MUTARS®-Münster

implantcast

Proximal Tibia M-O-M

Surgical Technique

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

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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. This special property of silver is used for the silver coated components of MUTARS® to build an intelligent protection against bacteria.

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]

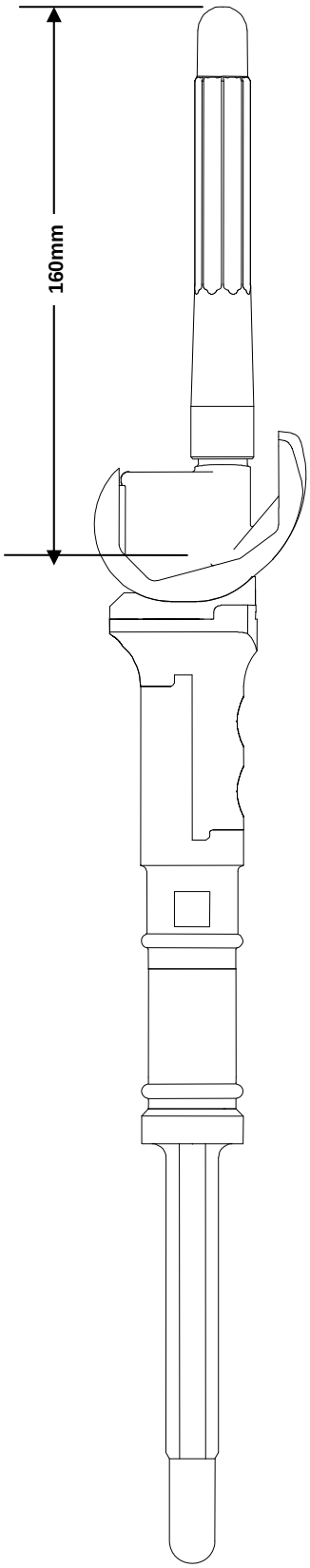
In order to prevent allergic reactions, certain parts of the prosthesis may be supplied with a ceramic coating (TiN). Since almost all components of the tumor system consist of titanium alloy, this only concerns those components, which are made of a cast CoCr alloy (CoCrMo). The REF-numbers of the TiN 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.

[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)

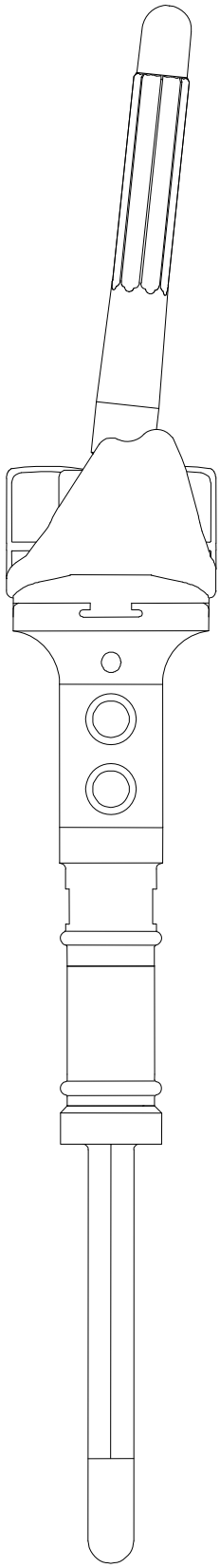
System Overview



revision stem for femoral component
length 160mm
Ø10-16mm cementless
Ø11-17mm cemented

femoral component Sz.3
cementless and cemented

modulare proximale Tibia xs with
connection part
105mm (125mm)



Proximal Tibia

assembling options
(length in mm)

reconstruction	components			
	femoral joint	**connecting part**	**extension piece**	**bar screw**
115	x	105	-	25
135	x	125	-	45
155	x	105	40	65
175	x	105	60	85
195	x	105	80	105
215	x	125	80	125
235	x	125	40 + 60	145

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

figure 2

figure 3

figure 4

Tumor resection
Resect the tumor and measure the dimension of the explant.
The minimum bone resection is 115 mm.

Femoral preparation

Fix the femoral alignment stylus to the femoral resection block and place the assembly on the distal femoral bone.

Slide the stylus as far as possible under the quadriceps muscle and assure that the stylus stays in contact with the anterior cortex.

Open the intramedullary cavity using the 9 mm initiator drill (fig. 1).

Adjust the rotation of the femoral resection block referencing on the posterior femoral condyles. Use two of the 3,2mm fixation pins to fix the femoral resection block to the bone (fig. 2). Remove the alignment stylus.

Anterior femoral resection

Place the saw capture to perform the anterior resection by the use of the ACS® saw blade (fig. 3).

Posterior femoral resection

Change the position of the saw capture to resect the posterior condyles (fig. 4).

Distal femoral resection

Mount the distal femoral cutting block$_1$ 6° facing the „L“ for the left knee or „R“ for the right knee to the femoral alignment guide and lock the resection block in such a way that the block corresponds with the mark on the medial side$_2$ of the alignment guide to determine the level of the distal bone resection (fig. 5).

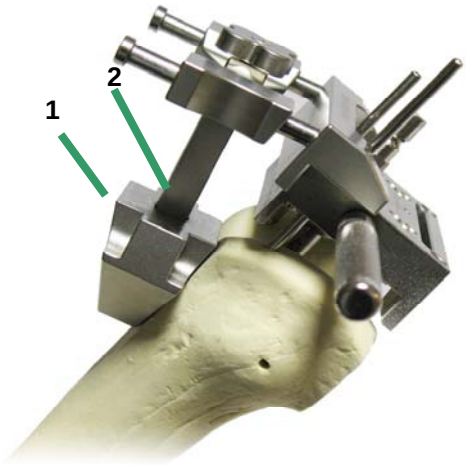


figure 5

Place the whole assembly on the femoral resection block (fig. 6).

Leave the initiator drill in the bone for additional stability.

figure 6

The distal femoral cutting block should lie flush with the anterior resection plane$_3$ and it is attached to the bone using two predrilled pins$_4$ (fig. 7).

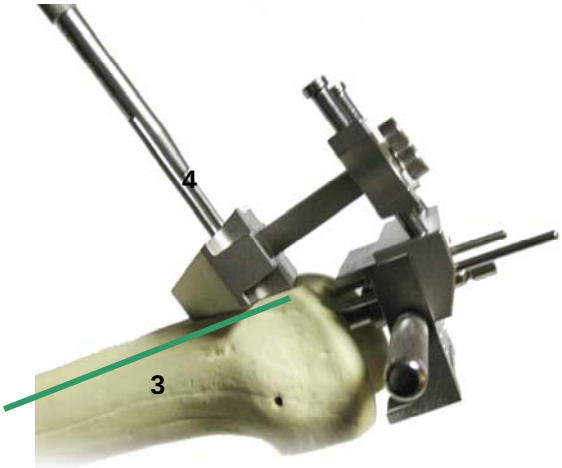


figure 7

figure 8

Remove all instruments except the distal femoral cutting block; add the saw capture and resect the distal femur with the ACS® saw blade (fig. 8).

To make sure that the distal cut surface is correct please remove the saw capture and use the resection check (fig. 9).

figure 9

Femoral stem preparation

Place the finishing guide to the distal femoral bone. The guide should rest completely on both the distal and the anterior bone surface (fig. 10).

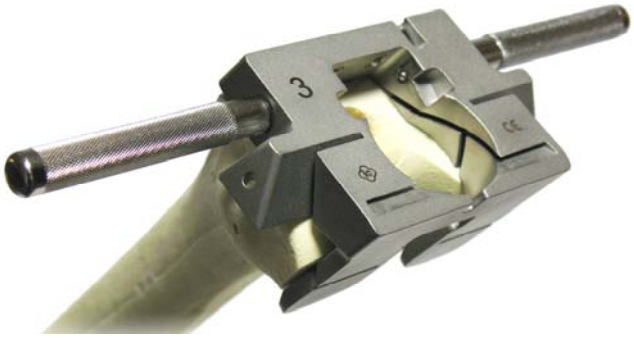


figure 10

Slide the long stem sleeve 10mm into the guide. Drill with the 10mm reamer until the 200mm mark reaches the top of the sleeve (fig. 12).

Please use the sleeves and reamers of growing diameters in the same way enhancing the diameter in 2 mm steps. For additional stability please slide the femoral reamer sleeve over reamer shaft (fig. 11). Please reference to table 1 and 2 to find out the recommended diameter for the bone preparation when a cementless or cemented stem fixation is planned.

table 1: cementless implantation
femoral stem 12 mm ➔ reamer 11 mm
femoral stem 14 mm ➔ reamer 13 mm
femoral stem 16 mm ➔ reamer 15 mm
femoral stem 18 mm ➔ reamer 17 mm

table 2: cemented implantation
femoral stem 11 mm ➔ reamer 12 mm
femoral stem 13 mm ➔ reamer 14 mm
femoral stem 15 mm ➔ reamer 16 mm
femoral stem 17 mm ➔ reamer 18 mm

Drill with the final reamer until the 200mm mark reaches the top the sleeve (fig. 12).

Please leave the reamer and the sleeves in place and insert two fixations pins to stabilise the finishing guide in the correct M/L position (fig. 13).

figure 11

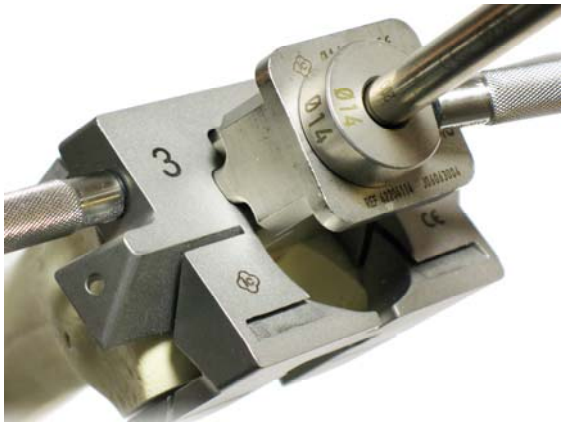


figure 12

figure 13

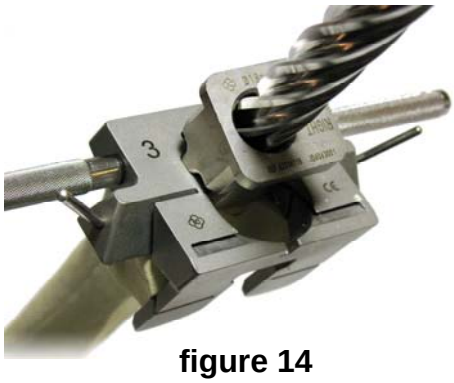


figure 14

Use the 18 mm reamer and the 18 mm sleeve (fig. 14) to remove additional bone, to allow a proper seating of the taper connection of the femoral component.
Please ream deep enough that the reaming part of the reamer will stay app. 1 cm out of the sleeve (fig. 15).

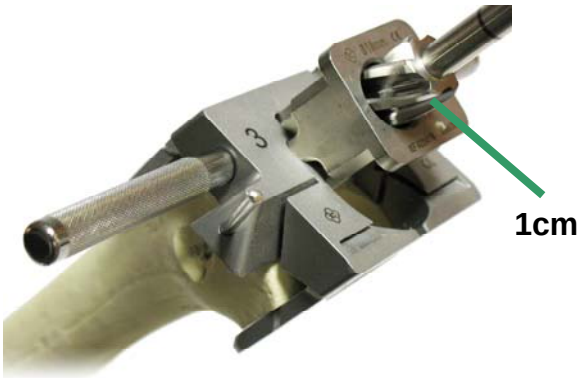


figure 15

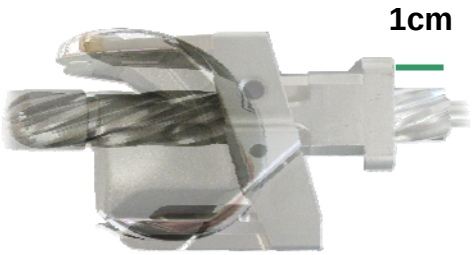


figure 16

Then remove the 18 mm reamer and the 18 mm sleeve. Slide the box reamer guide into the finishing guide (fig. 16).

Remove the intracondylar bone by using the box reamer until it is stopped by the box reamer guide (fig. 17a and 17b).

figure 17a

figure 17b

Use the narrow ACS® saw blade to perform the chamfer cuts to finalise the femoral bone preparation.

figure 18

Start with the anterior chamfer cut (fig. 18) and perform the posterior chamfer (fig. 19).

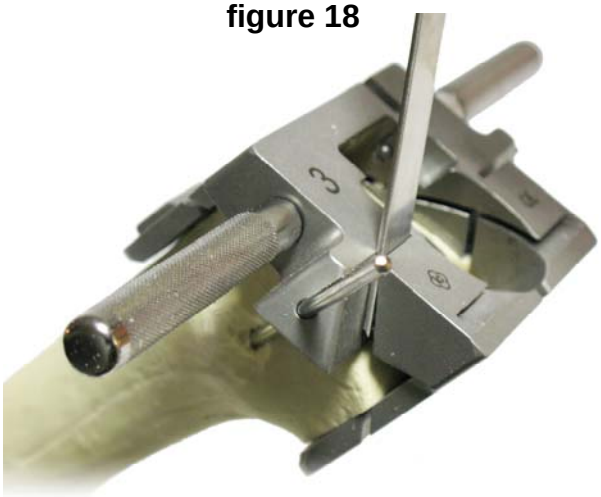


figure 19

Cut out the anterior groove with the osteotome (fig. 20).

The femoral bone preparation is now performed.

figure 20

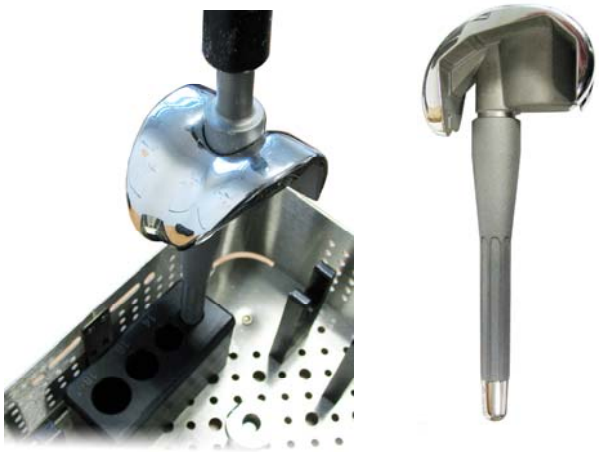


figure 21

Assembling of the femoral implants

Choose the femoral stem of the correct size and version, cemented or cementless.

Place the stem into the assembling block of the instrument tray and connect the femoral component.

Use the femoral impactor and a mallet to enhance the taper connection (fig. 21).

figure 22

Implantation of the femoral implants

Insert the femoral component with the assembled stem into the femoral bone and impact the components with the impactor inserted in the notch of the femoral component (fig. 22).

If sufficient seating is achieved, the impactor is removed.

figure 23

figure 24

For adjustment of the femoral component after seating, you could remove the femoral component by the use of the extractor mounted on the slide hammer (fig. 23 and 24).

Assemble the MUTARS® locking mechanism and the special MUTARS® instrument for locking mechanism. Therefore turn the attachment part of the lock by 100 degrees until it rests in the sleeve of the locking instrument (fig. 25a and 25b).

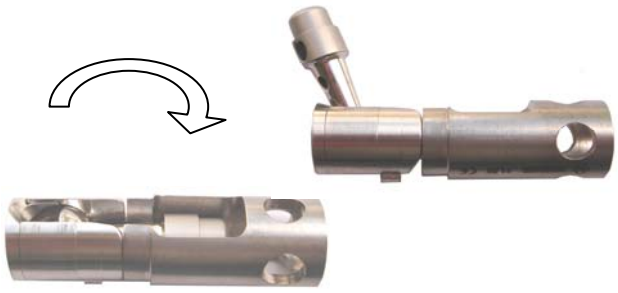


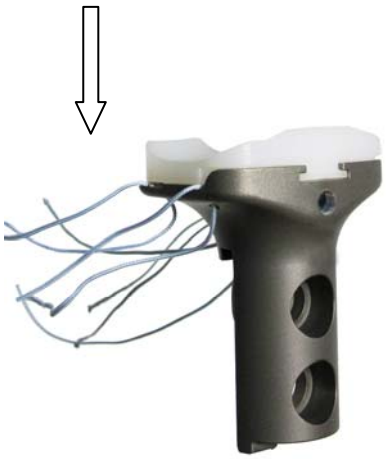
figure 25 a and 25b

Insert the lock into the intracondylar notch of the femoral joint (fig. 26).

figure 26

Use the socket wrench to turn the locking instrument and the lock clockwise by 180 degrees (fig. 26). The lock is correctly positioned when the attachment partly falls out of the sleeve of the locking instrument (fig. 27). Remove the locking instrument.

figure 27



Fill the 4 suture holes of the Proximal Tibia component with non absorbable sutures (Ethibond is recommended) to allow the fixation of the attachment tube. Insert the PE inlay x-small in the Proximal Tibia. Move the PE-inlay towards the anterior locking rim and push it down at the posterior part until it is locked securely (fig. 28).

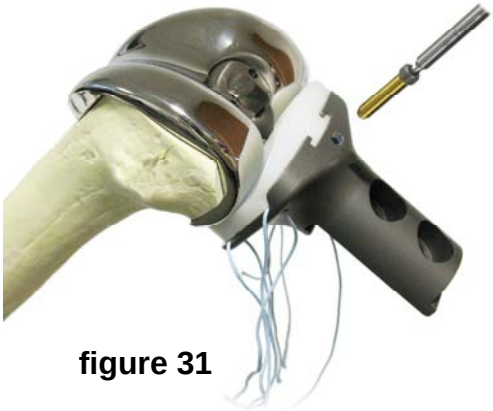
figure 28

Attach the locking mechanism to the Proximal Tibia. Therefore use the setting instrument. The screw hole should be placed forward-turned to enable locking (fig. 29).

figure 29

The positioner is inserted into the screw hole of the short stem of the coupling mechanism (fig. 30).

figure 30



Remove the positioner and insert the screw with the 3.5 mm hex screw driver. To complete the connection, please insert the Multilock security screw also with the 3.5 mm hex driver (fig. 31).

figure 31

Tibial bone preparation

Use the medullary cavity reamer to prepare the tibial bone (fig. 32a and 32b).

figure 32a and 32b

Cemented fixation

Ream the tibial medullary cavity preferably up to a depth of 130 mm with a rigid reamer that is 2 mm larger than the size of the tibial stem (fig. 33a and 33b).

Cementless fixation

Ream the tibial medullary cavity preferably up to a depth of 130 mm with a rigid reamer that is 1,5 mm smaller than the size of the tibial stem (fig. 33a and 33b).

Make sure that at least a 9cm contact between reamer and cortical bone is achieved.

Remark
The use of a tibial rasp for a **cemented stem** is optional. Generally you can proceed with the trial reduction (see page 16).

figure 33a and 33b

figure 34a

Cementless preparation

Choose the tibial rasp (fig. 34a and 34b) of the preoperatively planned size.

Assemble the tibial rasp of the appropriated size (see table 3 below), the sleeve and the slide hammer. Lock the rasp on the slide hammer by using the engineers' wrench (fig. 34).

Stem size	Rasp Size
12mm	12mm
13mm	13mm
14mm	14mm
15mm	15mm
16mm	16mm

table 3

figure 34b

Optional technique for the use of cemented stems

If you want to prepare for a cemented stem with the tibial rasp, please use the rasp which is 2 mm larger than the preoperatively chosen cemented tibial stem.

That will provide a cement mantle of 1 mm thickness (table 4). Use the 16mm rasp to prepare for the 15 mm stem.

Stem size	Rasp size
11mm	13mm
13mm	15mm
15mm	16mm

table 4

Although the tibial stem is not curved it is recommended to mark the anterior aspect of the tibial bone to assure that the rotation of the final stem corresponds to the rotation of the rasp (fig. 35a).

Rasp the medullary cavity with the chosen tibial rasp (fig. 35b). Careful use of the slide hammer is recommended.

To prevent fractures of the cortical bone it is helpful to fix a bone forceps around the tibial bone while rasping.

Remark
It is recommended to clean the rasp of bone chips during the rasping.

Leave the tibial rasp in the bone for the trialing.

figure 35a and 35b

figure 36

figure 37

Trial reduction

Attach the MUTARS® connecting part for the Proximal Tibia (length: 105 mm or 125 mm) to the tibial rasp (fig. 36). Mark the rotation of both components with methylene blue.

Remark
For the **cemented procedure** bone rasps are usually not available. Please insert the cemented stem (without cement) for trialling purposes.

Connect the MUTARS® Proximal Tibia and the connecting part. Perform a trial reduction and check the joint stability and the rotational alignment (fig. 37).

Adjust the rotation if necessary. If the joint line could not be restored correctly, it might be necessary to change the length of the tibial reconstruction by a change of the connecting part, or adding of an extension piece in conjunction with an enlarged tibial bone resection.

Implantation of the tibial stem

Impact the MUTARS® tibial stem (fig. 38).

Insert the stem of the same size as the rasp if a **cementless stem** is used.
To prevent fractures of the cortical bone it is helpful to fix a bone forceps around the femoral bone during impaction.

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

Remove all instruments, especially during the cement hardening to prevent bending moments (fig. 39).

figure 38

figure 39

figure 40a and 40b

Final joint locking

Please attach the connecting part (and the possibly used extension pieces) to the tibial stem. Use the bar screw of the correct length (see table on page 2) to lock the component to the tibial stem (fig. 40a). Lock the screw by using the swing wrench and counter the assembly with the engineers' wrench SW 24 (fig. 40b).

figure 41

Slide over the attachment tube. The trevira tube should be turned up inward on the end. If necessary cut the tube to the correct length (fig. 41.)

Combine the Proximal Tibia to the connecting part and insert the two locking screws into the anterior holes and lock them with the swing wrench (fig. 42).

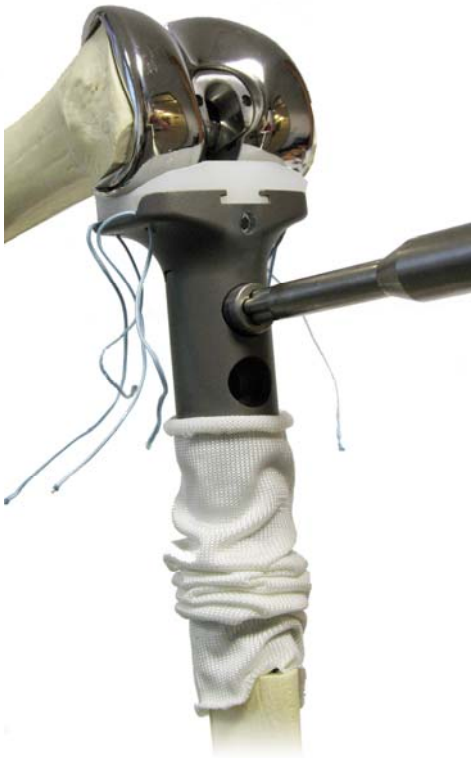


figure 42

Fixation on the attachment tube

Please fix the tube to the upper part of the Proximal Tibia by using the previously inserted 4 sutures.

Fold the tube to achieve a very close covering of the components (fig. 43a and 43b). Insert additional sutures around the attachment pads of the implant components.

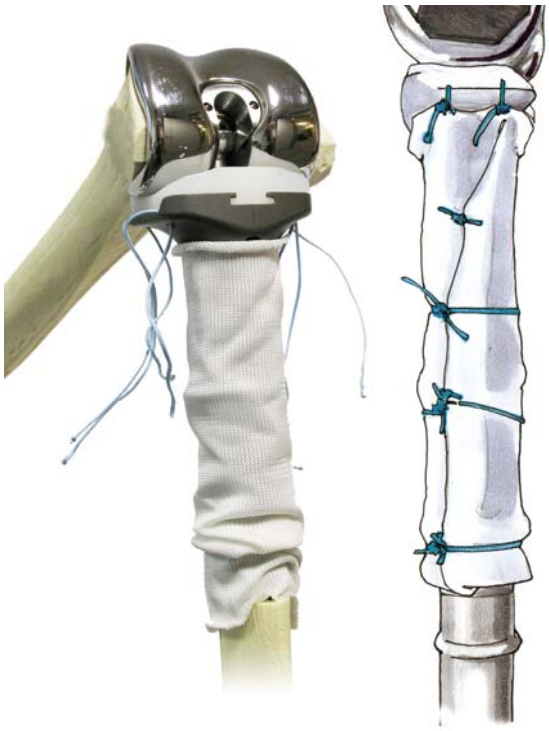


figure 43a and 43b

To reconstruct the extensor mechanism it is mandatory to perform a gastrocnemius muscle transfer. Release the muscle at its distal insertion (fig. 44a). Suture the muscle to the anterior portion of the attachment tube (fig. 44b).

Reinsert the extensor structures to the gastrocnemius muscle and the tube to restore a reasonable function of the joint.

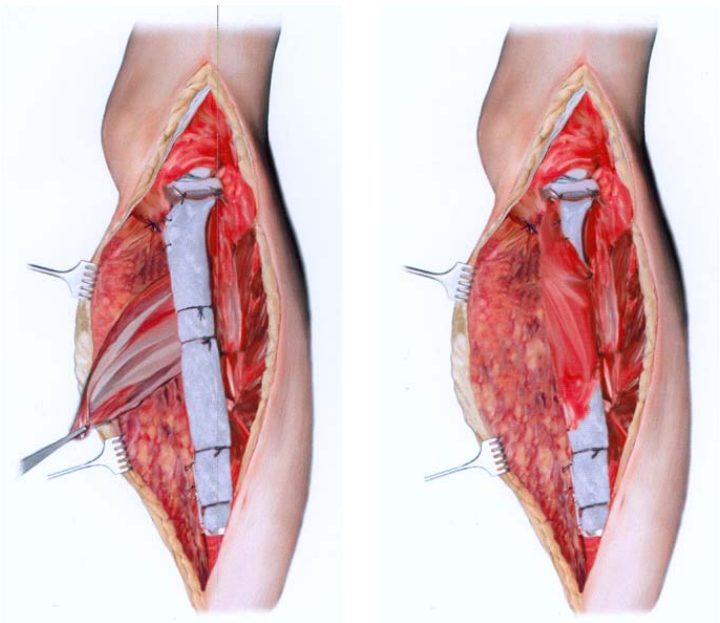


figure 44a and 44b

IMPLANTS

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

MUTARS® revision stem for femoral cementless 160 mm

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

5761-1612	12/160 mm
5761-1614	14/160 mm
5761-1616	16/160 mm
5761-1618	18/160 mm

MUTARS® revision stem for femoral cemented 160 mm *N

Mat.: implavit®; CoCrMo-casting alloy
according to DIN ISO 5832/4

5762-1611	11/160 mm
5762-1613	13/160 mm
5762-1615	15/160 mm
5762-1617	17/160 mm

MUTARS® femoral component cemented *N

Mat.: implavit®; CoCrMo-casting alloy
according to DIN ISO 5832/4

5720-0310	right	Size 3
5720-0315	left	Size 3
5720-0320	right	Size 4
5720-0325	left	Size 4
5720-0330	right	Size 5
5720-0335	left	Size 5

MUTARS® femoral component cementless *N

Mat.: implavit®; CoCrMo-casting alloy
according to DIN ISO 5832/4

5720-0210	right	Size 3
5720-0215	left	Size 3
5720-0220	right	Size 4
5720-0225	left	Size 4
5720-0230	right	Size 5
5720-0235	left	Size 5

IMPLANTS

MUTARS® patellar component cemented
UHMW-PE *according to* DIN ISO 5834/2
5720-1000

MUTARS® PE- inlay x-small
Mat.: UHMWPE according to DIN ISO 5834/2
5721-0000

MUTARS® modular proximal Tibia x-small, incl. locking mechanism and locking screws (2pcs) *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5750-0003

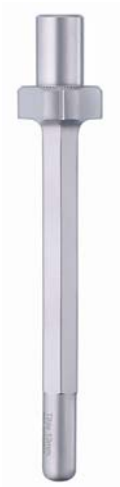
MUTARS® connecting part for modular proximal Tibia *S
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5750-0105 105 mm
5750-0125 125 mm

MUTARS® extension piece *S
mat.: implatan®;$TiAl_6V_4$ according to DIN ISO 5832/3
5772-2504 40 mm
5772-2506 60 mm
5772-2508 80 mm

intramedullary plug
UHMW-PE according to DIN ISO 5834/2
0299-4000 small
0299-4010 large

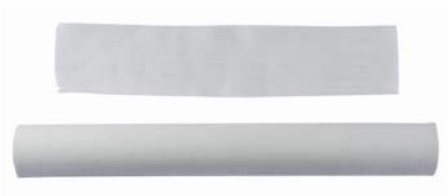
IMPLANTS

MUTARS® bar screw
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3
5792-1002 M10x 25 mm
5792-1004 M10x 45 mm
5792-1006 M10x 65 mm
5792-1008 M10x 85 mm
5792-1010 M10x105 mm
5792-1012 M10x125 mm
5792-1014 M10x145 mm
5792-1016 M10x165 mm
5792-1018 M10x185 mm
5792-1020 M10x205 mm
5792-1022 M10x225 mm



MUTARS® tibial stem cemented *N
mat.: implavit®; CoCrMo-casting alloy according to DIN ISO 5832/4
5750-0511 11 mm
5750-0513 13 mm
5750-0515 15 mm

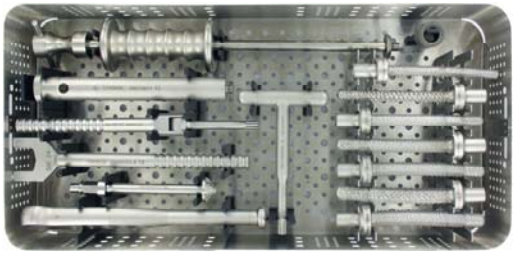
MUTARS® tibial stem cementless
mat.: implatan®; $TiAl_6V_4$ according to DIN ISO 5832/3 with HA-coating
5750-1512 12 mm
5750-1513 13 mm
5750-1514 14 mm
5750-1515 15 mm
5750-1516 16 mm



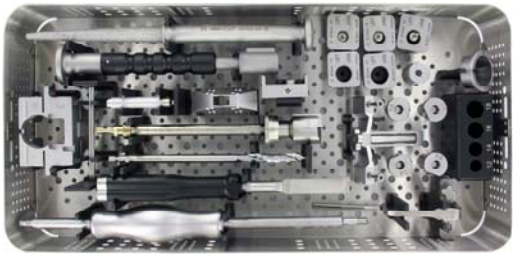
MUTARS® attachment tube
mat.: polyethylenterephtalat
5900-0300 35 mm
5900-0310 55 mm

INSTRUMENTS

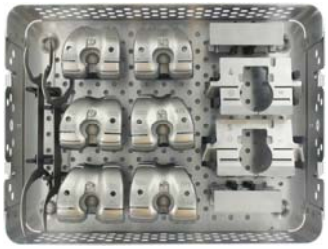
MUTARS® basic instrument tray cementless
7999-5710



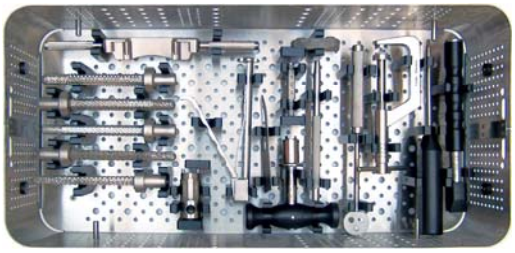
MUTARS® femoral joint instrument tray
7999-5723



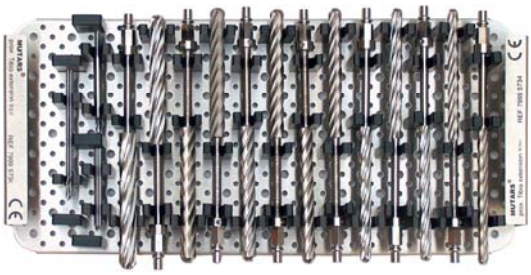
MUTARS® femoral instrument tray II
7999-5722



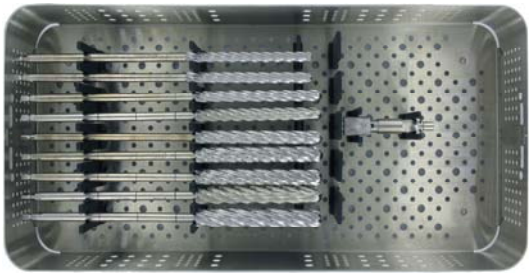
MUTARS® prox.Tibia extension tray lower tray
7999-5734



MUTARS® prox.Tibia extension tray top tray
7999-5734



MUTARS® rigid drills
7999-5735



INSTRUMENTS

MUTARS® extractor device
7220-0000

MUTARS® socket wrench
7420-0000

MUTARS® medullary cavity reamer
7760-0501

MUTARS® engineers‘wrench SW 24
7490-0000

MUTARS® universal impactor
7210-0000

MUTARS® impact and extract sleeve
7230-0000

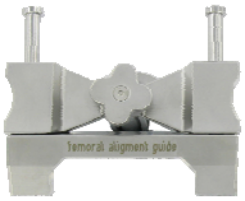
MUTARS® swing wrench
7411-0000

MUTARS® slide hammer
7220-0001

MUTARS® rasp for tibial stem
7750-0512 12 mm
7750-0513 13 mm
7750-0514 14 mm
7750-0515 15 mm
7750-0516 16 mm

INSTRUMENTS

femoral alignment guide
4220-0028



femoral reamer sleeve
4220-5112 12 mm
4220-5114 14 mm
4220-5116 16 mm
4220-5118 18 mm

reamer guide for long stem
4220-4110 10 mm
4220-4112 12 mm
4220-4114 14 mm
4220-4116 16 mm
4220-4118 18 mm

MUTARS® femoral extractor
7610-0002

MUTARS® femoral impactor
7610-0000

initiator drill 9mm
4220-0014

osteotom for patellar groove size 2-6
4223-0060

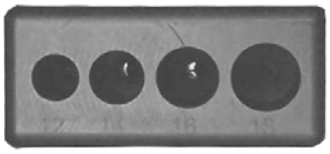
MUTARS® rasp universal
7512-1000

MUTARS® femoral reamer guide
7630-1028

INSTRUMENTS

distal femoral cutting block 6°
4220-0018

femoral resection block
4220-0003 Size 3
7320-0004 Size 4
7320-0005 Size 5



assembling block for stem
4223-4001

finishing guide
7630-1000 Size 3
7630-1002 Size 4
7630-1001 Size 5

femoral alignment stylus
4220-0012

MUTARS® fixation pin 3,2 mm x 97 mm (2 pieces)
4223-0008

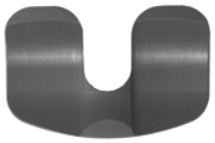
modular handle (6 pieces)
4223-0015

MUTARS® femoral box reamer
7630-1035

slap hammer
4223-0005

INSTRUMENTS

MUTARS® trial insert
7721-0003 extra small



fixation pin 3,2 mm x 77 mm
4223-0029 (4 pieces)

drill 126 x 3,2 mm
4221-0019 (2 pieces)

MUTARS® patella drill
7351-0000

MUTARS® reamer

7700-2110	10 mm
7700-2210	10,5 mm
7700-2111	11 mm
7700-2211	11,5 mm
7700-2112	12 mm
7700-2212	12,5 mm
7700-2113	13 mm
7700-2213	13,5 mm
7700-2114	14 mm
7700-2214	14,5 mm
7700-2115	15 mm
7700-2116	16 mm
7700-2117	17 mm

long stem reamer

4220-4010.1	10 mm
4220-4011.1	11 mm
4220-4012.1	12 mm
4220-4013.1	13 mm
4220-4014.1	14 mm
4220-4015.1	15 mm
4220-4016.1	16 mm
4220-4017.1	17 mm
4220-4018.1	18 mm

ic adapter out A/O in ic
7512-3602

INSTRUMENTS

MUTARS® locking instrument for femoral component
7608-0000

MUTARS® patella clamp
7352-0000

MUTARS® patella drill guide
7350-0000

hexagon screw driver short 3,5mm
0280-1007

pin extractor
4223-0007

ic T-handle
4223-0023

resection check
4223-0009

extractor universal
7512-2026

saw capture 1,5 mm
4223-0001
incl. modular handle
4223-0015

MUTARS® impactor for tibial insert
7210-0001

pin inserter 3,2 mm
4223-0006

INSTRUMENTS

Setting instrument for locking mechanism
7751-1200

MUTARS® positioner for locking mechanism
7610-0003

Femoral trial

7720-0210	Size 3 right
7720-0215	Size 4 right
7720-0220	Size 5 right
7720-0225	Size 3 left
7720-0230	Size 4 left
7720-0235	Size 5 left

Femoral sizing guide

4220-0010	Size 3/4
4220-0011	Size 5/6

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