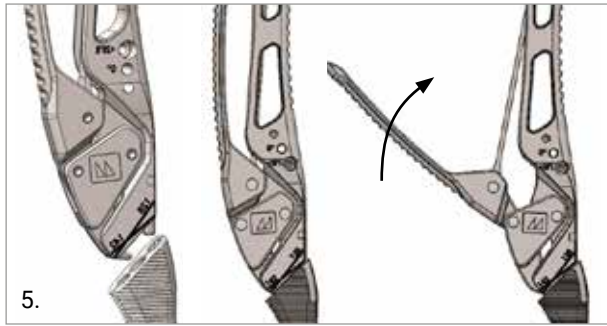


### 2.3 HUMERAL CANAL PREPARATION

To avoid undersizing and varus positioning of the stem, remove the proximal metaphyseal cancellous bone using the metaphyseal chisel.



Attach the smallest broach (size 6) to the humeral broach handle: insert the lateral tip of the handle into the dedicated slot of the broach and close the lever to insert the medial tip and lock the broach.



Start preparing the canal by lightly hammering on the anvil.

Stop hammering when the superior plane of the broach is aligned with the humeral resection. Continue broaching with incrementally larger sizes.

The largest size that fits with its proximal portion fully seated in the canal determines the final stem size.



**WARNING**

Do not try to introduce a broach larger than the last Intramedullary Reamer. This might lead to a diaphyseal humeral fracture.

The broach has an embedded 135° inclination, while 128° and 142° markings are available on the broach handle.

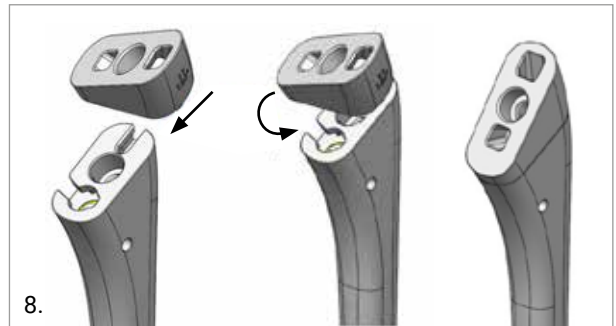
Check the humeral inclination considering that the correct inclination line should start from the supraspinatus insertion and should be flush with the humeral cut.

**2.4 FINAL HUMERAL RESECTION**

If the measured inclination is 135°, remove the broach handle by pulling the lever and leave the rasp in the canal.



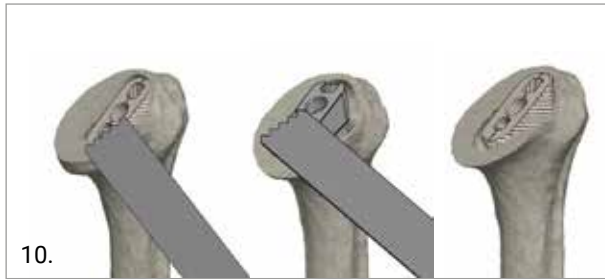
If the measured inclination is 128° or 142°, remove the rasp from the canal. Select the desired inclination of the trial humeral metaphysis and connect it to the corresponding trial humeral diaphysis as shown in the pictures below.



Insert the assembled trial stem into the humeral canal using the broach handle.



Use the proximal surface of the broach or trial stem as a cutting guide to perform the final humeral resection.



10.

Alternatively it is possible to use a planar cutter with a power tool to obtain the final humeral resection. Screw the humeral reaming guide onto the broach or trial stem, connect the planar cutter to the reamer shaft and ream the humeral metaphysis until a mechanical stop occurs.



11.

## 2.5 HUMERAL HEAD SIZE DETERMINATION

Use the trial humeral head to define the implant size. Check the coverage by positioning the trial humeral head over the resected bone. Choose the size that best fits the humeral anatomy. If in doubt between two sizes, it is preferable to select the smaller one.



12.

## 2.6 CUT PROTECTION

Place the cut protector on the resection plane. Choose the size which offers the best coverage. Fix it by screwing it to the broach using the HEX 3.5 screwdriver.



13.



### 3. GLENOID PREPARATION AND TRIAL INSERTION

#### 3.1 EXPOSURE OF THE GLENOID

Two different options are available to expose the glenoid:

1. External rotation and abduction of the humerus.
2. Alternatively, expose the glenoid trough humeral flexion, internal rotation and slight abduction, aiming at postero-inferior dislocation of the humerus. This implies circumferential capsular resection and release of the coracohumeral ligament.

#### 3.2 DEFINITION OF GLENOID CENTRE

Please consider that the glenoid size to be used corresponds with the previously selected humeral head size. This leads to a diametrical mismatch of 6 mm.

If desired, the glenoid size can be increased or decreased, taking into account that this choice will affect the level of diametrical mismatch, according to the following table:

		Cemented glenoid										
Size		40	42	44	46	48	50	52	54	56	58	
A.D.		46	48	50	52	54	56	58	60	62	64	
Humeral head	40	40	6	8	10							
	42	42	4	6	8	10						
	44	44	2	4	6	8	10					
	46	46		2	4	6	8	10				
	48	48			2	4	6	8	10			
	50	50				2	4	6	8	10		
	52	52					2	4	6	8	10	
	54	54						2	4	6	8	10
56	56							2	4	6	8	
58	58								2	4	6	

A.D. = Articular Diameter

Connect the glenoid multi-purpose handle to the anatomical glenoid aiming device of the corresponding selected size. Position the assembled instrument on the glenoid vault so that the convex surface is in contact with the bone.



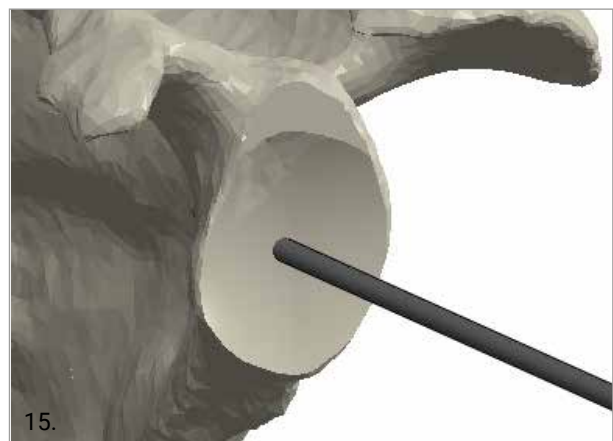
14.

The presence of osteophytes may lead to incorrect positioning. It is highly recommended to remove them before positioning the k-wire.

Fine-tune the position so that the outer profile matches the glenoid rim and assess the glenoid coverage considering that the outer profile of the aiming device represents the smaller indicated size.

Insert the k-wire through the central hole of the aiming device adjusting the drilling orientation in order to obtain the planned angular correction.

Remove the aiming device leaving the k-wire in place.



15.



### 3.3 GLENOID REAMING

Select the size of the glenoid reamer as previously determined using the following table:

		Glenoid Implant										
		Size	40	42	44	46	48	50	52	54	56	58
Glenoid reamer	S											
	M											
	L											
	XL											

Not allowed  
 Recommended  
 Usable if desired

Slide it on the k-wire and connect it to the reamer handle as shown in the pictures below.



Use a power tool to ream the glenoid to the desired depth considering that the aim is to normalise the version whilst avoiding excessive thinning of the subchondral bone plate.

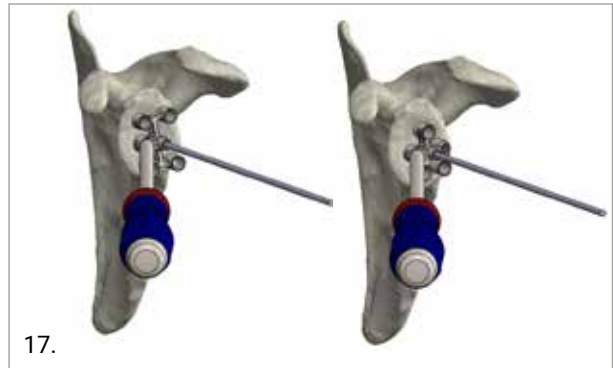
#### TIP

If the shoulder, due to exposure and/or strong soft tissues, is particularly tight and it is difficult to insert the regular anatomic glenoid reamers, use the small size reamers (Ø22, 24.5, 27 mm) provided with the instrument set. Start reaming the glenoid with the reamer Ø22 mm and incrementally increase the reamer size until the antero-postero (AP) aspect of the glenoid is completely reamed. In order to complete the supero-inferior (SI) reaming, remove the k-wire and complete the supero-inferior (SI) reaming free-hand.

In order to verify that the reaming is sufficient to welcome the glenoid final implant, the glenoid aiming device, utilized in the previous surgical step for glenoid sizing, could be used.

### 3.4 PERIPHERAL HOLES PREPARATION

Select the size of the drill guide for pegged glenoid as previously defined and connect it to the glenoid multi-purpose handle. Insert the drill guide over the k-wire and rotate it to match the glenoid orientation.



Drill a Ø4.5mm hole into the supero-anterior hole using the short drill bit for peripheral pegs and leave it in place to provide stability to the drill guide.



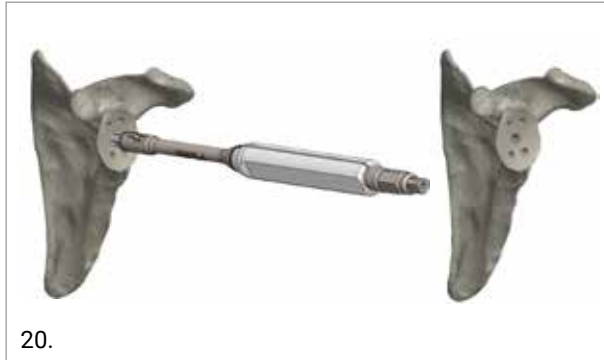
Use the long drill bit for peripheral pegs to drill the other peripheral holes



Remove the drill bit for peripheral pegs, short and long, then remove the drill guide for pegged glenoid, leaving the k-wire in place

## 3.5 CENTRAL HOLES PREPARATION

Connect the central peg reamer to the reamer handle. Slide the assembled reamer over the k-wire and use a power tool to ream the glenoid until the mechanical stop is reached.



## 3.6 TRIAL PEGGED GLENOID INSERTION

Use the glenoid clamp to position the trial pegged glenoid and apply gentle pressure to fix it in place.



## 4. HUMERAL TRIAL INSERTION

### 4.1 TRIAL DOUBLE ECCENTER AND TRIAL HEAD POSITIONING

Remove the humeral cut protector.

Place the trial double eccenter on the broach or trial stem. Select the size of the trial humeral head dish and cap as previously defined. Place the trial head dish on the trial eccenter.



The markings "12" on the head and "A" on the eccenter must be lateral when a neutral position is targeted. Starting from this position, search for the best offset using the following procedure.



Adjust the orientation of the trial double eccenter using the HEX3.5 screwdriver and contemporarily adjust the trial head by hand.



Once their position is considered satisfactory, temporarily lock the embedded screw of the trial double eccentric using the HEX3.5 screwdriver.



Place the trial humeral head cap on the trial double eccentric sliding the anti-rotation pin into the dedicated slot of the trial humeral head dish.



Gently push the trial head cap onto the trial double eccentric to fix it in place.



Perform trial reduction to assess the joint stability and ROM.

**4.2 RECORD HUMERAL VALUES AND REMOVE TRIALS**

Remove the trial humeral head cap.



Record the position of the trial humeral head dish with respect to the trial double eccentric.



Remove the trial humeral head dish.



Record the position of the trial double eccentric with respect to the broach or trial stem.



Unscrew and remove the trial double eccentric.



Protect the humeral cut.

## 5. PEGGED GLENOID IMPLANT IMPACTION

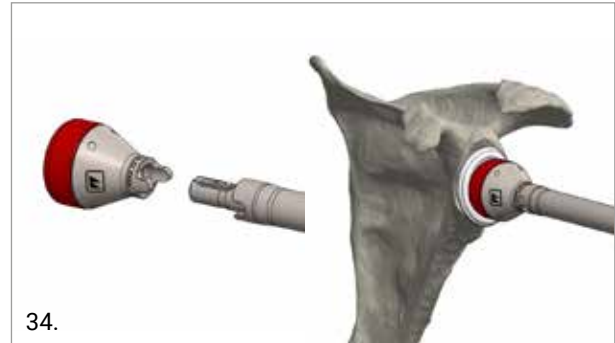
Remove the trial pegged glenoid.

Prepare the bone cement and carefully insert it into the prepared holes.

Use the glenoid clamp to position the pegged glenoid.



Connect the glenoid impactor tip to the impactor handle and use the assembled instrument to impact the glenoid implant.

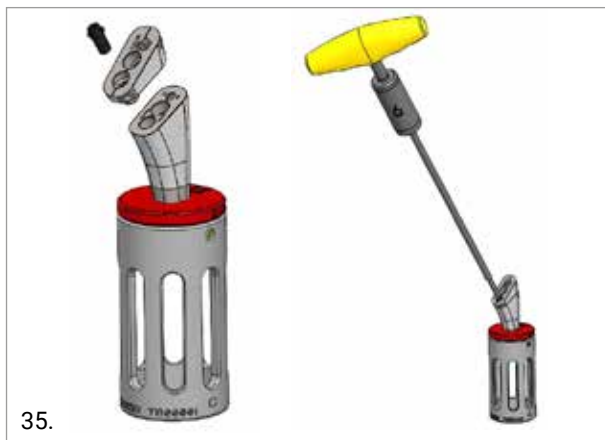


## 6. HUMERAL IMPLANT PREPARATION AND IMPACTION

### 6.1 ANATOMIC STEM BACK TABLE ASSEMBLY

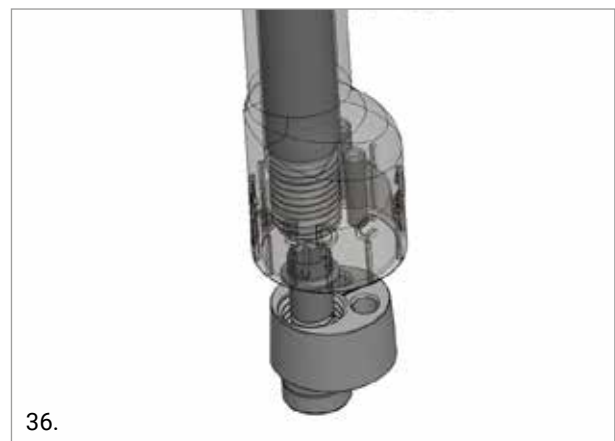
Assemble the backtable stem adapter of the selected humeral diaphysis size with the backtable assembly block, then insert the humeral diaphysis into the hole. Position the anatomic metaphysis of the selected inclination on the humeral diaphysis.

Insert the stem screw and tighten it with the torque limiting screwdriver T20 6 N·m.



Insert the double eccentric screw into the double eccentric. Slide the M8 fixation screw into the double eccentric

positioner. Screw the double eccentric onto the instrument inserting the pins into the dedicated holes.



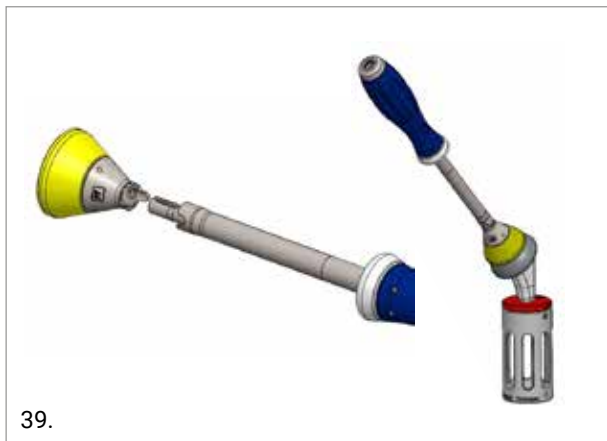
Place the double eccentric on the stem and align the markings (letters) of the instrument in the previously defined position, using the lateral line of the stem as a reference. Slide the torque limiting screwdriver T20 6 N·m into the double eccentric positioner and tighten the double eccentric screw.



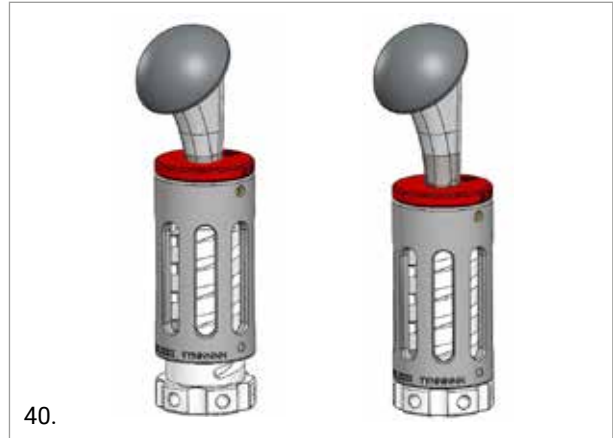
37. Select the previously defined size of the humeral head and place it on the double eccentric aligning the markings (numbers) in the previously determined position, using the notch on the double eccentric as a reference.



38. Connect the humeral head impactor tip to the impactor handle and use the assembled instrument to impact the humeral head on the stem.



If it is difficult to remove the stem from its slot, insert the backtable assembly block into the backtable stem removal device and screw both components. This will push the stem up and release it from the block.



## 6.2 HUMERAL STEM INSERTION AND IMPACTION

Remove the cut protector.  
Remove the broach or trial stem from the humeral canal.

Remove the assembled stem from the backtable assembly block and insert it into the humeral canal by tapping it using the humeral head impactor.





## 7. REMOVAL / REVISION

### 7.1 HUMERAL IMPLANTS REMOVAL / REVISION

In case it is needed, the instrument set does include all the instruments allowing the disassembling and removal of the implants. In the following the main steps are described.

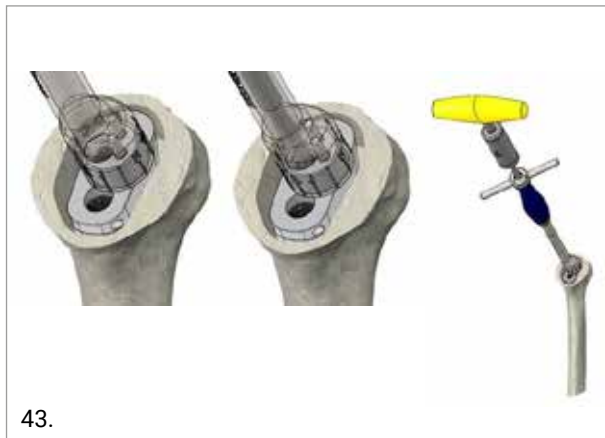
### 7.2 HUMERAL HEAD IMPLANT REMOVAL

Use the Humeral Head Extractor to remove the humeral head. Insert the fork between the humeral resection and the bottom surface of the implant by slightly hammering.



### 7.3 DOUBLE ECCENTER REMOVAL

Remove the eccentric screw using the Double Eccenter Positioner and the Torque Limiter Screwdriver T20.

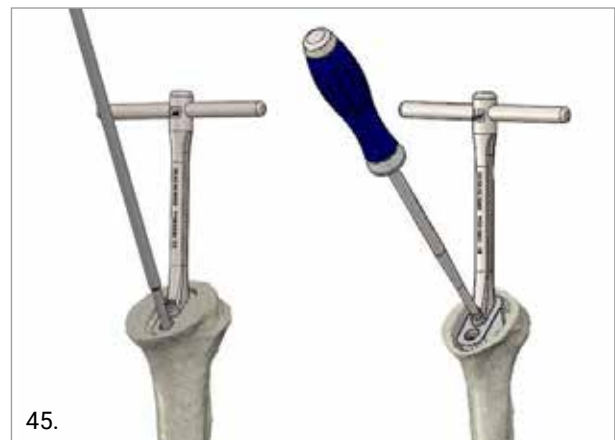


Screw the Double Eccenter Extractor on the double eccentric and slide the Double Eccenter Extractor Sleeve over it. Insert the extraction screw into the Double Eccenter Extractor until the Double Eccenter is completely removed.



### 7.4 ANATOMIC METAPHYSIS REMOVAL

In order to remove the stem screw, position the Anatomical Metaphysis Countertorque on the central and lateral holes and fix it to the stem by screwing using the HEX3.5 screwdriver. Holding the secured Anatomical Metaphysis Countertorque, use the Torque Limiter Screwdriver T20 to unscrew the stem screw.



Screw the Anatomic Metaphysis Extractor on the anatomical metaphysis. Insert the Extraction Screw into the Anatomic Metaphysis Extractor until the anatomical metaphysis is completely removed.





### 7.5 DIAPHYSIS REMOVAL

Assemble the Humeral Stem Repositioner on the Diaphysis by screwing it using the HEX3.5 screwdriver and tap on the awl to extract the Diaphysis from the humeral canal.




### 7.6 PEGGED GLENOID IMPLANT REMOVAL

Use the glenoid clamp to gently remove the pegged glenoid




## 8. IMPLANTS AND INSTRUMENTS NOMENCLATURE


**IMPLANTS**

REFERENCE	DESCRIPTION	PICTURE
04.01.0179	Short humeral diaphysis - cementless - 6	
04.01.0180	Short humeral diaphysis - cementless - 7	
04.01.0181	Short humeral diaphysis - cementless - 8	
04.01.0182	Short humeral diaphysis - cementless - 9	
04.01.0183	Short humeral diaphysis - cementless - 10	
04.01.0184	Short humeral diaphysis - cementless - 11	
04.01.0185	Short humeral diaphysis - cementless - 12	
04.01.0186	Short humeral diaphysis - cementless - 13	
04.01.0187	Short humeral diaphysis - cementless - 14	
04.01.0188	Short humeral diaphysis - cementless - 15	
04.01.0189	Short humeral diaphysis - cementless - 16	


## IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0023	Humeral anatomical metaphysis - cementless - 135° - 6	
04.01.0024	Humeral anatomical metaphysis - cementless - 135° - 7	
04.01.0025	Humeral anatomical metaphysis - cementless - 135° - 8	
04.01.0026	Humeral anatomical metaphysis - cementless - 135° - 9	
04.01.0027	Humeral anatomical metaphysis - cementless - 135° - 10	
04.01.0028	Humeral anatomical metaphysis - cementless - 135° - 11	
04.01.0029	Humeral anatomical metaphysis - cementless - 135° - 12	
04.01.0030	Humeral anatomical metaphysis - cementless - 135° - 13	
04.01.0031	Humeral anatomical metaphysis - cementless - 135° - 14	
04.01.0032	Humeral anatomical metaphysis - cementless - 135° - 15	
04.01.0033	Humeral anatomical metaphysis - cementless - 135° - 16	
04.01.0034	Humeral anatomical metaphysis - cementless - 128° - 6	
04.01.0035	Humeral anatomical metaphysis - cementless - 128° - 7	
04.01.0036	Humeral anatomical metaphysis - cementless - 128° - 8	
04.01.0037	Humeral anatomical metaphysis - cementless - 128° - 9	
04.01.0038	Humeral anatomical metaphysis - cementless - 128° - 10	
04.01.0039	Humeral anatomical metaphysis - cementless - 128° - 11	
04.01.0040	Humeral anatomical metaphysis - cementless - 128° - 12	
04.01.0041	Humeral anatomical metaphysis - cementless - 128° - 13	
04.01.0042	Humeral anatomical metaphysis - cementless - 128° - 14	
04.01.0043	Humeral anatomical metaphysis - cementless - 128° - 15	
04.01.0044	Humeral anatomical metaphysis - cementless - 128° - 16	
04.01.0045	Humeral anatomical metaphysis - cementless - 142° - 6	
04.01.0046	Humeral anatomical metaphysis - cementless - 142° - 7	
04.01.0047	Humeral anatomical metaphysis - cementless - 142° - 8	
04.01.0048	Humeral anatomical metaphysis - cementless - 142° - 9	
04.01.0049	Humeral anatomical metaphysis - cementless - 142° - 10	
04.01.0050	Humeral anatomical metaphysis - cementless - 142° - 11	
04.01.0051	Humeral anatomical metaphysis - cementless - 142° - 12	
04.01.0052	Humeral anatomical metaphysis - cementless - 142° - 13	
04.01.0053	Humeral anatomical metaphysis - cementless - 142° - 14	
04.01.0054	Humeral anatomical metaphysis - cementless - 142° - 15	
04.01.0055	Humeral anatomical metaphysis - cementless - 142° - 16	


### IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0089	Double eccentric	


### IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0090	Metal humeral head Ø40	
04.01.0091	Metal humeral head Ø42	
04.01.0092	Metal humeral head Ø44	
04.01.0093	Metal humeral head Ø46	
04.01.0094	Metal humeral head Ø48	
04.01.0095	Metal humeral head Ø50	
04.01.0096	Metal humeral head Ø52	
04.01.0097	Metal humeral head Ø54	
04.01.0098	Metal humeral head Ø56	
04.01.0099	Metal humeral head Ø58	

### IMPLANTS

REFERENCE	DESCRIPTION	PICTURE
04.01.0128	HC pegged glenoid Ø40	
04.01.0129	HC pegged glenoid Ø42	
04.01.0130	HC pegged glenoid Ø44	
04.01.0131	HC pegged glenoid Ø46	
04.01.0132	HC pegged glenoid Ø48	
04.01.0133	HC pegged glenoid Ø50	
04.01.0134	HC pegged glenoid Ø52	
04.01.0135	HC pegged glenoid Ø54	
04.01.0136	HC pegged glenoid Ø56	
04.01.0137	HC pegged glenoid Ø58	

### HUMERAL STEM SCREW

REFERENCE	DESCRIPTION	PICTURE
04.01.0175	Humeral stem screw	

## INSTRUMENTS

REFERENCE	DESCRIPTION	PICTURE
04.01S.310US	Medacta Shoulder General US	
04.01S.313	Medacta Shoulder Anatomic	
04.01S.314US	Medacta Shoulder Short Humerus US	




**NOTICE:** All the above instrument sets include motorized instruments with Zimmer-Hall connection, in alternative:

04.01S.310: motorized instruments with AO connection

04.01S.314: motorized instruments with AO connection

## 9. INSTRUMENTS COLOUR CODING INSTRUCTIONS

Colour Coding for Instruments\*:

- Humeral Instruments: all the dedicated humeral instruments have a yellow tag 
- Glenoid Instruments: all the dedicated glenoid instruments have a red tag 
- General Instruments: all the multipurpose instruments have a white tag 

\*= except for torque limiting screwdrivers

Part numbers subject to change.

## NOTE FOR STERILIZATION

The instruments are not sterile upon delivery. Instruments must be cleaned before use and sterilized in an autoclave respecting the US regulations, directives where applicable, and following the manufactures instructions for use of the autoclave. For detailed instructions please refer to the document "Recommendations for cleaning decontamination and sterilization of Medacta® International reusable orthopaedic devices" available at [www.medacta.com](http://www.medacta.com).









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IN ORTHOPAEDICS  
AND NEUROSURGERY**

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Anatomic Shoulder Arthroplasty  
Short Stem  
Surgical Technique

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