MUTARS®

implantcast

Total Humerus

surgical technique

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MUTARS® was developed in co-operation with
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and Prof. Dr. G. Gosheger (director), Clinic and
Polyclinic for General Orthopedics and Tumororthopedics
at the University Hospital of Münster, Germany.
MUTARS® has been in successful clinical use since 1992.

Table of Contents

Nota Bene: The described surgical technique is the suggested treatment for the uncomplicated procedure. In the final analysis the preferred treatment is that which addresses the needs of the individual patient.

The *Silver* coating

Early and late 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. 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.
The anti-infective effect of silver ions has been known for centuries i.e. the disinfection of potable water is based on this principle. Until now only non-articulating surfaces and surfaces without direct bony contact are coated with silver.
In the catalogue information of this brochure 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).

It is not permitted to flush the wound with antiseptics that contain Iodine or heavy metals (such as Betaisodona®)

Iodine and Silver form insoluble salt complexes not only with the silver ions that are released post-operatively but also with the silver layer of the implant that will be covered with an insoluble silver-iodine (AgI) film. This will destroy the anti-adhesive protective layer irreversibly. Iodine or heavy metal based antiseptics may not be used at any time. Alternatively solutions containing H_2O_2 – (like Lavasept®, Prontosan® or similar) can be used.
The silver coating can be destroyed in its function by two factors: large amounts of albumin from seroma or hematoma can bind larger amounts of silver (1 mol Albumin inactivates 3 moles Silver ions). This should be minimized by using an attachment tube. In the instance that an infection is known pre-operatively, antibiotics like Vancomycin can be mixed with the bone cement. The intramedullary stems are not silver coated and cemented components are preferred in case of a septic revision.

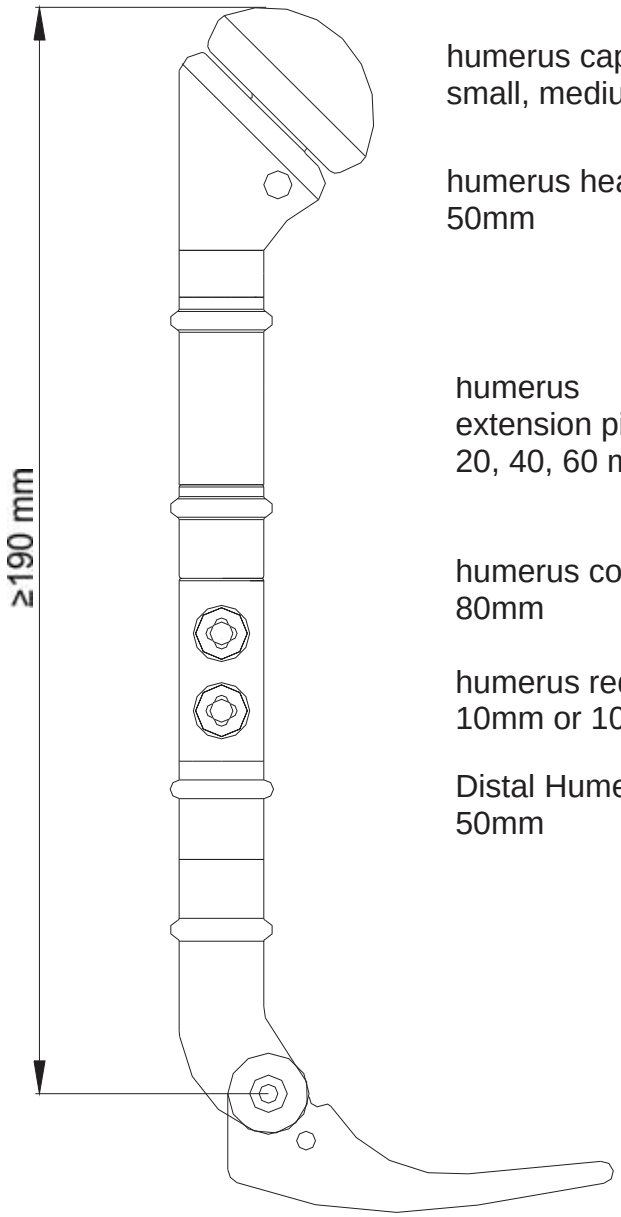
The TiN coating for allergy prophylaxis

As the metallic components of total knee replacements, the articulating metallic parts of the MUTARS® system are made of casted CoCrMo alloy. In the late 70's and 80's of the last century, some of the Cobalt Chromium implants had a small Nickel content to add strength to the implant. Nickel is the primary cause for metal sensitivity, although some patients have shown to be hypersensitive to other metals such as Cobalt and Chromium. The use of titanium components can't solve this problem, because the wear of the articulating polyethylene inlays will increase and so the survival time of the prosthesis is reduced. Since the end of the 1990's TiN (Titanium Nitride coating) has been successfully applied to protect the body against metal ions that could cause allergic reactions.
The metal ion release of TiN coated or TiNbN coated implants is reduced down to 10%.[1]
In order to prevent allergic reactions, certain parts of the prosthesis may be supplied with a ceramic coating (TiN). Since almost all components of the tumor system consist of titanium alloy, this only concerns those components, which are made of a cast CoCr alloy (CoCrMo). The REF-numbers of the TiN coated implants have the suffix N after the last digit (e.g. 5720-0005N).

***S**: For anti-infective treatment, silver coated implants are available.
***N**: For anti-allergic treatment, TiN coated implants are available.
***SN:** Implants are coated with silver and TiN.

[1] Metal Ion Release from Non-Coated and Ceramic Coated Femoral Knee Components: Boil test 240h in NaCl-solution nach FMZ PhysWerk VA 97350, University Würzburg (D) (On File)

System Overview



humerus cap
small, medium, large

humerus head
50mm

humerus
extension piece
20, 40, 60 mm

humerus connecting part
80mm

humerus reducer
10mm or 100mm

Distal Humerus
50mm

ulna anchorage
cementless ($TiAl_6V_4$)
length: 70mm

cemented (CoCrMo)
length: 70mm and 100mm

MUTARS® Total Humerus

assembling options

(length in mm)

The use of an 100mm reducer is recommended
for a reconstruction length over 300mm

	Humerus components					
reconstruction	head	reducer	extension piece	connecting part 80 mm	distal humerus	humerus screw
190	50	10		80	50	15+15+15
210	50	10	20	80	50	15+35+15
230	50	10	40	80	50	15+55+15
250	50	10	60	80	50	15+75+15
270	50	10	20+60	80	50	35+75+15
290	50	10	40+60	80	50	55+75+15
300	50	100	20	80	50	15+35+15
310	50	10	20+40+60	80	50	75+75+15
320	50	100	40	80	50	15+55+15

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.

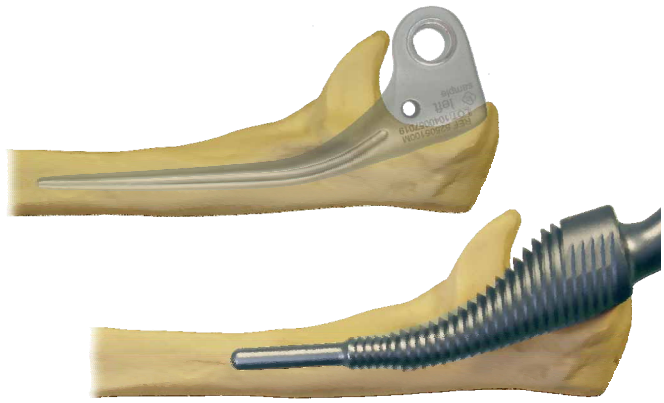


figure 1

Tumor 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 tumor it needn't be resected.

The minimum bone resection is 60mm.

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).

figure 2

figure 3

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

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).

To implant the ulna anchorage in the exact depth, the entry has to be extended ventral at the Proc. Coronoideus and dorsal. The olecranon should be preserved, if possible.

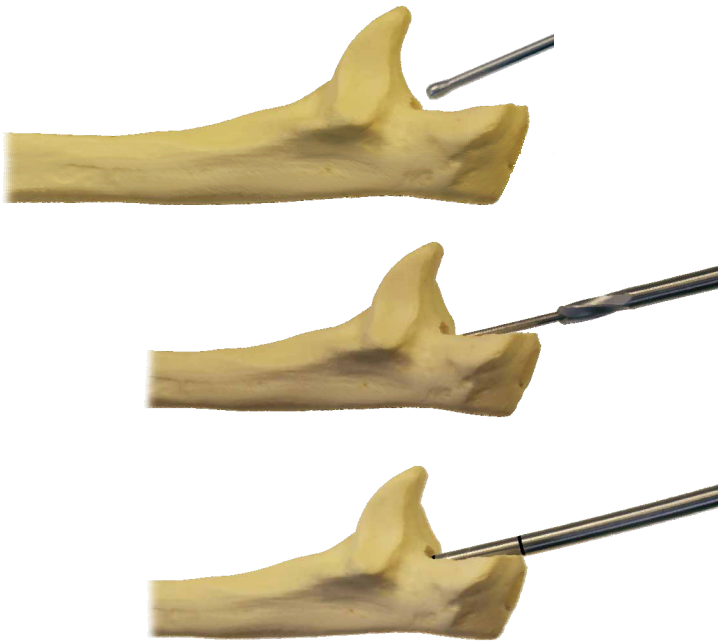


figure 4

Rasp the medullary cavity with the MUTARS® rasp for ulna anchorage (fig. 5 and 6).

figure 5

Remark
Risk of the via falsa with cortical perforation. Control in 2 plains under x-ray is recommended.

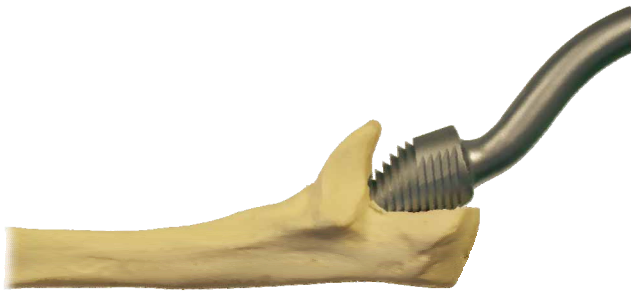


figure 6

figure 7

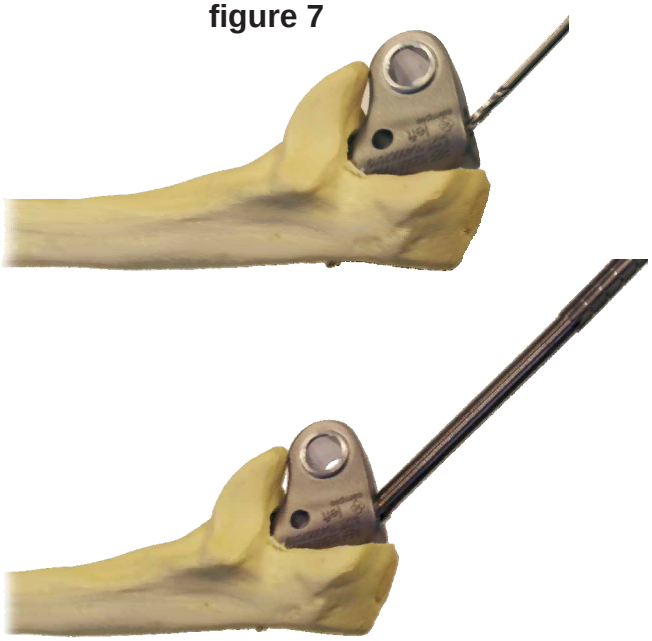


figure 8

figure 9a

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, measure the length of the 4 mm screw (fig. 8) and insert the screw (fig. 9a).

Remark
The use of a cancellous screw is preferable, because the use of a cortical screw can lead to a skin impignment.

Make again a concluding x-ray control in 2 plains and check the proper positioning of the implant as in example fig. 9b).

figure 9b

Assembling of the humeral components

The modularity of the system allows the readjustment of the rotational alignment and the length after the trialling at several connectors.

Generally it is possible to build up the prosthetic body of the appropriated length by combining the long reducer (100mm) (fig. 10a) or by the use of the short reducer (10mm) in combination with the connecting part (fig. 10b).

Please also see the table of assembling options on page 2.

Remark
The use of a connection part is preferable, because in case of revision the disconnecting of the parts will be easier without the opening of any of both joints (fig. 10c).

figure 10a

figure 10b

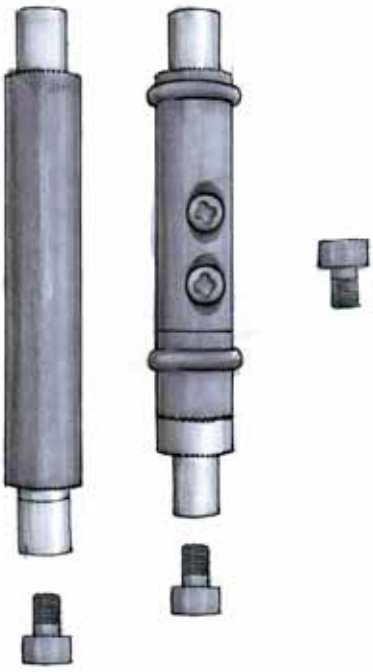


figure 10c

Trial reduction with the humeral parts

It is recommended to combine all necessary humerus components before inserting them into the patient.

Please assemble first the distal humerus and the reducer and the connecting part distally (fig. 11a).

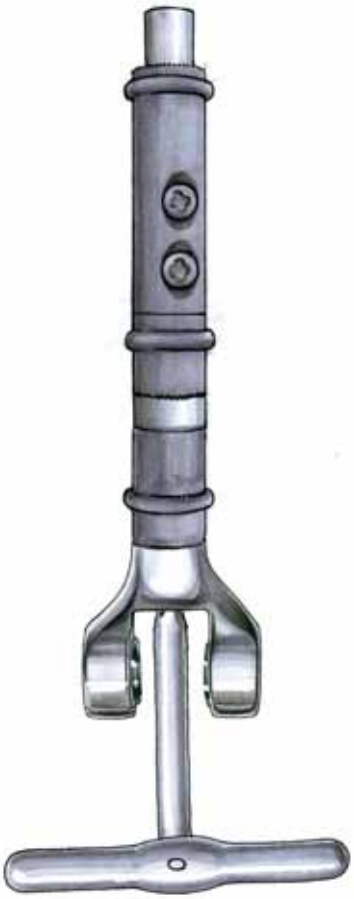


figure 11a

Combine the distal humerus and the reducer with a 15mm screw (fig. 11b). Adjust the correct rotational position.

Lock the screw with the MUTARS® small socket wrench.

Secure the assembly by using the counter instrument (fig. 11d).

Lock the humerus safety screw in the same way (fig. 11c).

figure 11b

figure 11c

figure 11d

Insert the ulna stop by using the impactor (fig. 12a) or a punch.

The ulna stop should be impacted completely.

figure 12a

Remark:
The elbow joint can be connected. Further adjustments of the rotation alignment can be performed by changing the proximal components.

Combine the ulna anchorage with the distal humerus components and insert the articulating axle (fig. 12b).

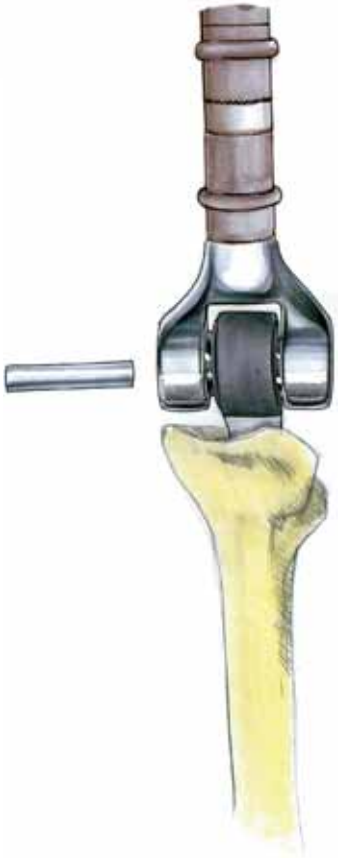


figure 12b

figure 13a

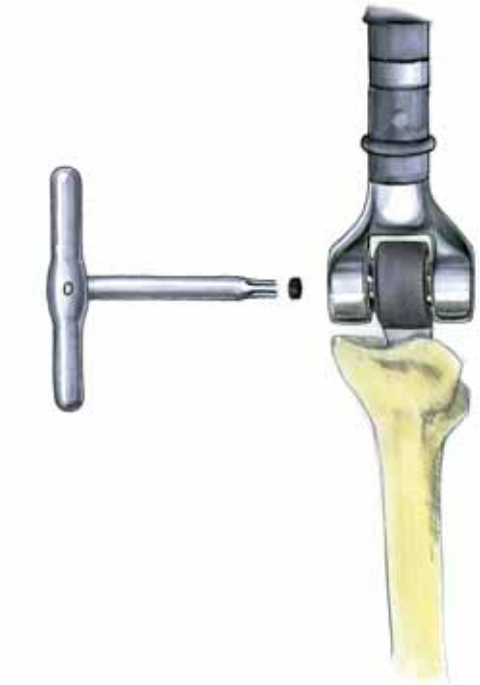


figure 13b

figure 13c

Locking of the joint mechanism

After inserting of the axle please close the distale humerus with the lock screw. (fig. 13a).

Use the socket wrench to tighten the locking screw (fig. 13b and 13c).

Trial reduction with trial components

Mount the humerus trial head and the possibly used trial extension pieces (possible enlargement from 20 to 200 mm; see table page2) onto the top of the connecting part. Insert the trial bar screw of the correct length and lock it with the socket wrench (fig. 14a).

Remark
If you perfrom the trial reduction by using the implant components (fig. 14b) don't insert the safety screw at that stage!

figure 14a

figure 14b

Put the humerus trial cap, which belongs to the size of the preoperative chosen humerus cap (small, medium or large) on the head (fig. 15).

Perform a trial reduction and control the muscle tension.

Remove the humerus trial cap, the humerus head and when sufficient stability is achieved.

figure 15

figure 16a

figure 16b

Final implant assembly

Combine the proximal implant components with the connecting part. Insert the bar screw of the correct length (see table on page 2), but do not tighten the screw completely at this stage (fig. 16a).

Put the chosen humerus cap on the humeral head (fig 16b). Perform stability tests and readjust the rotation if necessary.

figure 17a

figure 17b

If sufficient stability and the correct rotation are found please use the small socket wrench to tighten the screw. Use the counter instrument to secure the assembly (fig. 17a).

Lock the humerus safety screw in the same way (fig. 17b)

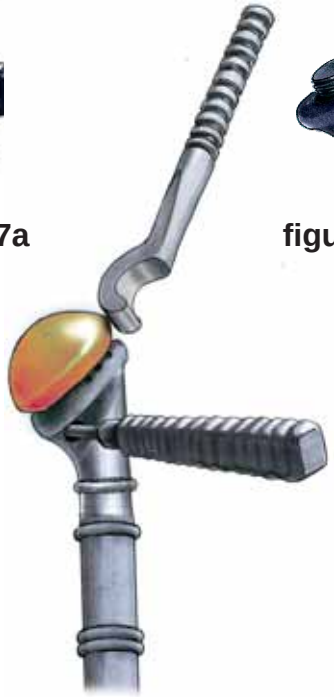


figure 18

Screw the humerus cap of the correct diameter with the MUTARS® wrench for cap/counter instrument and secure it with the wrench for humerus (fig. 18).

The use of the attachment tube

Fasten the attachment tube. Fix the tube, first proximally and then distally.
Pull the tube over the joint capsule and fix the tube to the capsule wall.

Afterwards tighten the tube and fix it over and under the pads of the MUTARS® components (fig. 20a and fig. 20b).

Fix muscles and tendon tissues with sutures to the meshes of the tube (fig. 21a. and fig. 21b).

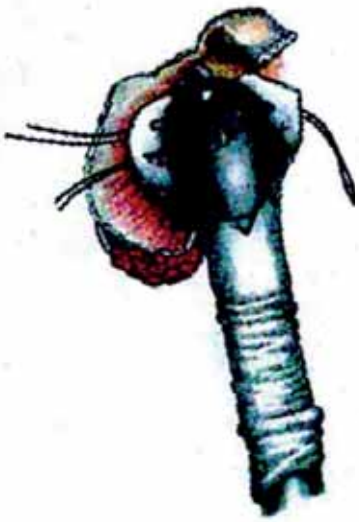


figure 20a

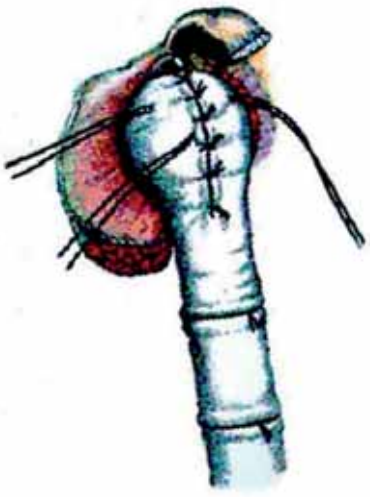


figure 20b

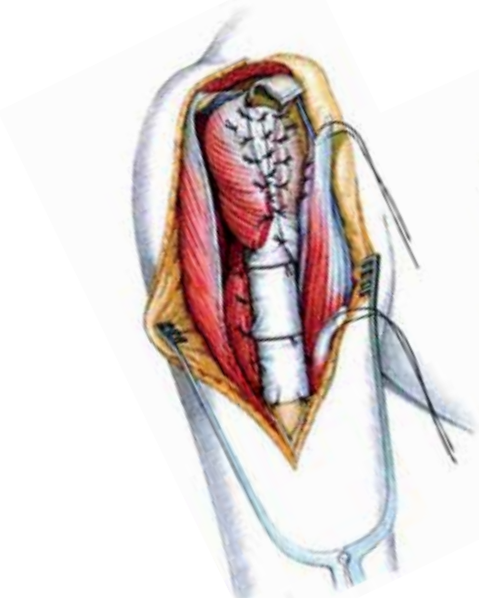


figure 21a

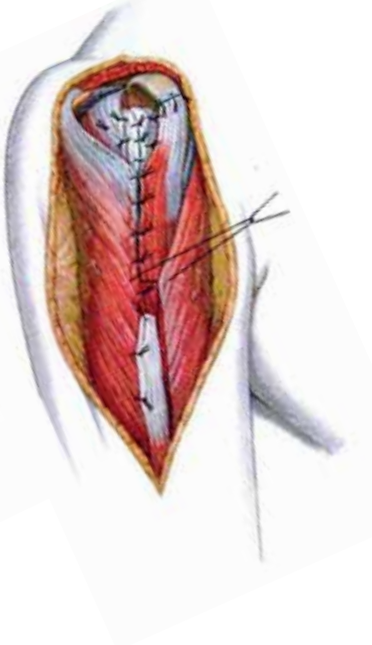


figure 21b

IMPLANTS

***S**: For anti-infective treatment, silver coated implants are available.
***N**: For anti-allergic treatment, TiN coated implants are available.
***SN:** Implants are coated with silver and TiN.

MUTARS® humerus cap
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3 with TiN-coating
5210-0000 small
5210-0005 medium
5210-0010 large

MUTARS® humerus head 50 mm *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5200-0000

MUTARS®humerus screw
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5230-0015 M8x15 mm
5230-0035 M8x35 mm
5230-0055 M8x55 mm
5230-0075 M8x75 mm
For a total humerus three screws are needed (see table page2)

MUTARS®humerus extension piece *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5220-0020 20 mm
5220-0040 40 mm
5220-0060 60 mm

MUTARS® humerus connecting part *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5221-0080 80 mm

IMPLANTS

MUTARS® humerus reducer *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5221-0000 10 mm
5221-0100 100 mm

MUTARS® distal humerus 50 mm incl. axle, safety screw and 2 lock screws
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5250-0000

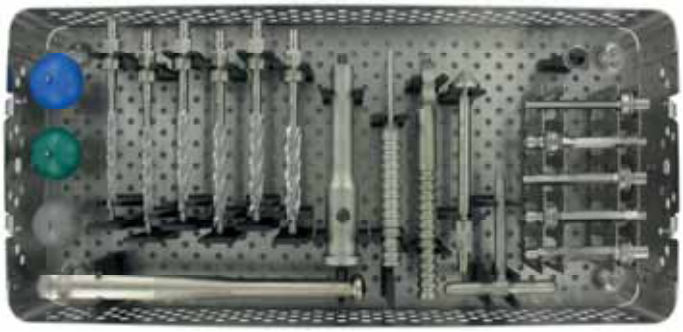
MUTARS® ulna stop
mat.: UHMWPE according to DIN ISO 5834/2
5250-1100

MUTARS® ulna anchorage cementless
mat.: implatan®; TiAl6V4 according to DIN ISO 5832/3 with cpTi and HA-coating
5250-1015 left
5250-1020 right

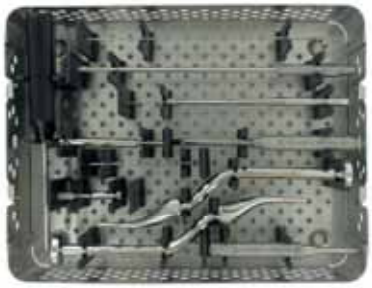
MUTARS® ulna anchorage cemented *N
mat.: implavit®; CoCrMo-casting alloy according to DIN ISO 5832/4
5250-0570 left 70mm
5250-0070 right 70mm
5250-5100 left 100mm
5250-0100 right 100mm

cancellous screw ∅ 4mm
Mat.: implatan®; $TiAl_6V_4$ acc. to DIN ISO 5832/3
5793-4026 26 mm
5793-4028 28 mm
5793-4030 30 mm
5793-4032 32 mm
5793-4034 34 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

INSTRUMENTS

Content MUTARS® humerus container

MUTARS® wrench for humerus
7420-0001

MUTARS® humerus impactor
7710-0000

MUTARS® humerus wrench for cap / Counter instrument
7710-0001

MUTARS® medullary cavity reamer
7760-0501

MUTARS® wrench small
7608-1010

MUTARS® humerus impact and extract sleeve
7721-0000

MUTARS® extractor device
7220-0000

MUTARS® Humerus trial cup
7710-1000 small
7710-1005 medium
7710-1010 large

MUTARS® Humerus rasp
7770-0809 9 mm
7770-0810 10 mm
7770-0811 11 mm
7770-0812 12 mm
7770-0813 13 mm

MUTARS® Humerus drills
7630-0007 7 mm
7630-0008 8 mm
7630-0009 9 mm
7630-0010 10 mm
7630-0011 11 mm
7630-0012 12 mm

INSTRUMENTS

Content MUTARS® distal humerus container

MUTARS® rasp for ulna anchorage
7420-0009 left
7420-0010 right

MUTARS® setting instrument for ulna, straight
7420-0013

MUTARS® trial axle for distal humerus
7420-0015

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

flexible drill
7701-2005 190 x 5 / AO

depth gauge small
0270-1015

drill for three jaw chuck 2mm
7520-0000

hexagon screw driver 2,5mm
7608-1001

MUTARS® patella drill
7351-0000

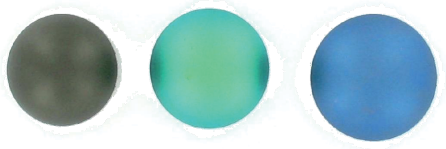
MUTARS® setting instrument for ulna anchorage, angular
7420-0014

INSTRUMENTS

Content MUTARS® humerus trial container

MUTARS® humerus trial cap with thread

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



MUTARS® humerus trial head

7710-1252

MUTARS® humerus trial extension piece

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

MUTARS® humerus trial reducer

7710-2100	10mm
7710-2101	100mm

MUTARS® humerus trial connecting part

7710-2180 80mm

MUTARS® humerus trial screw

7710-2315	M8 x 15mm
7710-2335	M8 x 35mm
7710-2355	M8 x 55mm
7710-2375	M8 x 75mm

MUTARS® distal humerus 50mm trial

7710-1275

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