

MUTARS®



implantcast



Total Elbow
Surgical Technique



Distal Humerus Surgical Technique

MUTARS® was developed in co-operation
with Univ.-Prof. Dr. W. Winkelmann (ex-director) and
Univ.-Prof. Dr. G. Gosheger (director) Department of General Orthopaedics
and Orthopaedic Oncology at the University Hospital of Münster, Germany.
MUTARS® is in successful clinical use since 1992.

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Nota Bene: The herein described surgical technique shows the treatment suggested by the author in uncomplicated surgical procedures. However, it is ultimately the operating surgeon's decision, which approach is the most reasonable and effective for the respective patient.

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The Silver Coating

Infections represent the most severe complications of tumour arthroplastic treatments. Although local and systemic antibiotic treatments are considered, the scientific literature reports of infection rates from 5 to 35 percent [1]. Reasons for these high rates are, for example, the long surgery time, the large incisions and the immunosuppression due to chemo therapy and radio therapy as well as the increasing resistance of the bacteria against antibiotic drugs.

Silver, in particular free silver ions, is well known for its broad-spectrum antimicrobial activity. The silver coating has been shown to reduce bacterial colonization on the device surface.

Until now only non-articulating surfaces and surfaces without direct bony contact are coated with silver.

In the catalogue information of this surgical technique you can find the supplement *S indicating which MUTARS® components are available in a silver coated version. The eight digit REF number receives an addition after the last digit (e.g. 5220-0020S).

Important Intra-Operative Instructions for the Use of Silver-Coated Implants

It is not permitted to flush the wound with antiseptics that contain H₂O₂, Iodine or heavy metals (such as Betaisodona®) and acetic acid during surgery since this can lead to a subsequent loss of effectiveness of the silver coating due to their oxidative properties. Alternatively, solutions such as NaCl or Lavasept® and Prontosan® can be used. The additional use of antibiotic-containing bone cement can be an advantage particular in case of a septic revision.

The TiN Coating for Allergy Prophylaxis

All metallic implant components release ions to their environment over time. In some patients such ions can elicit allergic reactions. Nickel, cobalt and chromium, which are elements of the base material CoCrMo of the articulating implant components, are considered the most frequently allergy eliciting metals [2]. The TiN-coating is biocompatible and acts like a barrier; the potential release of allergy eliciting ions of the base material is reduced to a minimum [3]. Also in clinical practice there have never been any evidence of allergic reactions with implants that have been TiN-coated showing an intact surface [5]. Therefore the TiN-coating on implant components is especially suitable for patients with sensitivity to nickel, chromium or cobalt [4][5].

Since almost all components of the MUTARS® tumour system consist of titanium alloy, this only concerns those components, which are made of a cast CoCrMo alloy. The REF-numbers of the TiN-coated implants have the suffix N after the last digit (e.g. 5720-0005N). Items which are available with Silver and TiN coating have the suffix SN after the last digit (e.g. 5720-0005SN).

***S:** Implants are available with Silver coating!

***N:** Implants are available with TiN coating!

***SN:** Implants are available with Silver and TiN coating!

[1] Gosheger et al. 2004. Silver-coated megaendoprotheses in a rabbit model – an analysis of the infection rate and toxicological side effects. *Biomaterials* 25, 5547-5556.

[2] Eben R et al. (2009) Implantatallergieregister - ein erster Erfahrungsbericht. *Orthopäde* 38: 557-562

[3] Wisbey et al. (1987) Application of PVD TiN coating to Co-Cr-Mo based surgical implants. *Biomaterials*, 11

[4] Prof. Thomas LMU München Final Report Effect of a TiNbN or TiN surface coating on cobaltchromium- molybdenum and stainless steel test specimens regarding the release of nickel, chromium and cobalt: evaluation via eluate analysis and in-vitro cytokine release from peripheral human blood cells, Data on file

[5] Baumann A. (2001) Keramische Beschichtungen in der KTEP Standardlösung für Allergiker. *JATROS Orthopädie & Rheumatologie* 6: 16-17

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Pre-Operative Planning

Pre-operative planning and precise surgical techniques are mandatory for optimal results. The instructions and the procedure given in the surgical technique to the system must be adhered to. Familiarity with the recommended surgical technique and its careful application is essential to achieve the best possible outcome.

Before surgery a surgical planning with regard to the dimensions of the prosthetic model and the positioning of the implant components in the bone has to be carried out by the surgeon.

For this purpose, x-ray templates are available:

Digital templates: Digital templates are included in the data base of the common planning systems. For missing templates, please contact the provider of the planning software and request for these templates.

Radiographic templates: Alternatively radiographic templates are available in various scale factors, which can be obtained from your local representative.



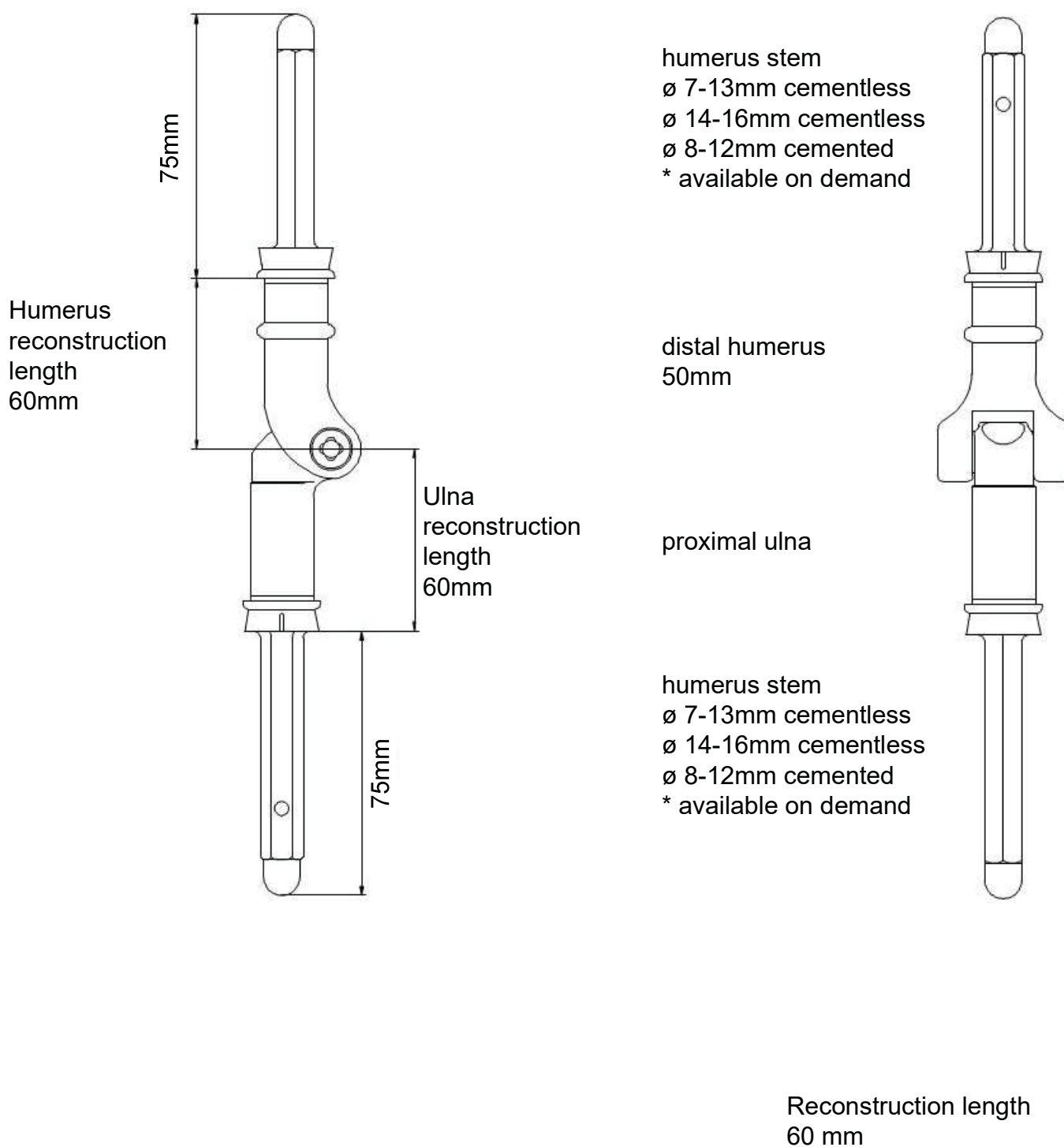
Picture shown: MUTARS® Total Elbow implant in A/P view



Picture shown: MUTARS® Total Elbow implant in M/L view



System Overview





MUTARS® Total Elbow

Assembling Options

Humeral Components					
Reconstruction (mm)	Distal Humerus (mm)	Extension piece (mm)	Connection piece (mm)	Extension piece (mm)	Humerus screw
60	50				15
80	50	20			35
100	50	40			55
120	50	60			75
140	50		80		15 + 15
160	50	20	80		35 + 15
180	50	40	80		55 + 15
200	50	60	80		75 + 15
220	50	60	80	20	75 + 35
240	50	60	80	40	75 + 55
260	50	60	80	20 + 40	75 + 75

Ulnar Components					
Reconstruction (mm)	Distal Humerus (mm)	Extension piece (mm)	Connection piece (mm)	Extension piece (mm)	Humerus screw
60	50				15
80	50	20			35
100	50	40			55
120	50	60			75
140	50		80		15 + 15
160	50	20	80		35 + 15
180	50	40	80		55 + 15
200	50	60	80		75 + 15
220	50	60	80	20	75 + 35
240	50	60	80	40	75 + 55
260	50	60	80	20 + 40	75 + 75

Note: Please notice that the amount of implants and instruments send with an individual shipment may differ from the information in the catalogue information of this brochure. Please make sure, during the preoperatively planning, that all necessary implants and instruments are available for the surgery.

Tumour Resection

Resect the tumour and determine the length of the explanted bone.

The minimal resection on the humeral bone is 60mm on the ulna bone is 60mm (Fig. 2).

Remark: In the case that the radius head is free of tumour it needn't be resected.



Fig. 1

Preparation of the Proximal Ulna

Cementless use

Drill the medullary cavity with a humerus drill 1mm smaller than the size of the preoperatively chosen humerus stem (Fig. 3).

Make sure that a minimum cortical bone contact of app. 4 cm is achieved.



Fig. 2

Cemented Use

Drill the medullary cavity with a humerus drill 2mm larger than the size of the preoperatively chosen humerus stem (Fig. 3).

Make sure that a minimum cortical bone contact of app. 4 cm is achieved.



Fig. 3

Remark: An even cortical contact must be obtained, since there is a danger

Prepare the medullary cavity with the medullary cavity reamer (Fig. 4).

Remark: There is a danger of Via falsa with a cortikalis perforation. An X-Ray control in two planes is advised!



Fig. 4

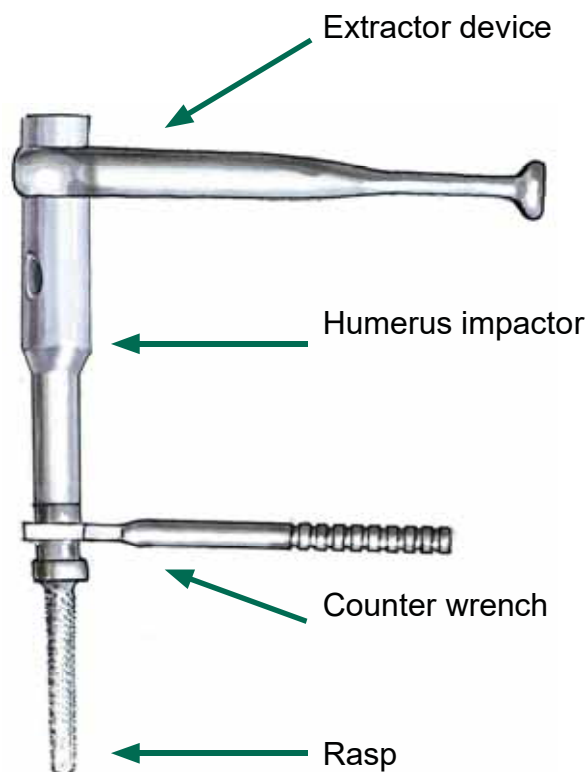


Fig. 5

Rasping of the Ulnar Cavity

Assemble the humeral rasp of the appropriated size (see tables below), the extractor device, the humerus impactor and the sleeve. Lock the rasp on the humerus impactor by using the counter wrench.

Remark: The use of a humeral rasp for a cemented stem is optional. Generally you can proceed with the trial assembly.

Use of Cementless Stems

Use the humeral rasp (Fig. 5), of the same size as the preoperatively chosen humerus stem (table 1).

Stem size	Rasp size
7mm	7mm
8mm	8mm
9mm	9mm
10mm	10mm
11mm	11mm
12mm	12mm
13mm	13mm

Table 1

Optional Technique for the Use of Cemented Stems

If you want to prepare for a cemented stem with the humeral rasp, please use the rasp which is 2 mm larger than the preoperatively chosen cemented humerus stem (Fig. 5).

That will provide a cement mantle of 1mm thickness (table 2).

Stem size	Rasp size
8 mm	10 mm
9 mm	11 mm
10 mm	12 mm
11 mm	13 mm
12 mm	14 mm

Table 2

Rasp the medullary cavity with the chosen humeral rasp (Fig. 6 and Fig. 7). A carefully use of the mallet is recommended.



Fig. 6

Remark: It is recommended to clean the rasp from bone chips during the rasping.
To prevent fractures of the cortical bone, it is helpful to fix a bone forceps around the ulnar bone during rasping.

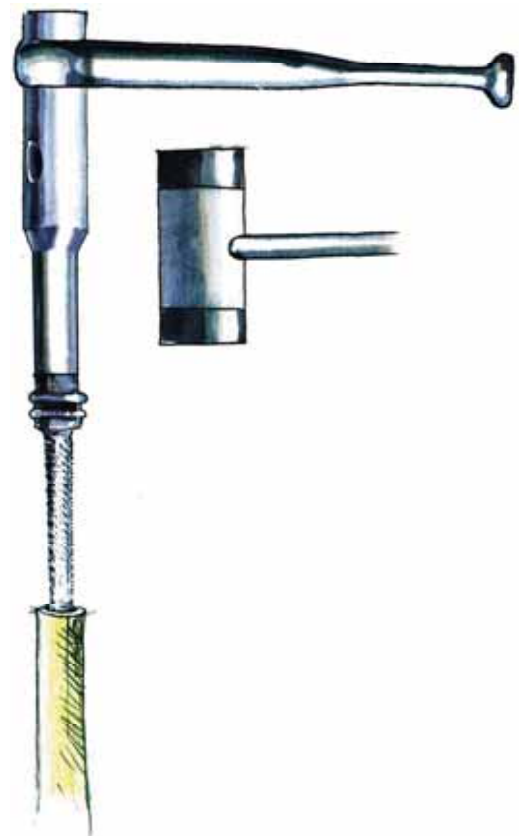


Fig. 7

Leave the humeral rasp in the bone for the trialing.



Fig. 8

Humeral Bone Preparation

Cementless Use

Drill the medullary cavity with a humerus drill 1 mm smaller than the size of the preoperatively chosen humerus stem (Fig. 8).

Cemented Use

Drill the medullary cavity with a humerus drill 2 mm larger than the size of the preoperatively chosen humerus stem (Fig. 8).

Remark: An even cortical contact must be obtained, since there is a danger of jamming.



Fig. 9

Prepare bone cavity with the MUTARS® medullary cavity reamer (Fig. 9).

Rasping of the Humeral Cavity

Assemble the humeral rasp of the appropriated size (see tables below), the extractor device, the humerus impactor and the sleeve. Lock the rasp on the humerus impactor by using the counter wrench.

Remark: The use of a humeral rasp for a cemented stem is optional. Generally you can proceed with the trial assembly.

Use of Cementless Stems

Use the humeral rasp (Fig. 10), of the same size as the preoperatively chosen humerus stem (table 3).

Stem size	Rasp size
9 mm	9 mm
10 mm	10 mm
11 mm	11 mm
12 mm	12 mm
13 mm	13 mm

Table 3

Optional Technique for the Use of Cemented Stems

If you want to prepare for a cemented stem with the humeral rasp, please use the rasp which is 2 mm larger than the preoperatively chosen cemented humerus stem (Fig. 10).

That will provide a cement mantle of 1mm thickness (table 4).

Stem size	Rasp size
8 mm	10 mm
9 mm	11 mm
10 mm	12 mm
11 mm	13 mm
12 mm	14 mm

Table 4

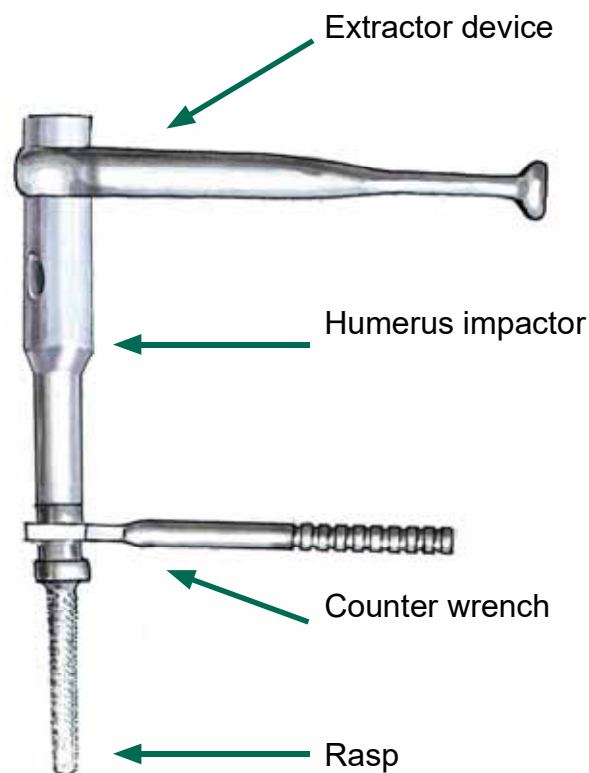


Fig. 10

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Fig. 11

Rasp the medullary cavity with the chosen humeral rasp (Fig. 11 and Fig. 12). A carefully use of the mallet is recommended.



Fig. 12

Remark: It is recommended to clean the rasp from bone chips during the rasping.
To prevent fractures of the cortical bone, it is helpful to fix a bone forceps around the humeral bone during rasping.

Leave the humeral rasp in the bone for the trialing.

Trial Reduction

Mount the distal humerus and the possibly used extension pieces (possible enlargement from 20 to 200mm; see table page 5) onto the top of the rasp.

Assemble the articulating mechanism by inserting the trial axle (Fig. 13).

Also mount the Proximale Ulna onto the rasp which left in the ulna cavity (Fig. 14).



Fig. 13



Fig. 14

Assemble the articulating mechanism by inserting the trial axle (Fig. 15 and Fig. 16).

Perform a trial reduction, control the muscle tension and check the rotational alignment of the components.



Fig. 15



Fig. 16

Remark: At this stage the use of a bar screw is not mandatory, the teeth mechanism is stabilising the assembly. If you want to enhance the stability you may insert the bar screw of the correct length into the Proximal Ulna and lock it (see table on page 5).

Implantation of the Humeral Stem

Mount the humerus stem of the proper size, the impact sleeve on the impactor.

Fasten the connection using the counter instrument. Impact the humerus stem (Fig. 17).

When using the cementless stem, insert the stem of the same size as the previously used rasp.

Remark: To prevent fractures of the cortical bone, it is helpful to fix a bone forceps around the humeral bone during impactation.

It is possible to protect the humerus stem against rotation using a 3.5mm cortical screw.

If a cemented implantation is planned, insert the cement and use the cemented stem which is 2 mm smaller than the previously used drill or rasp.

Remove all instruments, especially during the cement hardening to prevent bending moments.

Implantation of the Ulna Stem

Repeat the stem impactation procedure and impact the ulna stem in the way as described above (Fig. 18).

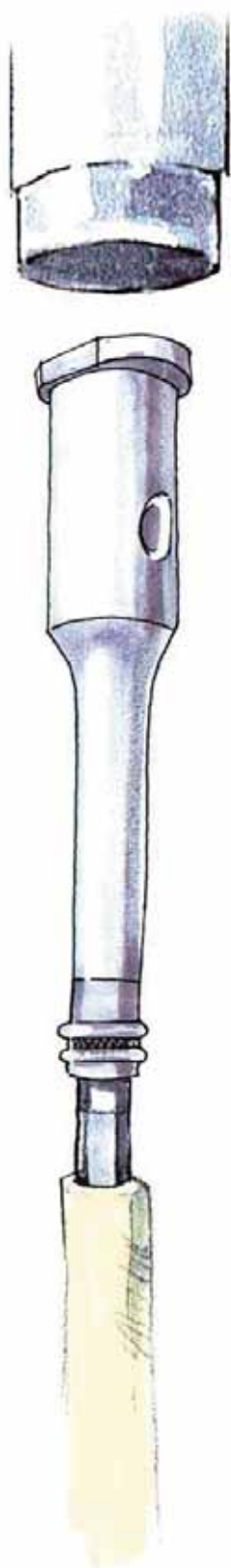


Fig. 17



Fig. 18

Implantation of the Distal Components

Combine the distal humerus on the humerus stem (Fig. 19). If necessary extend with humerus extension pieces. Adjust the correct rotation position.

Lock the components with the corresponding humerus screw of the correct length (see table on page 5).

Secure the components with the MUTARS® socket wrench small (Fig. 21).

Secure the assembly by using the counter instrument (Fig. 20).

Lock the humerus safety screw in the same way (Fig. 22).



Fig. 19



Fig. 20



Fig. 21



Fig. 22

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Fig. 23

Insert the ulna stop with the setting instrument for ulna anchorage (Fig. 23).

The ulna stop must entirely close the hole of the distal humerus to ensure a free run of the joint.



Fig. 24

Connect the Proximale Ulna with the stem (Fig. 24). If necessary use the extension pieces to reconstruct the previously resected amount of bone. Adjust the correct rotational alignment.

Lock the assembly by inserting the bar screw of the correct length (see table on page 5).



Fig. 25

Use the small MUTARS® socket wrench to tighten the screw (Fig. 25). Use the counter wrench to secure the assembly.

Insert the safety screw and lock it in the same way (Fig. 26).



Fig. 26

Final Reduction

Connect the distal humerus 30mm to the Proximal Ulna by inserting the articulating axle (Fig. 27).

Locking of the Hinge Mechanism

After coupling of the joint components (Fig. 28) please insert the locking screws on both sides in order to cover the articulating mechanism and to protect the axle. Therefore the small socket wrench is used (Fig. 29 and Fig. 30-).



Fig. 27



Fig. 28



Fig. 29



Fig. 30

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Implants

***S:** For anti-infective treatment, silver coated implants are available.

***N:** For anti-allergic treatment, TiN coated implants are available.



MUTARS® Distal humerus 50 mm incl. axle, safety screw and 2 lock screws humerus cap *S

mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3

axle CoCrMo according to 5832-12

bushing CoCrMo according to 5832-12

REF 5250-0000



MUTARS® Proximal ulna incl. safety screw *S

Mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3

bushing CoCrMo according to ISO 5832-12

REF 5250-0030



MUTARS® ulna stop

mat.: UHMWPE according to ISO 5834-2

REF 5250-1100



cancellous screw 4mm

mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3

size

REF 5793-4026 26mm

REF 5793-4028 28mm

REF 5793-4030 30mm

REF 5793-4032 32mm

REF 5793-4034 34mm



MUTARS® attachment tube

mat.: polyethylene terephthalate (PET)

size

REF 5900-0300 35 mm

REF 5900-0310 55 mm



MUTARS® humerus screw

mat.: *implatan®*; $TiAl_6V_4$ according to ISO 5832-3

	size
REF 5230-0015	M8x15 mm
REF 5230-0035	M8x35 mm
REF 5230-0055	M8x55 mm
REF 5230-0075	M8x75 mm



MUTARS® humerus stem HA cementless

mat.: *implatan®*; $TiAl_6V_4$ according to ISO 5832-3
implaFix® HA; HA- coating acc. to ISO 13779-2

	size
REF 5240-0807	7 mm
REF 5240-0808	8 mm
REF 5240-0809	9 mm
REF 5240-0810	10 mm
REF 5240-0811	11 mm
REF 5240-0812	12 mm
REF 5240-0813	13 mm
REF 5240-0814	14 mm*
REF 5240-0815	15 mm*
REF 5240-0816	16 mm*

*available on request.



MUTARS® humerus stem cemented *N

mat.: *implavit®*; CoCrMo according to ISO 5832-4

	size
REF 5240-0408	8 mm
REF 5240-0409	9 mm
REF 5240-0410	10 mm
REF 5240-0411	11 mm
REF 5240-0412	12 mm

Special stem sizes are available on request.



MUTARS® humerus extension piece *S

mat.: *implatan®*; $TiAl_6V_4$ according to ISO 5832-3

REF	size
5220-0020	20 mm
5220-0040	40 mm
5220-0060	60 mm



MUTARS® humerus connection piece *S

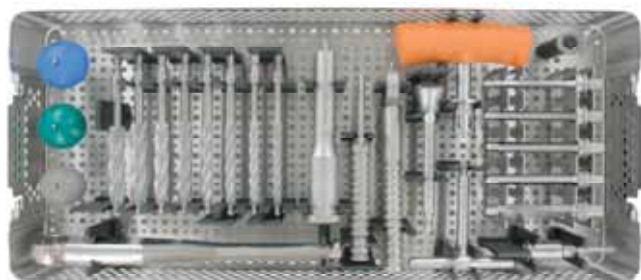
mat.: *implatan®*; $TiAl_6V_4$ according to DIN ISO 5832/3

REF 5221-0080	80 mm
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Instruments



MUTARS® humerus container
7999-5200



MUTARS® humerus trial container
7999-5202



MUTARS® proximal ulna container
7999-5205



MUTARS® humerus container

7999-5200

MUTARS® extractor device

REF 7220-0000



MUTARS® socket wrench small

REF 7608-1010



MUTARS® humerus drill ic-connection

	size
REF 7630-0207	7 mm
REF 7630-0208	8 mm
REF 7630-0209	9 mm
REF 7630-0210	10 mm
REF 7630-0211	11 mm
REF 7630-0212	12 mm
REF 7630-0213	13 mm
REF 7630-0214	14 mm



MUTARS® medullary cavity reamer

REF 4220-0000



MUTARS® rasp for humerus stem

	size
REF 7770-0809	9 mm
REF 7770-0810	10 mm
REF 7770-0811	11 mm
REF 7770-0812	12 mm
REF 7770-0813	13 mm



MUTARS® humerus impactor

REF 7710-0000



MUTARS® humerus impact + extract sleeve

REF 7721-0000



MUTARS® wrench for cap/ counter instrument

REF 7710-0001



MUTARS® counter instrument Ø6mm

REF 7420-0001



MUTARS® humerus trial cap

	size
REF 7710-1000	small
REF 7710-1005	medium
REF 7710-1010	large



ic- T-handle Zimmer-Jakobs

REF 4223-0023



ic-adapter




REF 4223-0022



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MUTARS® humerus trial container 7999-5202




MUTARS® humerus trial cap with thread

	size	
REF 7710-1200	small	
REF 7710-1205	medium	
REF 7710-1210	large	



MUTARS® humerus trial head REF 7710-1252



MUTARS® humerus trial extension piece

	size	
REF 7710-0020	20 mm	
REF 7710-0040	40 mm	
REF 7710-0060	60 mm	





MUTARS® humerus trial reducer

	size	
REF 7710-2100	10 mm	
REF 7710-2101	100 mm	

MUTARS® humerus trial connecting part REF 7710-2180 80 mm



MUTARS® humerus trial screw

	size	
REF 7710-2315	M8x15 mm	
REF 7710-2335	M8x35 mm	
REF 7710-2355	M8x55 mm	
REF 7710-2375	M8x75 mm	

MUTARS® distal humerus 50mm trial REF 7710-1275



MUTARS® proximal ulna container 7999-5205

MUTARS® trial axle for distal humerus REF 7420-0015






hexagon screw driver 2,5 mm REF 7608-1001



MUTARS® humerus drill ic-connection 6mm REF 7630-0206



MUTARS® humerus trial extension piece

REF 7710-0020	20mm	
REF 7710-0040	40mm	
REF 7710-0060	60mm	



MUTARS® proximal trial ulna REF 7710-1280



MUTARS® humerus trial screw

REF 7710-2315	M8x15mm	2x	
REF 7710-2335	M8x35mm		
REF 7710-2355	M8x55mm		
REF 7710-2375	M8x75mm	2x	

MUTARS® rasp for humerus stem

REF 7770-0807	7mm	
REF 7770-0808	8mm	



CE 0482

Your local distributor:

AUSD5QPD-201017

