

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.

Table of Contents

| | |
|---|----|
| Information About Silver and TiN Coating..... | 2 |
| Pre-Operative Planning | 3 |
| System Overview..... | 4 |
| Assembling Options..... | 5 |
| Surgical Technique | 6 |
| Implants..... | 17 |
| Instruments..... | 19 |

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 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

MUTARS[®] Distal Humerus

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

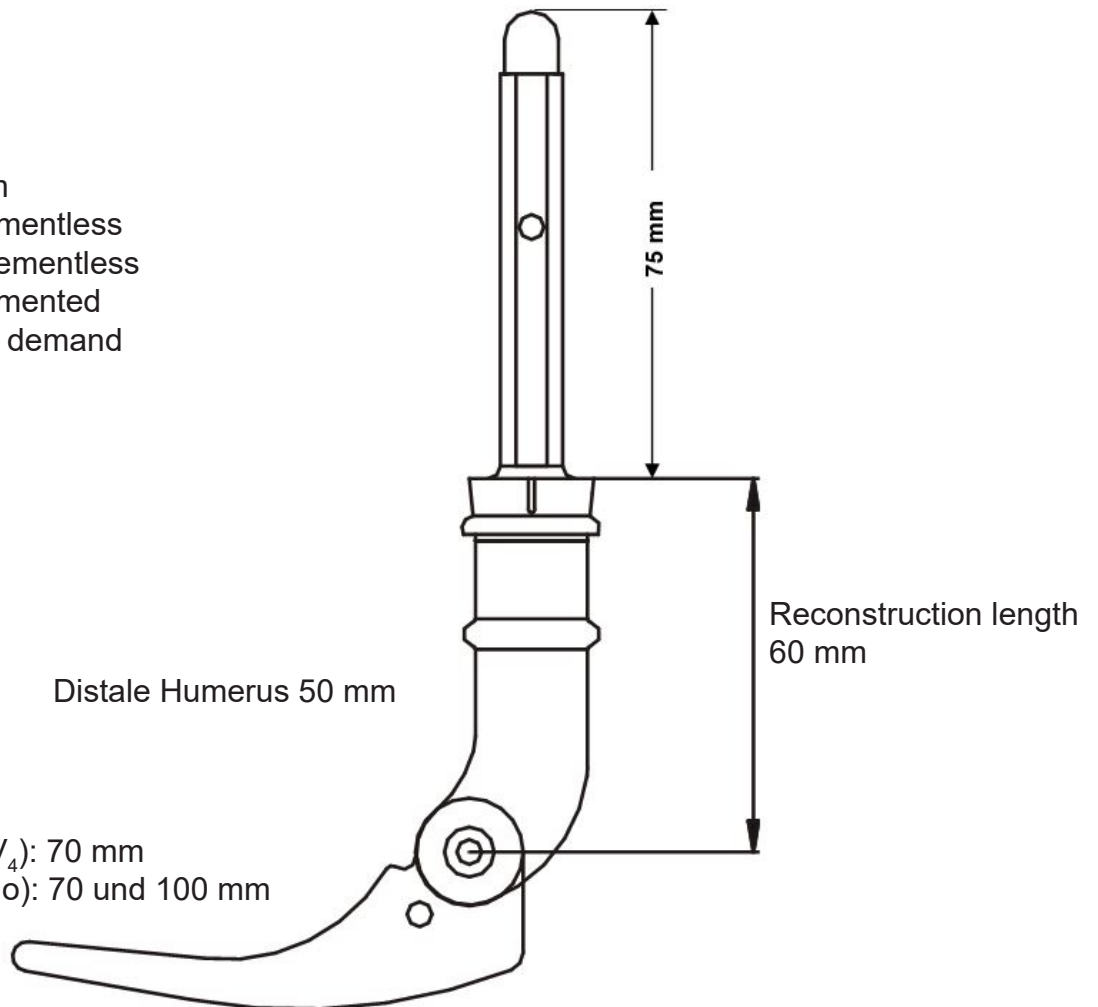


Picture shown: MUTARS[®] Distal Humerus implant in M/L view



System Overview

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





MUTARS[®] Distal Humerus

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.

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).

Open the medullary cavity at the appropriate position by the use of the 6mm drill with stop (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. 1



Fig. 2



Fig. 3

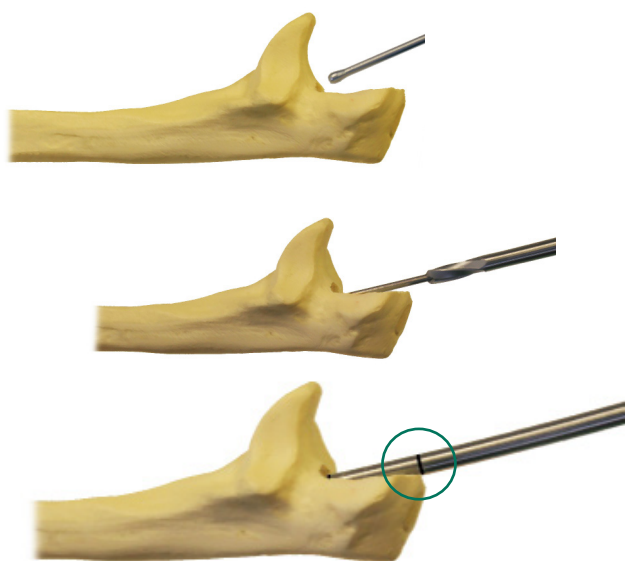


Fig. 4

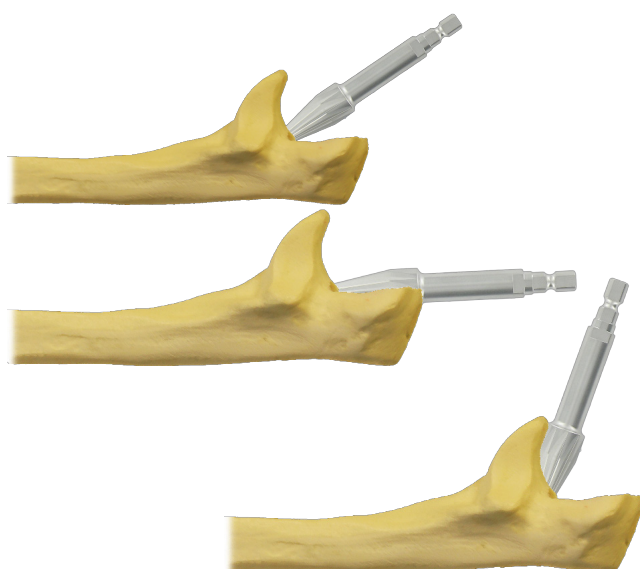


Fig. 5

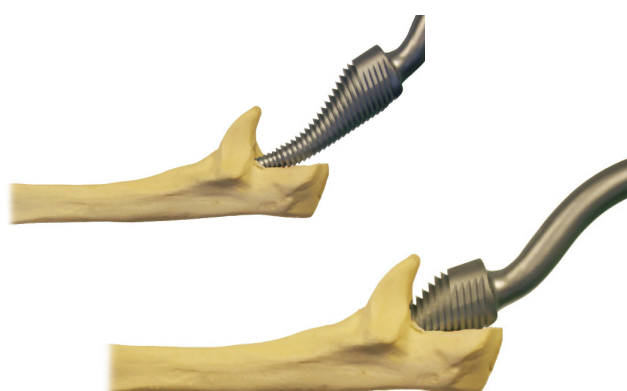


Fig. 6

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 olecranon.

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).

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).

Remark: Ulna anchorages that have been fixed without cancellous screw have shown elevated loosening rates. Use of cortical screws with transcortical anchorage can lead to skin perforation.

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



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11

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).



Fig. 12

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



Fig. 13

Prepare bone cavity with the MUTARS® 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.

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

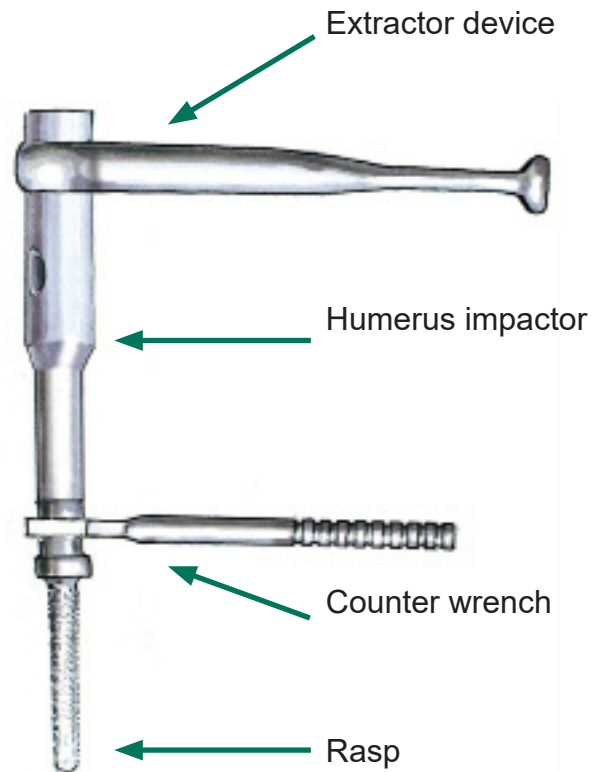


Fig. 14

MUTARS[®] Distal Humerus



Fig. 15

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

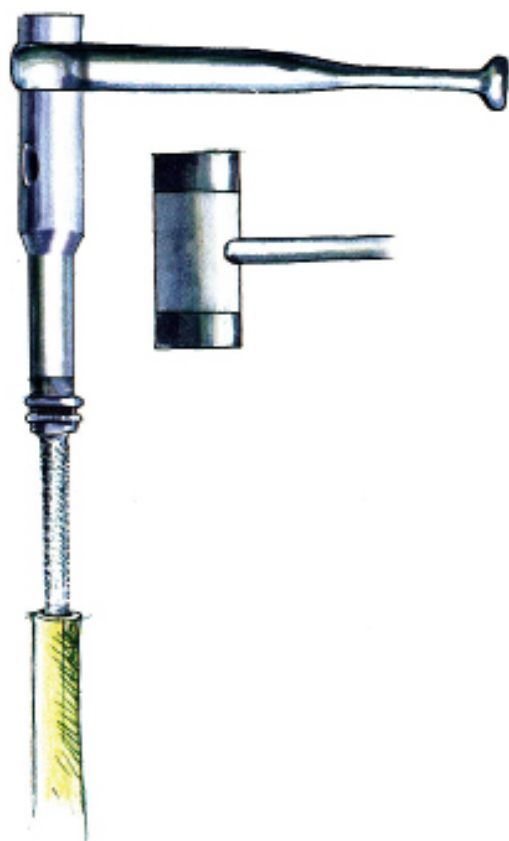


Fig. 16

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 cementing it.



Fig. 17



Fig. 18

MUTARS® Distal Humerus

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. 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.

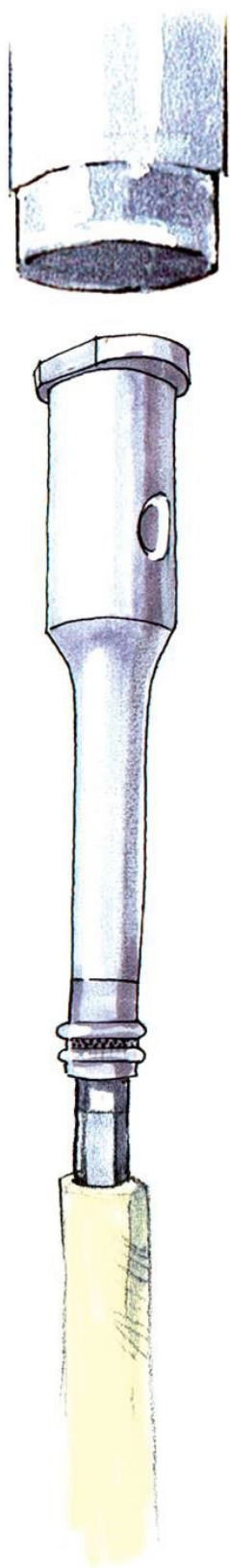


Fig. 19

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).

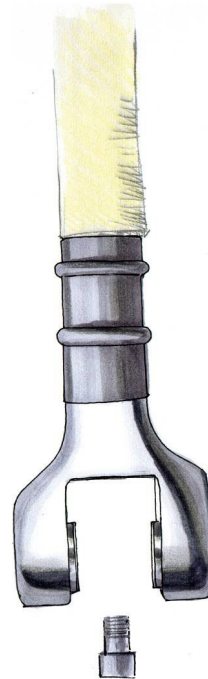


Fig. 20



Fig. 21



Fig. 22



Fig. 23

MUTARS® Distal Humerus



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.

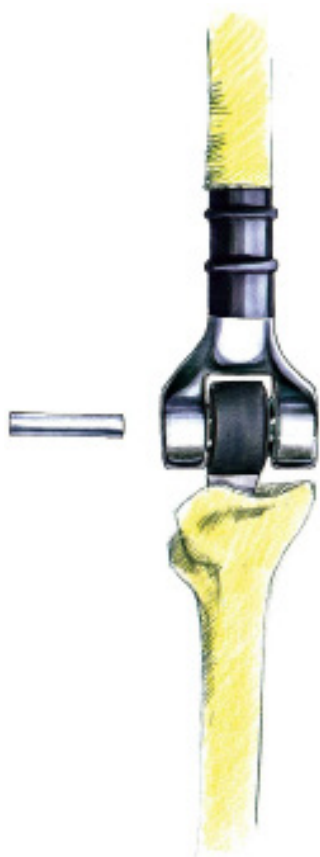


Fig. 25

Final trial Reduction

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



MUTARS® Distal Humerus

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).

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



Fig. 26

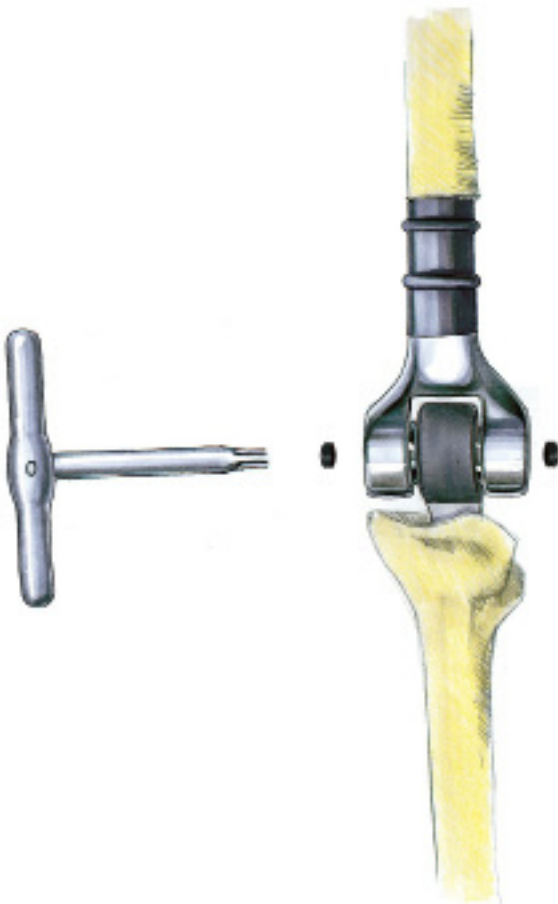


Fig. 27



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® Distal Humerus

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

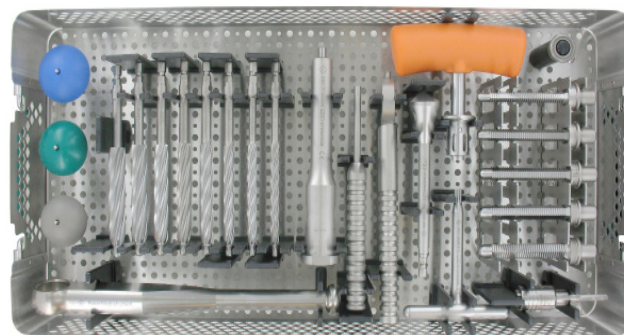


MUTARS® Distal Humerus

Instruments

MUTARS® humerus container

7999-5200

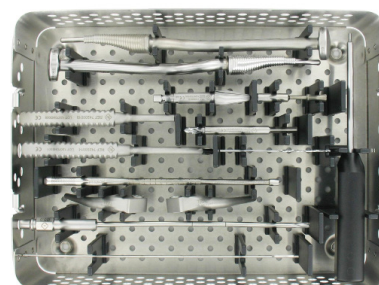


MUTARS® distal humerus container

7999-5150 left and right

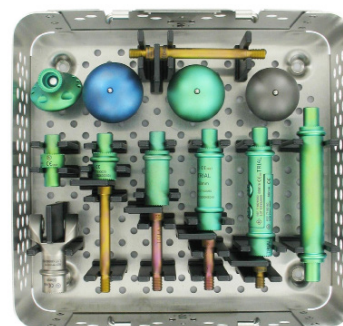
7999-5151 left

7999-5152 right



MUTARS® humerus trial container

7999-5202





MUTARS® Distal Humerus

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





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