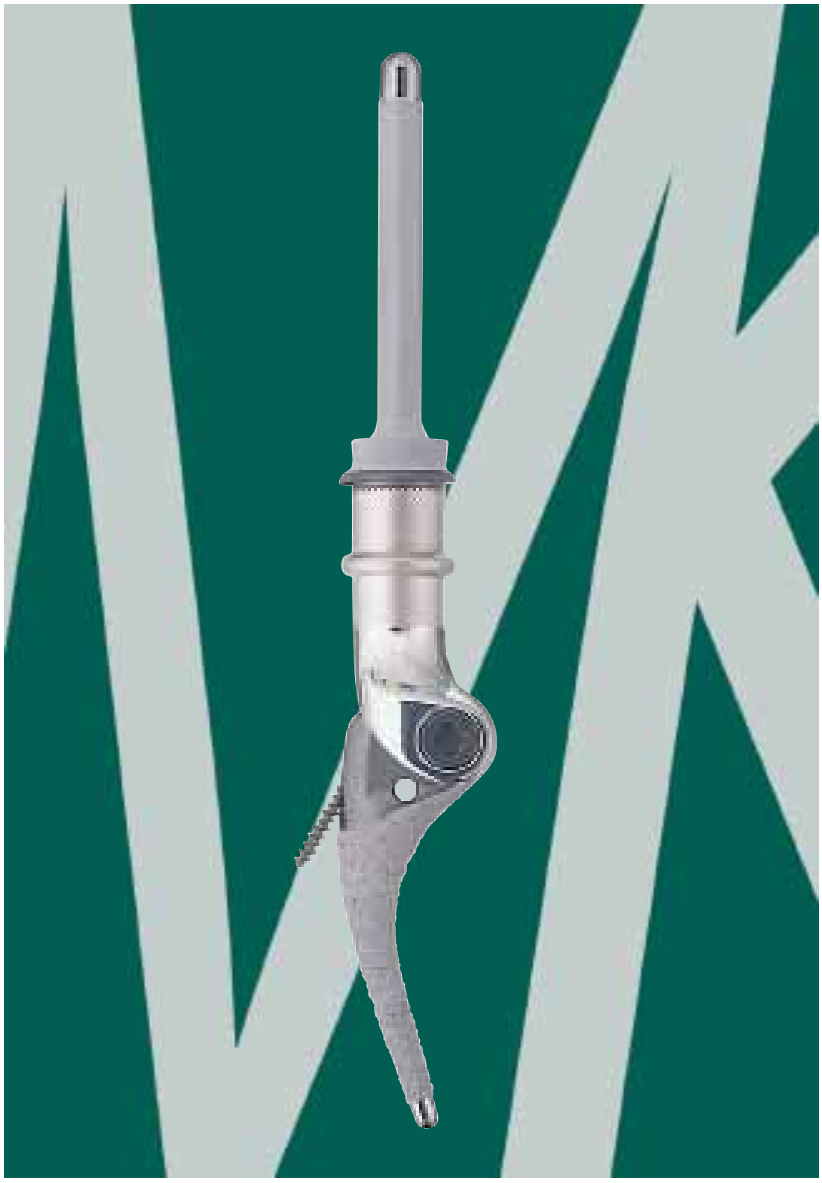
MUTARS®

implantcast



Distal Humerus

Surgical Technique

MUTARS®

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.

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 immunosupression 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 megaendoprostheses 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

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.

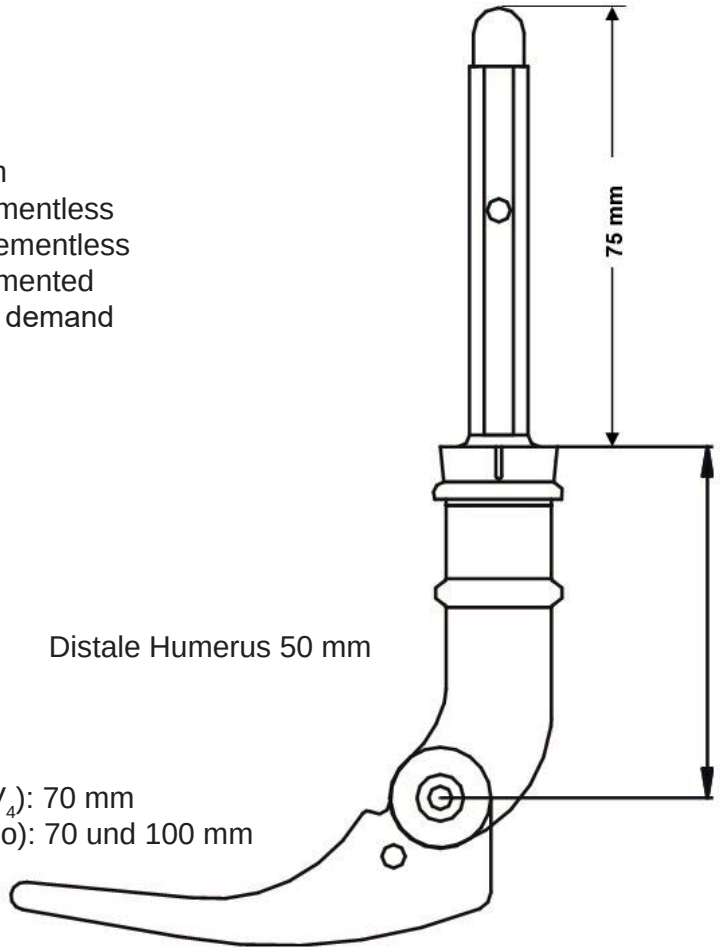
Radiographic templates: Alternatively radiographic templates are available in various scale factors, which can be obtained from your local representative.

Picture shown: MUTARS® Distal Humerus implant in A/P view

Picture shown: MUTARS® Distal Humerus implant in M/L view

System Overview

humerus stem
ø 7-13mm cementless
ø 14-16mm cementless
ø 8-12mm cemented
* available on demand



Reconstruction length
60 mm

Distale Humerus 50 mm

Ulnaverankerung

cementless ($TiAl_6V_4$): 70 mm
cemented (CoCrMo): 70 und 100 mm

Assembling Options

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.

Surgical Technique

Tumour Resection

Measure the size of the resected amount of bone. Compare the length to the preoperative planning.

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

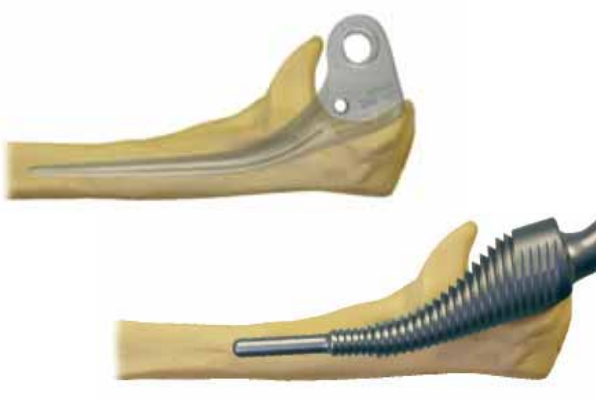


Fig. 1

Preparation of the Proximal Ulna

Observe the bony geometry and fit of the ulna anchorage (Fig. 1). Remove obsolete cartilage and bone from the olecranon (Fig. 2).

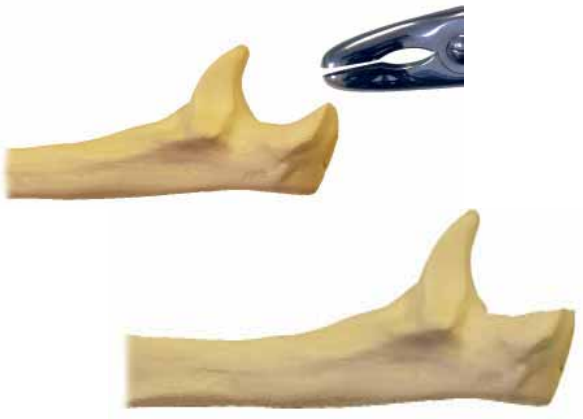


Fig. 2

Open the medullary cavity at the appropriate position by the use of the 6mm drill with stop (Fig. 3).

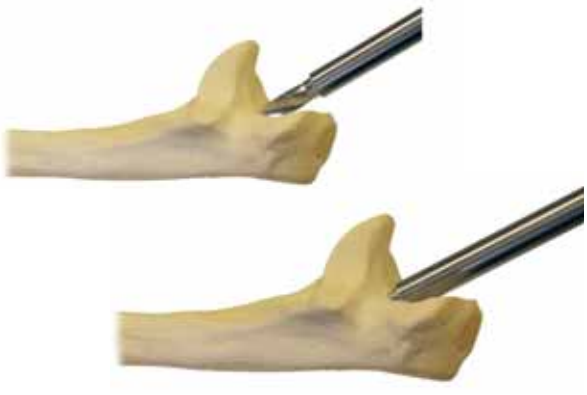


Fig. 3

Note: The central peg hole is slightly smaller than the central peg of the implant. The central peg will lock by PressFit eventually.

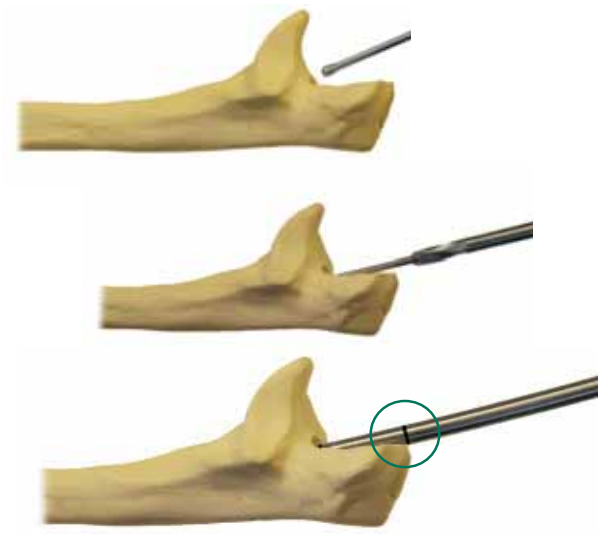


Fig. 4

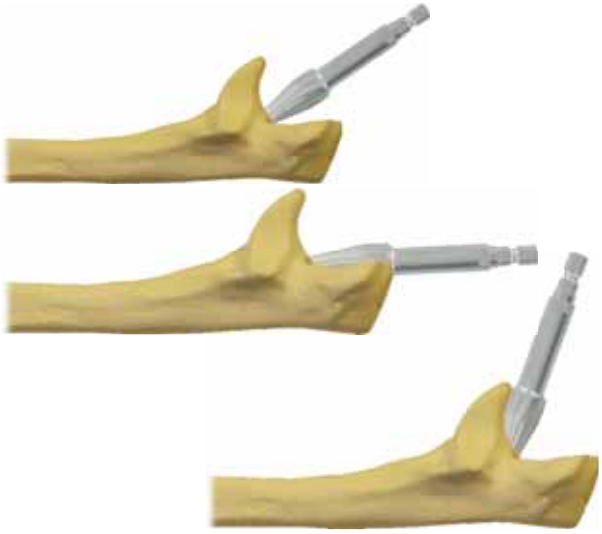


Fig. 5

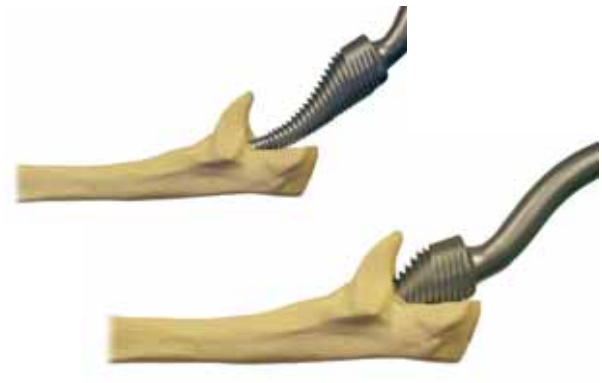


Fig. 6

Implantation of the Ulna Anchorage

Insert the guide wire into the medullary canal. Use the flexible drill 5mm guided by the rod until the depth is reached.

The cementless implants are available in length of 70mm, the cemented implants are available in the length of 70mm and 100mm.

The example shows the correct depth for a 100mm long implant (Fig. 4). The marking on the reamer should be in line with the tip of oleocranon.

To implant the ulna anchorage in the exact depth, the entry has to be extended ventral at the Proc. Coronoideus and dorsal. Use the ulna reamer to ream the core portion of the ulna free hand (Fig. 5).

The olecranon should be preserved, if possible.

Rasp the ulna with the MUTARS® rasp for ulnar anchorage (Fig. 6).

Note: When choosing the rasp, pay attention to the side (L / R).

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

Perform a final X-Ray control in two planes.

Ulna Implantation and Screw Fixation of the Ulna Anchorage

It is recommended to enhance the fixation of the ulna anchorage by adding a bone screw, both for the cementless and the cemented implantation.

If a cemented implantation is planned, clean the ulnar cavity and insert some cement. Insert and impact the ulna anchorage cemented or cementless. Use either the straight or the cranked setting instrument for impaction (Fig. 7).

Fig. 7

Please follow the steps shown on the left.

Drill with the 2mm drill (Fig. 8), measure the length of the 4 mm screw (Fig. 9) and insert the screw (Fig. 10).

Fig. 8

Remark: Ulna anchorages that have been fixed witout cancellous screw have shown elevated loosening rates. Use of cortical screws with transcortikal anchorage can lead to skin perforation.

Fig. 9

The proper positioning of the implant is as shown in Fig. 11

Fig. 11

Fig. 10

Fig. 12

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. 12).

Cemented Use
Drill the medullary cavity with a humerus drill 2 mm larger than the size of the preoperatively chosen humerus stem (Fig. 12).

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

Fig. 13

Prepare bone cavity with theMUTARS® medullary cavity reamer (Fig. 13).

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.

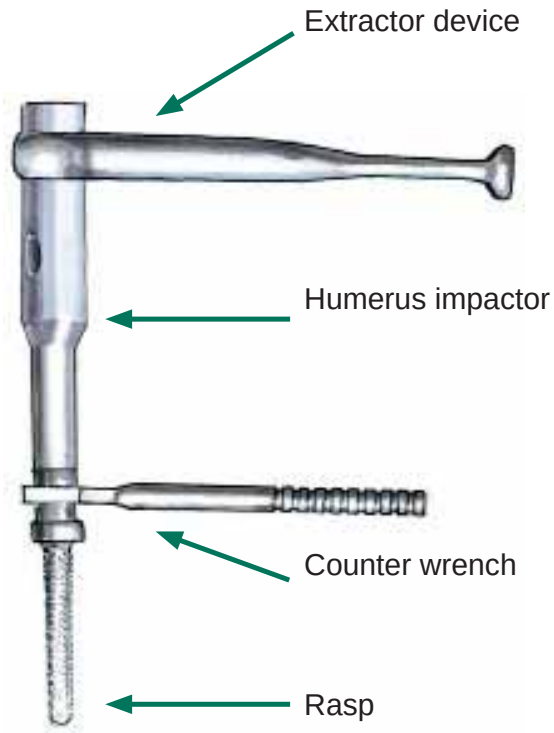


Fig. 14

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. 14), of the same size as the preoperatively chosen humerus stem (table 1).

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 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. 14).

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

Fig. 15

Rasp the medullary cavity with the chosen humeral rasp (Fig. 15 and Fig. 16). A carefully use of the mallet is recommended.

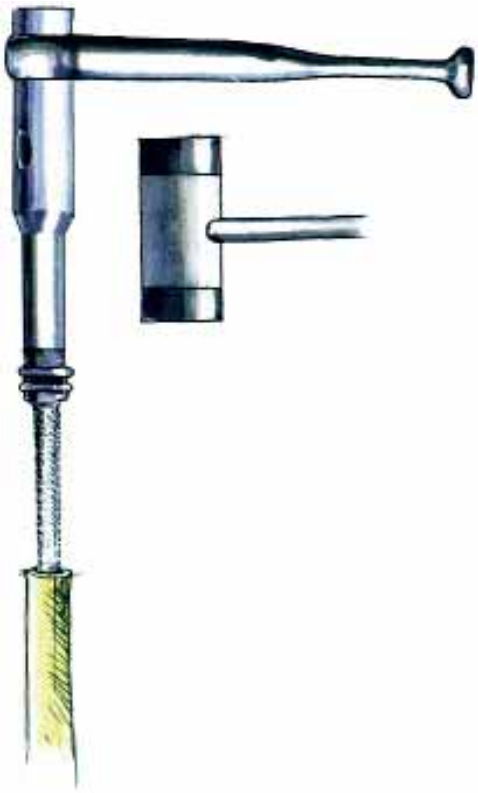


Fig. 16

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 3) onto the top of the rasp.
Assemble the articulating mechanism by inserting the trial axle (Fig. 17 and Fig. 18).

Remark: Please, keep in mind that no humerus trial stems are available. If you have not opted for the rasping option when implanting cemented stems, the only way to trial will be with the original cemented stem without cementig it.

Fig. 17

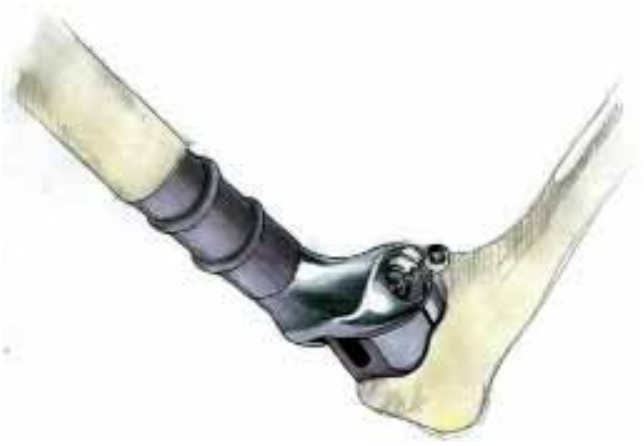


Fig. 18

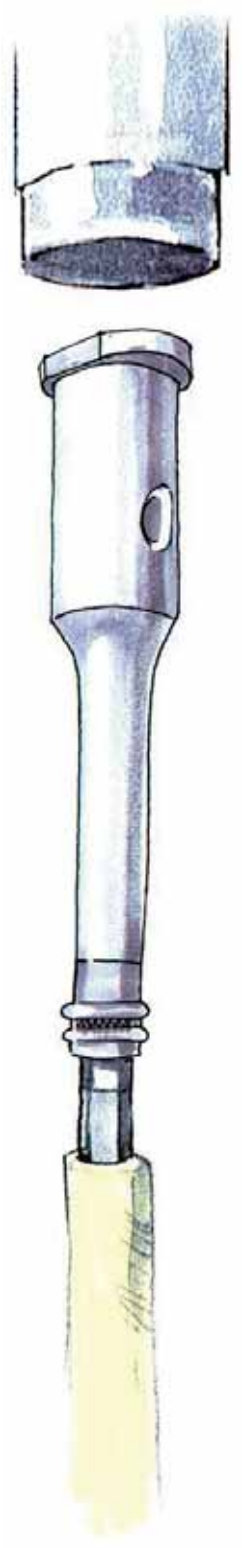


Fig. 19

Implantation of the Humeral Stem

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

Fasten the connection using the counter instrument. Impact the humerus stem (Fig. 19).

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 Distal Components

Combine the distal humerus on the humerus stem (Fig. 20). 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 2).
Secure the components with the MUTARS® socket wrench small (Fig. 21).

Secure the assembly by using the counter instrument (Fig. 22).

Lock the humerus safety screw in the same way (Fig. 23).

Fig. 20

Fig. 21

Fig. 22

Fig. 23

Fig. 24

Insert the ulna stop with the setting instrument for ulna anchorage (Fig. 24).

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

Fig. 25

Final trial Reduction

Connect the distal humerus to the ulnar anchorage by inserting the articulating axle (Fig. 25).

Locking of the Articulating Axle

To cover the articulating mechanism and to protect the axle on both sides the locking screws are inserted (Fig. 26).

Therefor the MUTARS® socket wrench small is used (Fig. 27 and Fig. 28).

Fig. 26

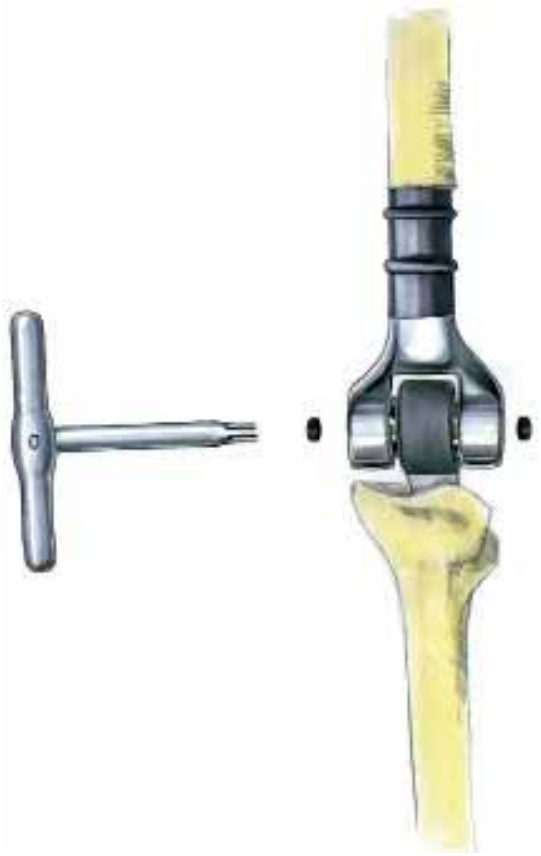


Fig. 27

Fig. 28

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 DIN ISO 5832-3
axle CoCrMo according to DIN ISO 5832-12
bushing CoCrMo according to ISO 5832-12
REF 5250-0000

MUTARS® ulna anchorage cementless
mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3 with implaFix® Duo; cpTi and HA-coating acc. to ISO 13779-2
bushing CoCrMo according to ISO 5832-12

	side	size
REF 5250-1015	left	70mm
REF 5250-1020	right	70mm

MUTARS® ulna anchorage cemented *N
mat.: implavit®; CoCrMo according to ISO 5832-4
bushing CoCrMo according to ISO 5832-12

	side	size
REF 5250-5070	left	70mm
REF 5250-0070	right	70mm
REF 5250-5100	left	100mm
REF 5250-0100	right	100mm

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®; $TiAl_6V_4$ acc. to ISO 5832-3 with implaFix® HA; HA- coating acc. to ISO 13779-2

	size
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.

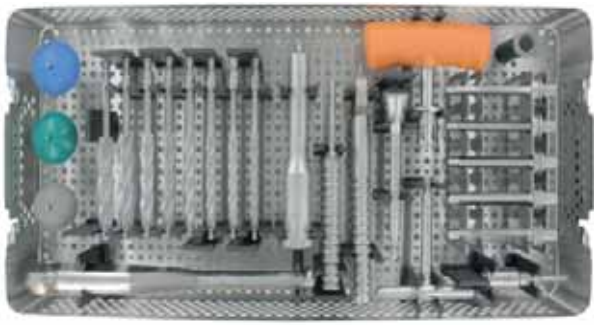
MUTARS® humerus extension piece *S
mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3

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

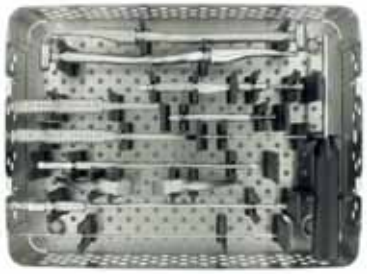
MUTARS® humerus connection piece *S
mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3
REF 5221-0080 80 mm

Instruments

MUTARS® humerus container
7999-5200



MUTARS® distal humerus container
7999-5150 left and right
7999-5151 left
7999-5152 right



MUTARS® humerus trial container
7999-5202

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
4223-0023

ic-adapter
4223-0022

MUTARS® Distal Humerus

MUTARS® distal humerus container 7999-5150

MUTARS® broach for ulna component

	side
REF 7420-0009	left
REF 7420-0010	right

MUTARS® setting instrument for ulna, straight
REF 7420-0013

MUTARS® setting instrument for ulna anchorage, angular
REF 7420-0014

MUTARS® trial axle for distal humerus
REF 7420-0015

depth gauge small
REF 0270-1015

MUTARS® drill for three jaw chuck 2mm
REF 7520-0000

hexagon screw driver 2,5mm
REF 7608-1001

flexible drill
REF REF 7701-2005

MUTARS® patella drill
REF 7351-0000

guide wire for flexible drill
REF 7512-0039 2,2 / 250 mm

Ulna reamer
REF 7420-0016

MUTARS® ulna trial anchorage

	side
REF 7710-1281	links
REF 7710-1282	rechts

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 (x2)
REF 7710-2335	M8x35 mm
REF 7710-2355	M8x55 mm
REF 7710-2375	M8x75 mm (x2)

MUTARS® distal humerus 50mm trial
REF 7710-1275

implantcast GmbH
Lüneburger Schanze 26
D-21614 Buxtehude
Germany
phone.: +49 4161 744-0
fax: +49 4161 744-200
e-mail: info@implantcast.de
internet: www.implantcast.de

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