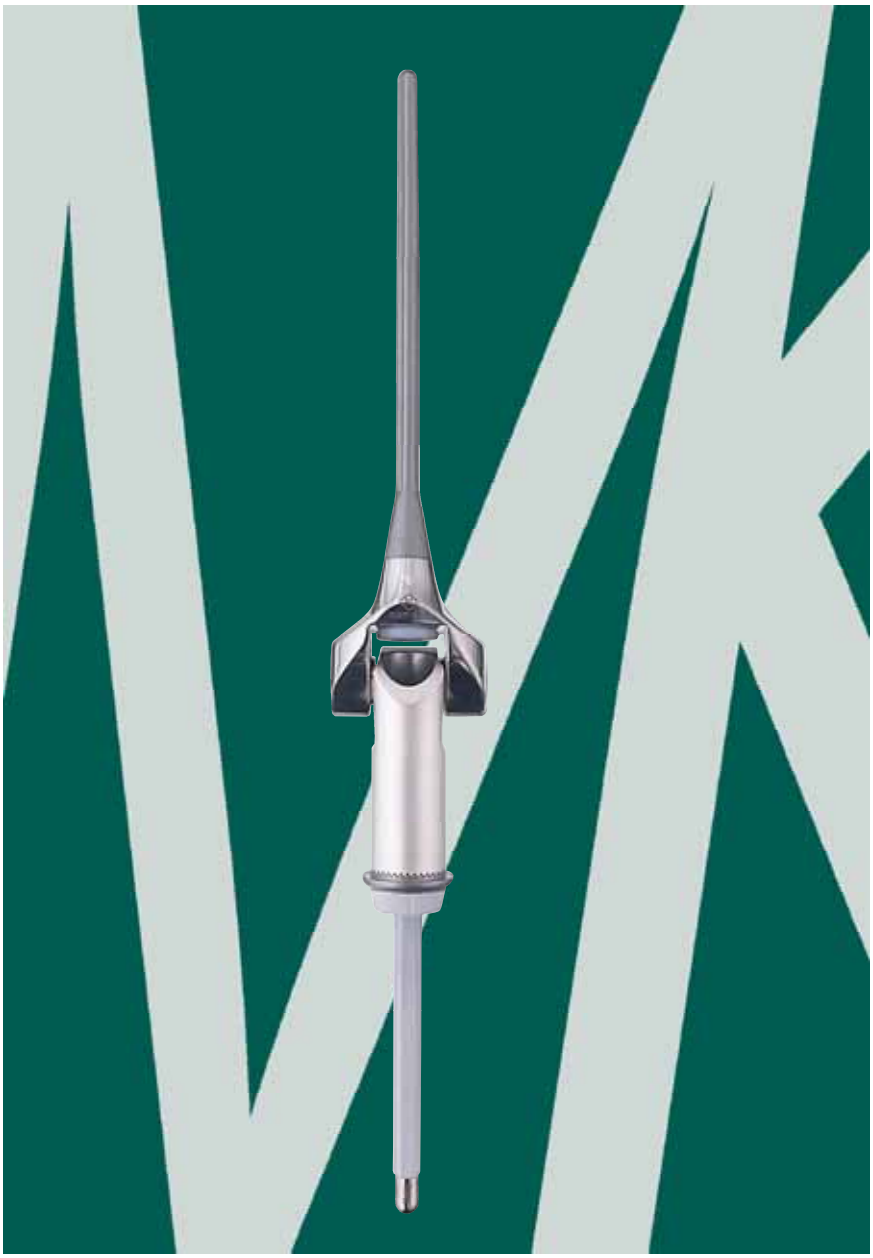
MUTARS®

implantcast



Proximal Ulna

Surgical Technique

MUTARS®

Proximal Ulna

Operationstechnik

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

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:

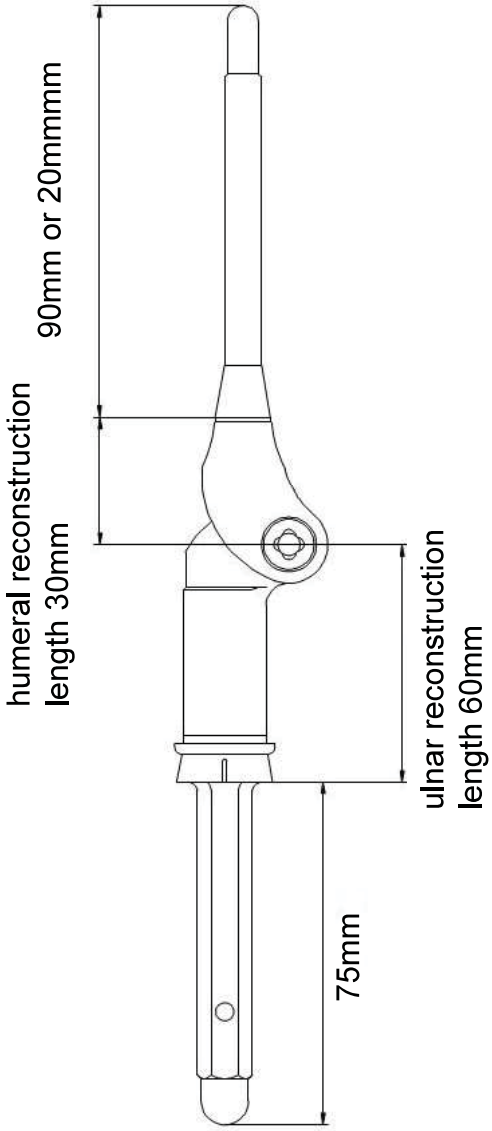
Digital templates: Digital templates are included in the data base of the common planning systems. For missing templates, please contact the provider of the planning software and request for these templates.

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

Picture shown: MUTARS® proximal ulna implant in A/P view

Picture shown: MUTARS® proximal ulna implant in M/L view

System Overview



AGILON® Trauma stem

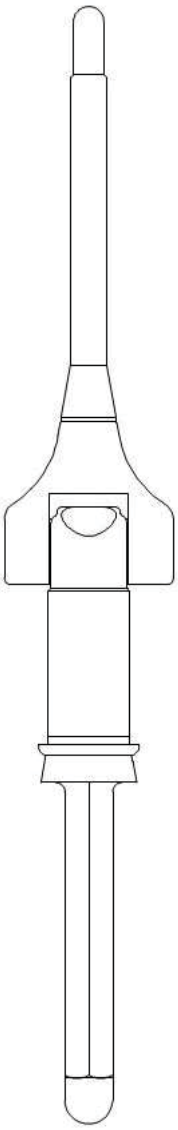
cemented: ø6mm,
ø8mm, ø10mm, ø12mm
length: 90 and 120mm

cementless ø 10 - 16mm
length: 60mm and 120mm

distal humerus
30mm

proximal ulna

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



Reconstruction length
60 mm

Assembling Options

Humeral Components				
Reconstruction (mm)	**Distal Humerus 30 mm**	**Distance sleeve (mm)**	**Distance sleeve (mm)**	**Screw for dist. Humerus 30 mm**
30	30			15
35	30	5		15
37.5	30	7.5		20
40	30	10		20
42.5	30	5	7.5	25
45	30	10	5	25
47.5	30	10	7.5	30
50	30	10	10	30

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 30mm 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).

Fig. 4

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

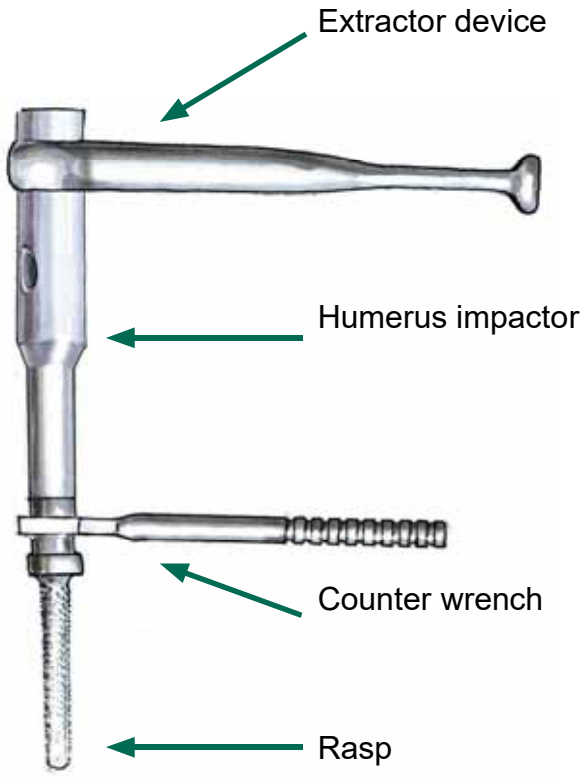


Fig. 5

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).

Table 1: Cementless Preparation of the Ulna

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

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).

Table 2: Cemented Preparation of the Ulna

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

Preparation of the Proximal Ulna

Use the rasp of the correct size to prepare the cavity (Fig. 6 and Fig. 7). A carefully use of the mallet is recommended.

Fig. 6

Fig. 7

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.

Leave the humeral rasp in the bone for the trialing (Fig. 8).

Fig. 8

Fig. 9

Fig. 10

Humeral Bone Preparation
Cemented Use

Drill the medullary cavity with a trauma stem drill (7-13 mm, in 1 mm steps) stepswise up to the planned diameter (1 mm bigger than preoperatively chosen stem) and the correct length (90 or 120 mm, see the mark on the drill) (Fig. 9).

Please use additionally the tapered drill when a stem smaller than 12mm is planned to complete the bone preparation (Fig. 10).

Implantation of the Complete Distal Humerus 30mm

Cemented Stem Use

For cemented fixation ream the canal 1mm bigger than the planned stem.

Cementless Stem Use

For the cementless stems, ream up to the planned stem size and implant the stem with the same size as the reamer.

Example:

Table 3: Preparation of the AGILON® Humerus Stem

Reamer Ø	cemented stem Ø	cementless stem Ø
Ø 8mm	Ø 6mm	
Ø 9mm		Ø 9mm
Ø 10mm	Ø 8mm	Ø 10mm
Ø 11mm		Ø 11mm
Ø 12mm	Ø 10mm	Ø 12mm
Ø 13mm		Ø 13mm
Ø 14mm	Ø 12mm	Ø 14mm
Ø 15mm		Ø 15mm
Ø 16mm		Ø 16mm

Implantation of the Cemented AGILON® Stem

Mount the impactor sleeve and the impactor to the stem of the correct size.

Fill in bone cement into the cavity. Insert the stem up to the correct depth (Fig. 11).

Remove remaining bone cement before cement hardening. Make sure that the teeth mechanism of the components is free of bone cement.

Remove the impactor and the impactor sleeve during cement hardening.

Implantation of the Cementless AGILON® Stem

Mount the impactor sleeve and the impactor to the stem of the correct size.

Insert the stem up to the correct depth (Fig. 11).

Remove the impactor and the impactor sleeve.

Fig. 11

Assembling of the Distal Humerus 30mm trial

Combine the Distal Humerus 30mm trial and, if used, the distance sleeves with the stem. Insert the screw of the correct length and lock the components to the stem (table 4) (Fig. 12).

Table 4: Overview of Screws and Distance Sleeves

Added length	Distance sleeve	Screw
0mm	none	15mm
5mm	5mm	15mm
7.5mm	7.5mm	20mm
10mm	10mm	20mm
12.5mm	5 + 7.5mm	25mm
15mm	5 + 10mm	25mm
17.5mm	7.5 + 10mm	30mm

Fig. 12

Mount the Proximale Ulna trial onto the rasp seated in the ulna cavity (Fig. 13).

Fig. 13

Fig. 14

Assemble the articulating mechanism by inserting the trial axle (Fig 14 and Fig. 15).

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

Fig. 15

After successful trialing, remove all trial components.

Fig. 16

Implantation of the Humeral Stem in the Ulna

Remove humeral rasp from the ulna using the humerus impactor and the extraction device (Fig. 16).

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

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 and impact the stem into the ulna. (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 ulnar 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.

Assembling of the Distal Humerus 30mm

Combine the Distal Humerus 30mm trial and the distance sleeve with the stem (Fig. 17). Insert the screw of the correct length and lock the components to the stem (table 4, page 10).

Use the 5mm torque wrench to tighten the screw.

Fig. 17

Fig. 18

Fig. 19

Fig. 20

Add the counter screw and tighten it by the use of the small socket wrench (Fig. 19).

Impact the ulna stop with the impaction instrument (fig. 20) or a punch.

The ulna Stop has to be fully seated to achieve a full range of motion of the joint.

Fig. 21

Fig. 22

Fig. 23

Fig. 24

Connect the Proximal Ulna with the stem (Fig. 21). 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 "Assembling Options - Ulnar Components" on page 5).

Use the small MUTARS® socket wrench to tighten the screw (Fig. 21). Use the counter wrench to secure the assembly (Fig 24).

Insert the safety screw and lock it in the same way (Fig. 23).

Final Reduction

Connect the distal humerus 30mm to the Proximal Ulna by inserting the articulating axle (Fig. 25).

Fig. 25

Locking of the Hinge Mechanism

After coupling of the joint components (Fig. 26) please insert the locking screws on both sides in order to cover the articulating mechanism and to protect the axle Therefor the small socket wrench is used (Fig. 27 and Fig. 28)..

Fig. 27

Fig. 26

Fig. 28

MUTARS® Proximal Ulna

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.

AGILON® trauma shoulder stem cemented *N *E
mat.: implavit®; CoCrMo according to ISO 5832-4

REF 3820-9006	90mm	ø 6mm
REF 3820-9008	90mm	ø 8mm
3 REF 820-9010	90mm	ø10mm
REF 3820-9012	90mm	ø12mm
REF 3821-2006	120mm	ø 6mm
REF 3821-2008	120mm	ø 8mm
REF 3821-2010	120mm	ø10mm
REF 3821-2012 1	20mm	ø12mm

AGILON® trauma shoulder stem cementless
mat.: implatan®; TiAl6V4 according to ISO 5832-3

REF 3830-6010	60mm	ø 10mm
REF 3830-6011	60mm	ø 11mm
REF 3830-6012	60mm	ø 12mm
REF 3830-6013	60mm	ø 13mm
REF 3830-6014	60mm	ø 14mm
REF 3830-6015	60mm	ø 15mm
REF 3830-6016	60mm	ø 16mm
REF 3831-2010	120mm	ø 10mm
REF 3831-2011	120mm	ø 11mm
REF 3831-2012	120mm	ø 12mm
REF 3831-2013	120mm	ø 13mm
REF 3831-2014	120mm	ø 14mm
REF 3831-2015	120mm	ø 15mm
REF 3831-2016	120mm	ø 16mm

AGILON® extension piece
mat.: implatan®; TiAl6V4 according to ISO 5832-3

REF 3820-0050	5mm
REF 3820-0075	7.5mm
REF 3820-0100	10mm

MUTARS® Distal Humerus 30 mm incl. axle, covers and safety screw
mat.: implatan®; TiAl6V4 according to ISO 5832-3
axle CoCrMo according to 5832-12
bushing CoCrMo according to 5832-12
REF 5250-1300

screw for Distal Humerus 30mm M6
mat.: implatan®; $TiAl_6V_4$ according to ISO 5832-3

5230-1815	15 mm
5230-1820	20 mm
5230-1825	25 mm
5230-1830	30 mm

MUTARS® Proximale Ulna incl. safety screw *S
Mat.: implatan®; TiAl6V4 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

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
with 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

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

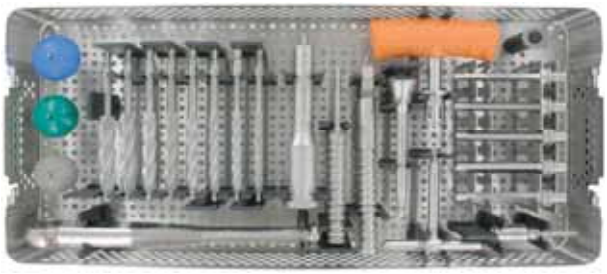
Special stem sizes are available on request.

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

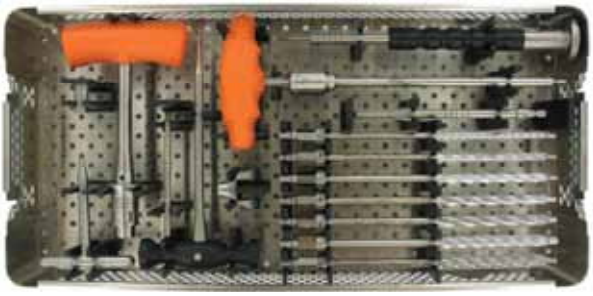
	size
REF 5220-0020	20 mm
REF 5220-0040	40 mm
REF 5220-0060	60 mm

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 30mm for M6 container
7999-5208

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

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

MUTARS® Proximal Ulna

MUTARS® Distal Humerus 30mm M6 instrument tray 7999-5208

AGILON® stem impactor
REF 7801-0012

AGILON® guide rod
REF 7801-0015

torque wrench 15Nm 5mm
REF 7512-0025

AGILON® reamer tapered
REF 7801-0019

MUTARS® hexagon socket wrench 3,5 mm with T-handle
REF 7608-1035

MUTARS® socket wrench small
REF 7608-1010

ic t-handle A/O
REF 7512-0100

AGILON® trauma shoulder drill

REF 7820-0007	7 mm
REF 7820-0008	8 mm
REF 7820-0009	9 mm
REF 7820-0010	10 mm
REF 7820-0011	11 mm
REF 7820-0012	12 mm
REF 7820-0013	13 mm

AGILON® impaction sleeve
REF 7801-0017

MUTARS® distal humerus 30mm trial
REF 7710-1273

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

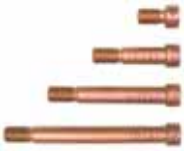
MUTARS® humerus trial reducer

	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

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

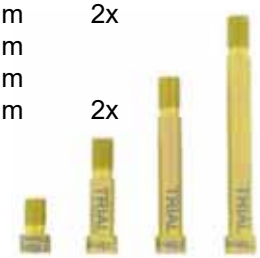
MUTARS® humerus trial extension piece

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

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