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Revision Modular Stem – type RMD



Preface

Revision modular stem (RMD) is a solution for severe problems with the aid of high-precision and fast technology when it is necessary to perform a revision surgery of femoral cemented and/or cementless implants.

The design concept of the RMD system ensures an attainment of the most important targets of revision arthroplasty:

- **implant stability**
- **optimal modularity for most revision cases**
- **custom-made implant assembly**
- **accurate positioning of femoral neck**
- **optimal position setting**
- **reconstruction and preservation of the extremity length**
- **optimal filling of the bone marrow canal**
- **facilitation of quality osteointegration**
- **up to 216 combination options**

Revision modular stem is designated primarily for revision surgeries on patients with various degrees of bone loss in the area of proximal femur or having anatomical anomalies. It is designed for implantation without bone cement. The primary fixation of the implant is ensured through insertion of the grooved stem into the medullary canal.

For long stem, it is necessary to reckon with an anatomic femur curving. For this reason, the stem tip is scarfed on one side. For cases with a minor defect in the proximal femur, the proximal segment is coated with plasma porous titanium in the taper section to facilitate good secondary fixation. All sizes of the stem and proximal segment can be interchangeably combined. A connecting screw with a plastic safety pin (UHMWPE) is used for joining the proximal segment and stem. The screw must always be properly tightened with a moment key!

This text is to be used as an orientation guide for the implant and instrumentation set. It focuses merely on the very procedure of implant insertion – thorough acquaintance with general rules of hip joint replacement surgical technique on the part of the surgeon and other staff is presumed. The goal of this publication is to enable physicians and suture nurses to get a quick overview of the range and correct use of the individual tools in the instrumentation set, so that optimal results can be achieved and unnecessary damage or depreciation of the instrumentation set or even the implant are excluded. Under no circumstances, this publication is to be viewed as teaching material of surgical technique.

Surgical approach to RMD implantation is subject to the surgeon's discretion.



CONNECTION SCREW
with security peg.

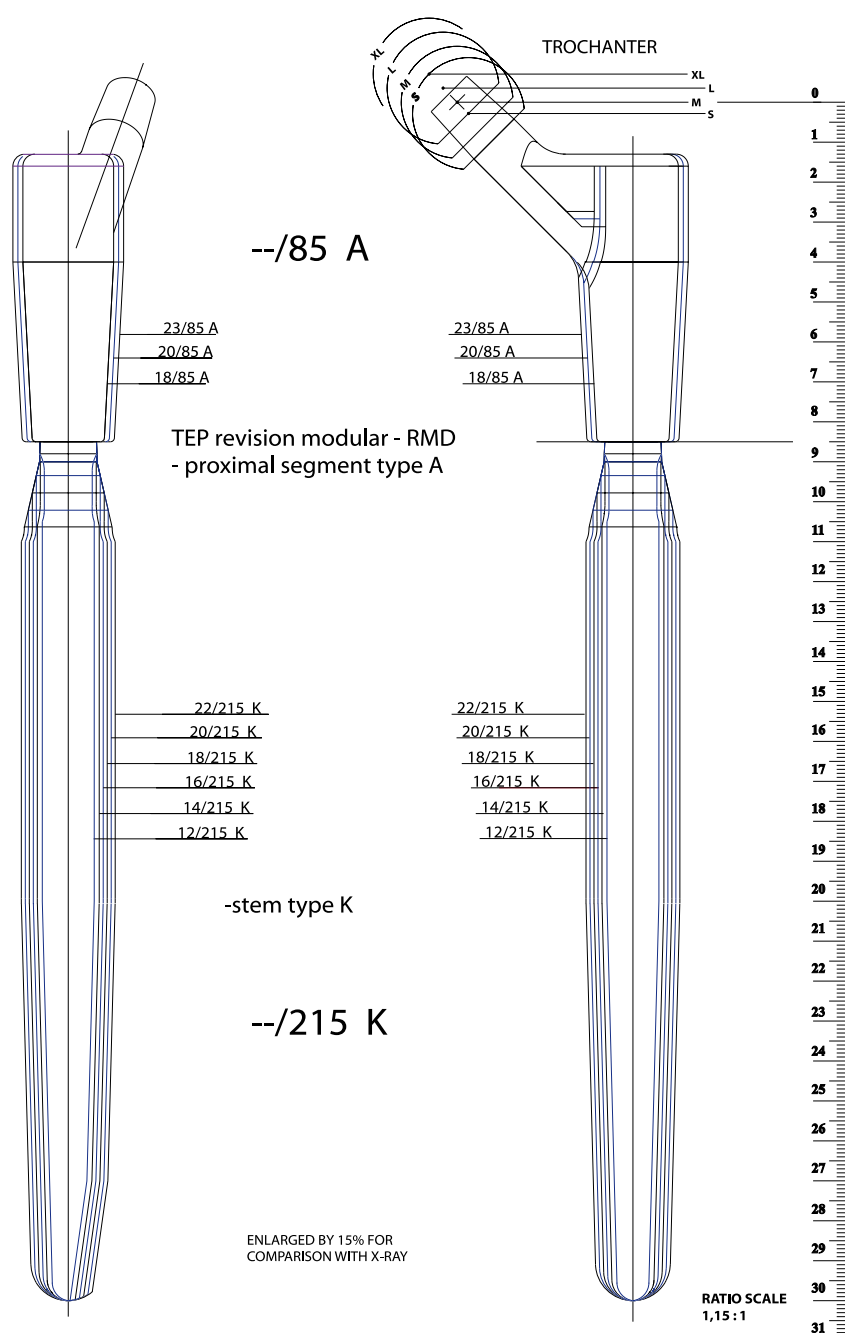
PROXIMAL SEGMENT - type A, AX
allows optimal filling of the bone marrow canal and correct positioning and lateralization of the neck.

CEMENTLESS STEM - type K
ensures a maximal rotation stability and an easy insertion according to an anatomical curving of the femur.



Introduction

Before every modular stem surgery, it is important to do pre-surgery planning to be able to determine the right size of the implant. The size planning of the implant is done with the aid of templates provided by the manufacturer. These templates are apposed to the x-ray images of the corresponding scale. We recommend making two hip joint projections with a 15% enlargement.



A. Standard Surgical Technique

1. Preparation of the bed

Using a stem cutter, cut a distal femur to shape (Fig. 1)

Marks on cutters

Cutter sizes for stems: Ø 10,12,14,16,18, 20, 22 (mm)

Stem lengths: 135,175, 215 (mm)

Cutter sizes for proximal segment: Ø18, 20, 23 (mm)

Proximal segment lengths: 85, 95 (mm)

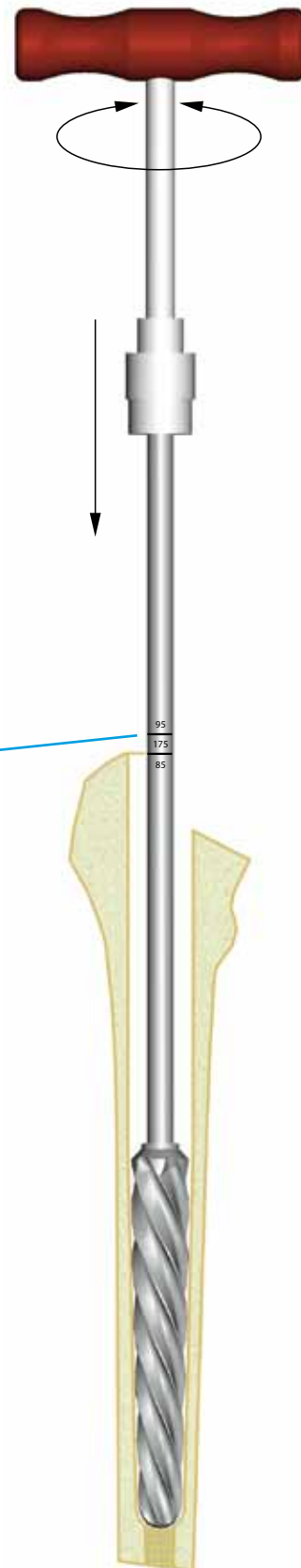
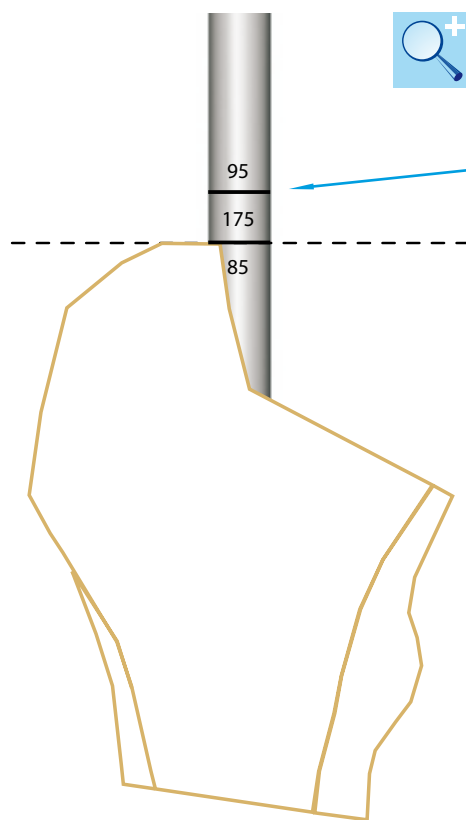


Fig. 1

2. Cutting the bed for the proximal segment

2.1. Put proximal segment cutter (Fig. 2a) or use an extender with the cutter on the stem cutter, depending on a stem drilling depth (Fig. 2b, 2c).

2.2. Cut with the proximal segment cutter upto backstop, checking the correct position on the cutter body (Fig. 2).



Fig. 2a
Extender free:
stem length 135 mm



Fig. 2b
With one extender:
stem length 175 mm



Fig. 2c
With two extenders:
stem length 215 mm

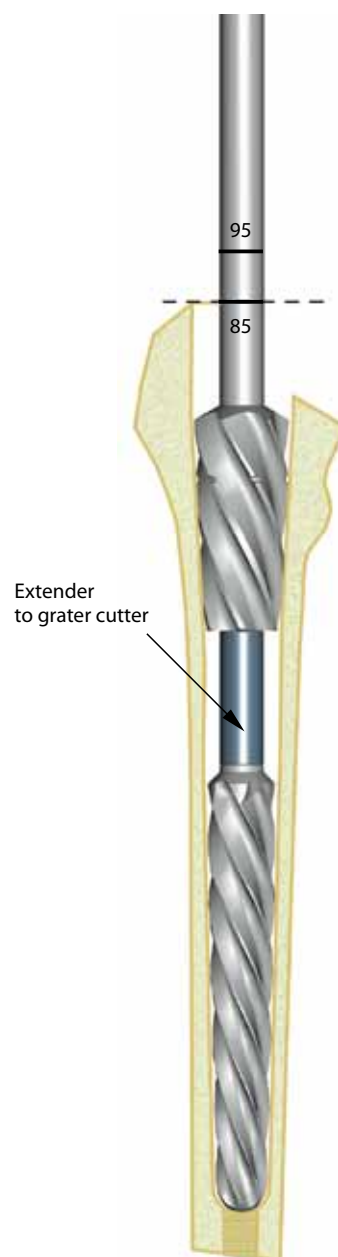


Fig. 3

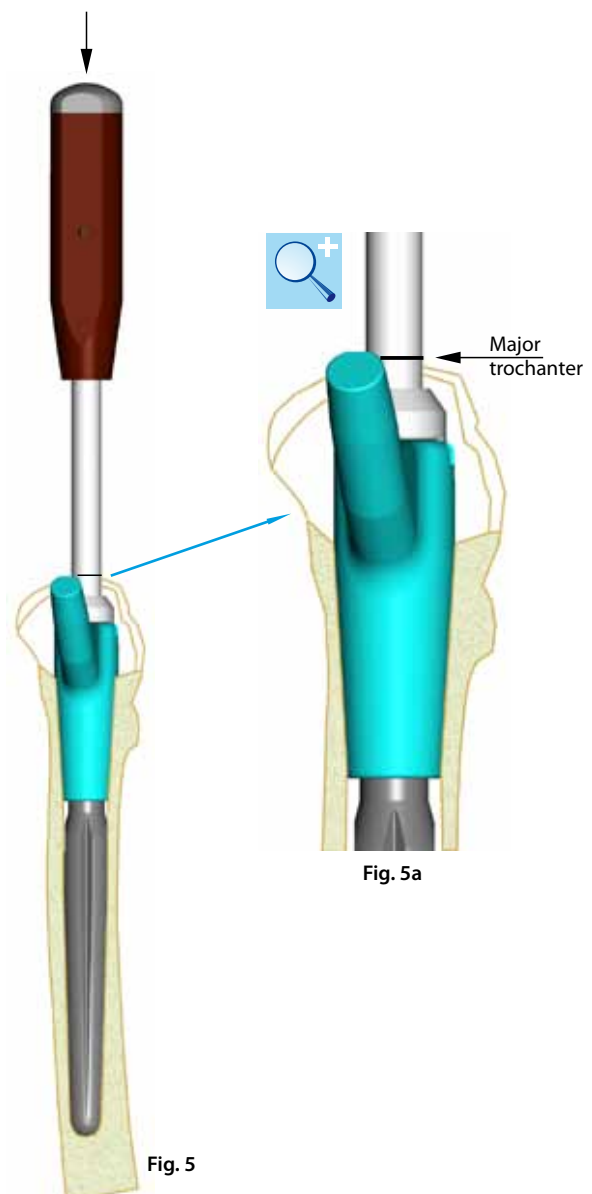
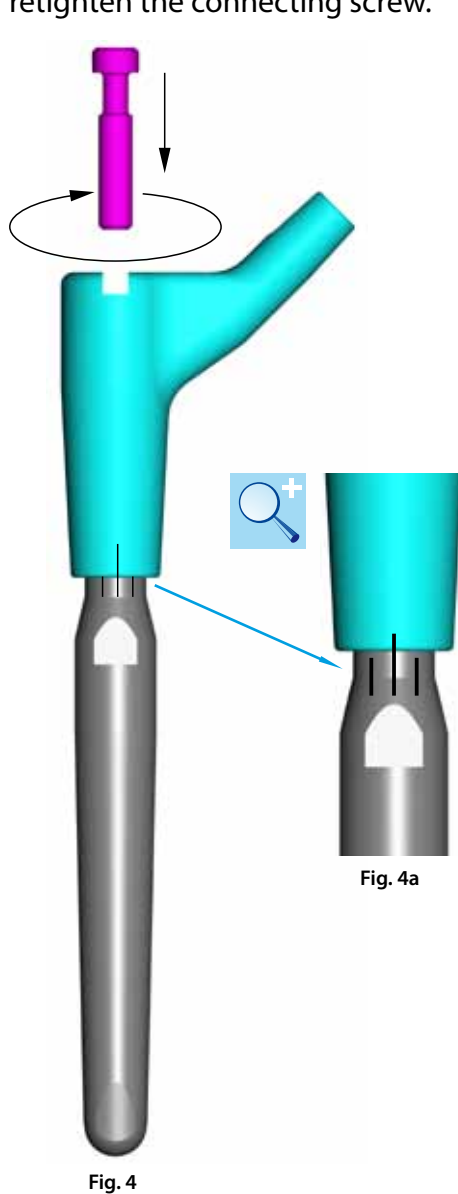


3. Insertion of a Trial Component

3.1. Put the trial proximal segment on the trial stem and lock it with the connection screw for trial components (Fig. 4). The size of trial segments corresponds to the size of the cutter last used. Use hexagonal screwdriver or hexagonal T-screwdriver for tightening the joint.

When positioning the trial proximal segment, follow marks on the trial components (Fig. 4a) for orientation.

3.2. With your hand, insert the assembled unit into the bed, juxtaposing the distal trimming of the stem against the anatomical curving of the femur (Fig. 5). Fit the guiding bar of the trial component into the grooves in the proximal trial segment and insert the assembled unit into the bed. Check the depth using the line on the guiding bar (Fig. 5a). After insertion, put the trial proximal segment in the desired position by loosening the connecting screw, hold the trial proximal segment in the desired position, and then retighten the connecting screw.



3.3. Put the plastic trial head (sizes: S, M, L, XL) on the trial proximal segment and try out the fit of the joint. If deemed necessary, change the head or replace the trial component.

3.4. Taking out the trial component can be done in several ways:

- a) Use the sliding hammer with an extender (Fig. 6) to remove the connecting screw and the whole trial component.
- b) If only intending to replace the trial proximal segment with another lateralization of the same size, it is necessary to loosen the connecting screw. If unable to take out the trial proximal segment by hand, use the sliding hammer with the extender.

The trial stem can be taken out with the sliding hammer without the extender, either with the trial proximal segment or without it (Fig. 7).

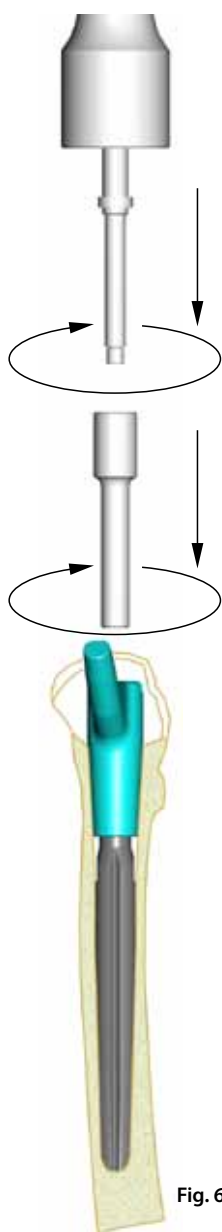


Fig. 6

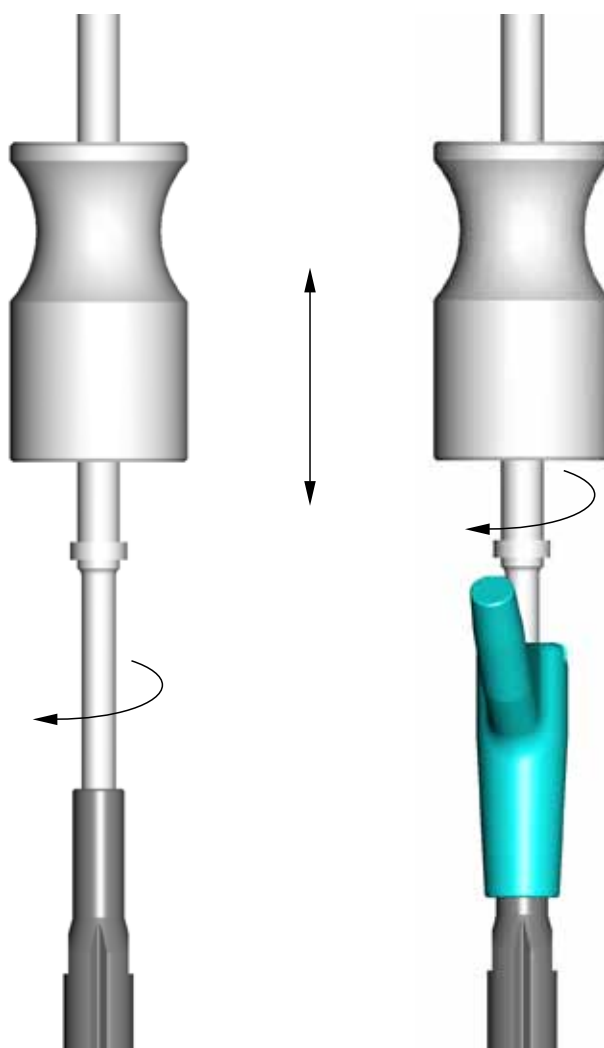


Fig. 7



4. Implant Assembly

4.1. The implant is assembled away from the operation area using a suitable trial component (Fig. 8). Follow the line on the side for orientation during the assembly procedure.

4.2. Put the implant proximal segment on the implant taper in the desired position, according to the tried-out trial component, and join both of the implant components with the connecting screw with plastic security peg, then tighten it with the hexagonal screwdriver (Fig. 9).

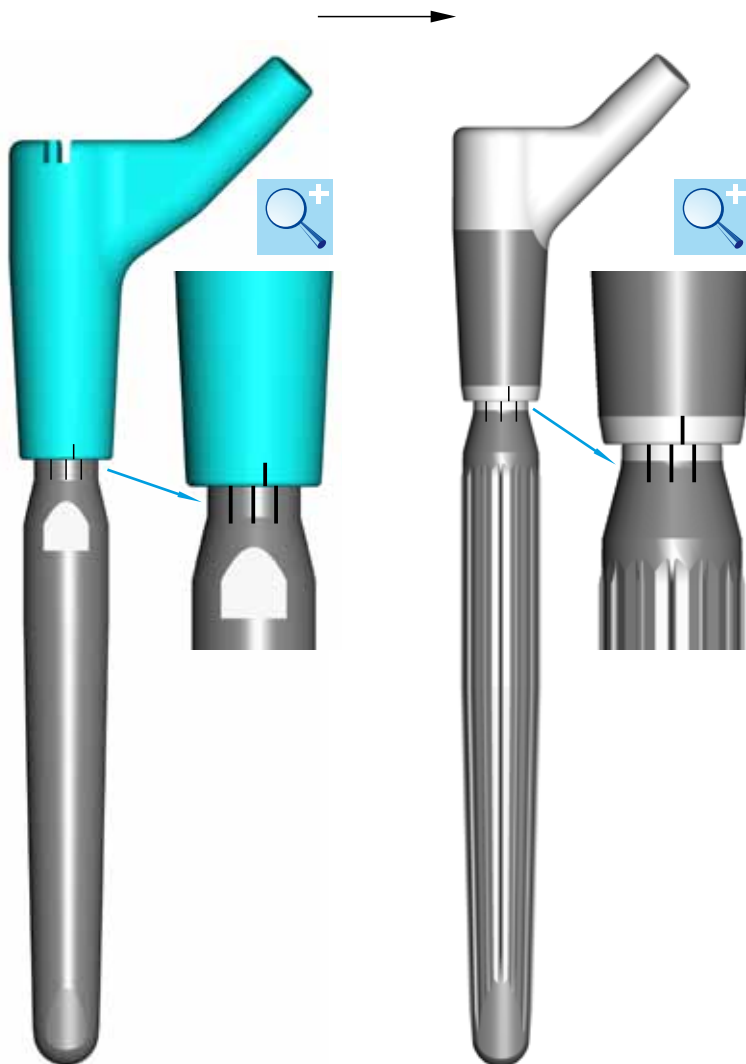


Fig. 8

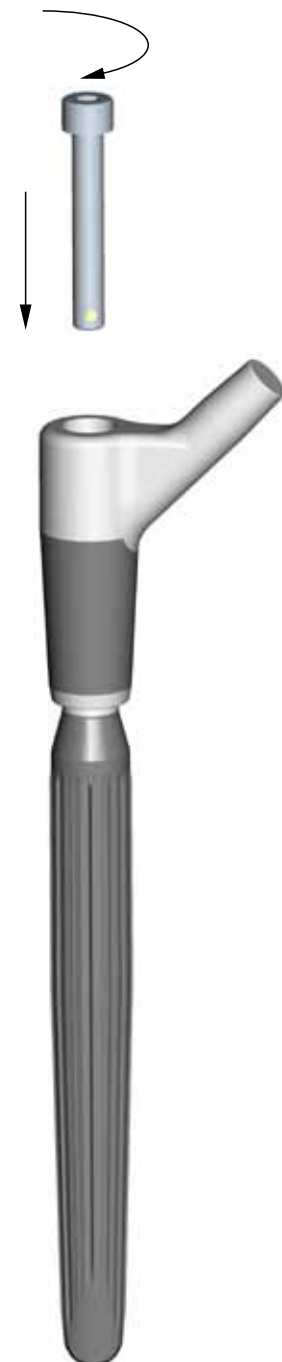


Fig. 9

5. Implant Fixation

5.1. Put the implant guiding bar on the assembled implant (Fig. 10) and tap it on with the sliding hammer.

5.2. Insert the long hexagonal screwdriver into the guiding bar, with the end for the moment key, and tighten the connecting screw (Fig. 11).

5.3. Put the moment key on the screwdriver and, checking the mark, tighten the screw to the desired gauge line (18 Nm). This step is to be done even after insertion of implant (point 6).

5.4. As considerable strength is needed to reach the torque moment while tightening, we recommend using an auxiliary handle for facilitation (Fig. 12).

Also, we recommend holding the implant in a vertical position on a support table.



Fig. 10



Fig. 11



Fig. 12



6. Implant Insertion

Place the implant into the prepared bed, checking carefully the anteversion selected, and using the guiding bar insert the implant in the desired position. Check whether the implant position corresponds to the gauge line on the guiding bar (Fig. 13).

7. Implant change options

Already embedded proximal segment can be pulled off (extracted) from the stem with the aid of a clamp. To do this, loosen the connecting screw and take it out of the implant (use a guiding bar with a screwdriver), then screw the clamp into the proximal segment (Fig. 14 a 15). Tighten the end of the clamp with a T-screwdriver turning clockwise (Fig. 16) until the proximal segment comes loose (Fig. 17). If necessary, hold the clamp in its place with a flat key 13-17.

8. Head fitting

After RMD implantation, put the definitive head on the implant and fit the component into position.

9. Implant extraction

For extracting the implant from the bed, it is necessary to take out the connecting screw first. Using the slide hammer, take the implant out the same way as the trial component.



Fig. 13



Fig. 14



Fig. 15



Fig. 16



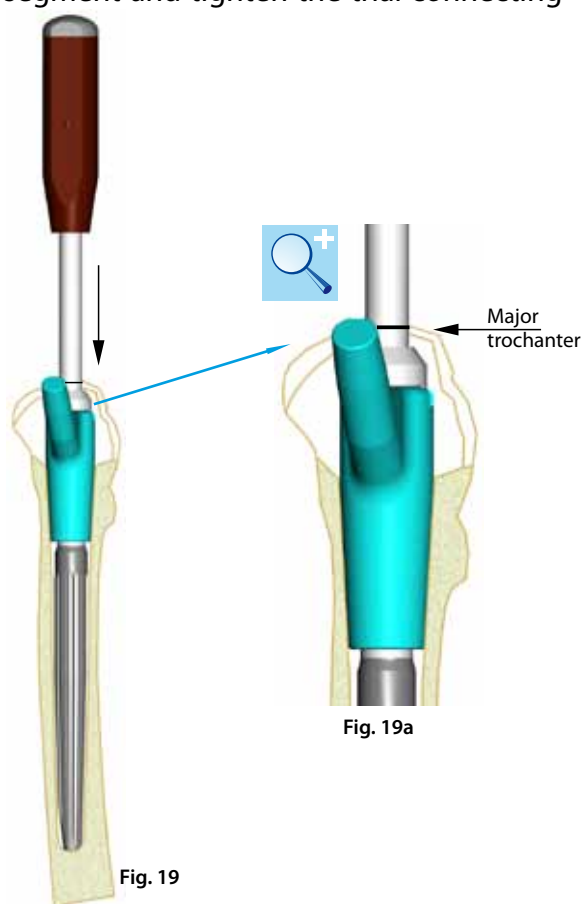
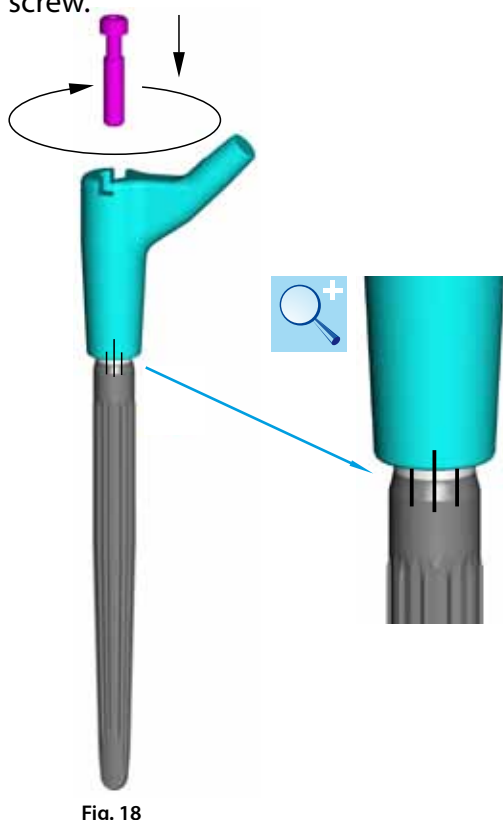
Fig. 17

B. Non-standard Surgical Technique - Direct Insertion of Complete Implant

Revision modular stem surgery can also be done using the method of so-called „direct implantation“, where the final implant is inserted into a pre-prepared bed as a whole. For this type of implantation, the final stem is inserted directly into the bone marrow canal, i.e. the trial procedure is skipped. This approach cannot be recommended as a standard one. It greatly depends on the quality of the bone, because if the stem is twisted in the bed, the femur might crack. One must realize that if a different size of the trial proximal segment is to be used, it is necessary to use the sliding hammer for taking out the proximal segment already inserted.

Surgical technique

1. Prepare the bed as described under (1) and (2) of the standard surgical technique.
2. Place the selected stem (implant) on the trial proximal segment of the desired size and secure it with the connecting screw for trial component (Fig. 18). For initial positioning, follow the marks on the components for orientation. The components are assembled before insertion into the bone marrow canal.
3. The assembled unit is then inserted into the bed so that the stem distal scarfing is juxtaposed to the anatomical curving of the femur (Fig.19). Fit the guiding bar for trial component into the grooves of the trial proximal segment and insert the whole unit all the way. Check whether the depth corresponds to the mark on the guiding bar (Fig. 19a), then check the position of the trial proximal segment and tighten the trial connecting screw.



6. Put the guiding bar on the assembled implant (Fig. 24) and tap on the proximal segment with the sliding hammer. Insert the screwdriver into the guiding bar with the end of the moment key, and tighten the connecting screw (Fig. 25).

7. If everything is all right, put the moment key on the screwdriver and, checking the mark, tighten the screw to the desired gauge line (18 Nm). As considerable strength is needed to reach the torque moment while tightening, we recommend using an auxiliary handle to overcome resistance (Fig. 26).

8. After RMD implantation, put the final head on the implant and fit the component into position.

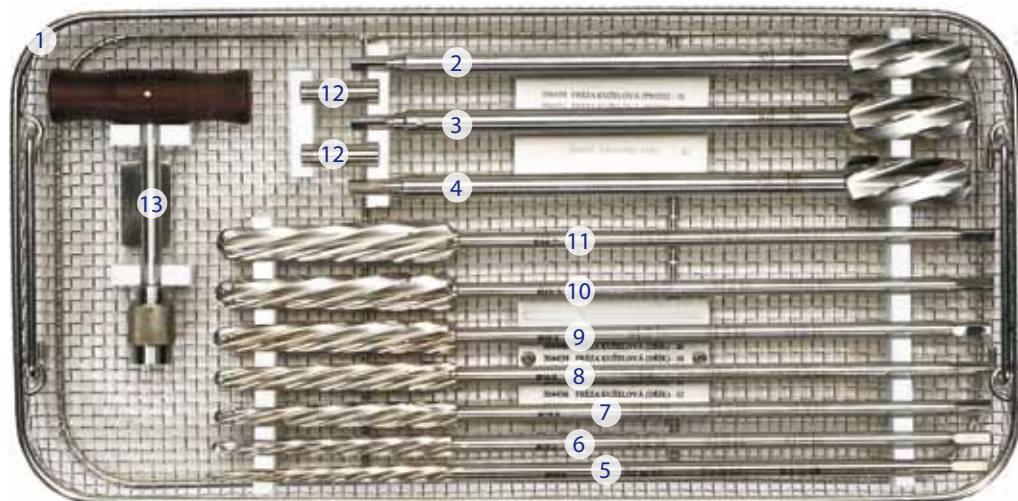




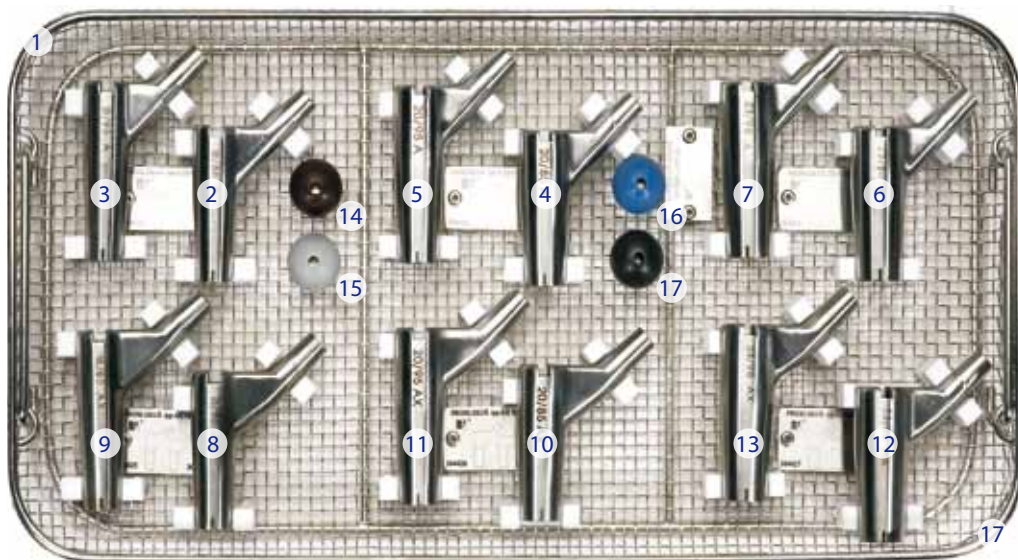
X-ray Examples of Using Revision Modular Stem - Type RMD



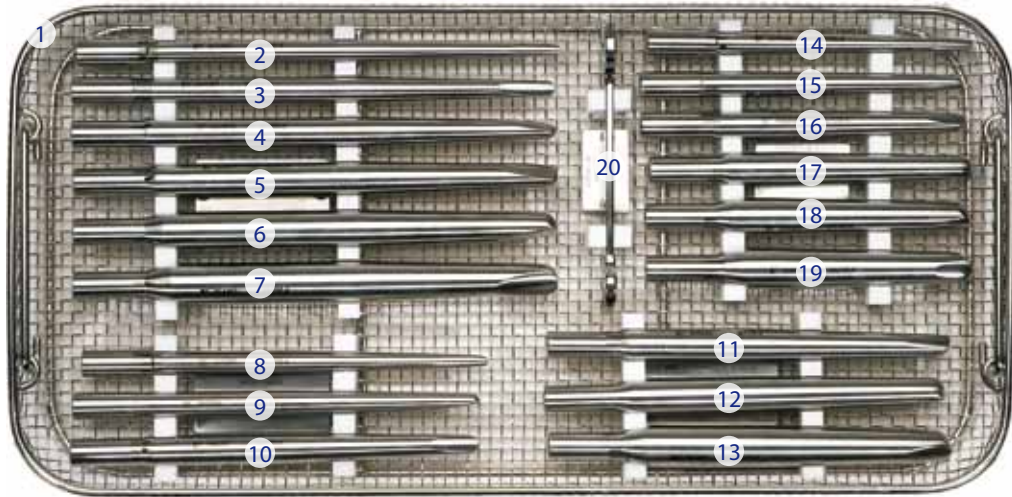
Instrumentation Set for Application of RMD Stem (Order No. 301070)



	Denomination	Ord.No.			
1	Tray I – Cutters: Cutter cylin. (PROXI)	301071	7	Cutter cylin.(stem) 14 (RMD) 3-sided	304437
2	18 (RMD) 3-sided Cutter cylin. (PROXI)	304430	8	Cutter cylin.(stem) 16 (RMD) 3-sided	304438
3	20 (RMD) 3-sided Cutter cylin. (PROXI)	304431	9	Cutter cylin.(stem) 18 (RMD) 3-sided	304439
4	23 (RMD) 3-sided Cutter cylin. (STEM)	304432	10	Cutter cylin.(stem) 20 (RMD) 3-sided	304440
5	10 (RMD) 3-sided Cutter cylin. (STEM)	304435	11	Cutter cylin.(stem) 22 (RMD) 3-sided	304441
6	12 (RMD) 3-sided	304436	12	Cutter Extender (RMD)	304455
			13	Head T-3-sided	304002



	Denomination	Ord.No.			
1	Tray II-proximal trial segments	301072	9	Proxi segment trial type AX 18/95	304425
2	Proxi segment trial type A 18/85	304410	10	Proxi segment trial type AX 20/85	304421
3	Proxi segment trial type A 18/95	304415	11	Proxi segment trial type AX 20/95	304426
4	Proxi segment trial type A 20/85	304411	12	Proxi segment trial type AX 23/85	304422
5	Proxi segment trial type A 20/95	304416	13	Proxi segment trial type AX 23/95	304427
6	Proxi segment trial type A 23/85	304412	14	Head trial 28-12/14 (S)	307205
7	Proxi segment trial type A 23/95	304417	15	Head trial 28 - 12/14 (M)	307204
8	Proxi segment trial type AX 18/85	304420	16	Head trial 28 - 12/14 (L)	307203
			17	Head trial 28 - 12/14 (XL)	307202



	Denomination	Ord.No.			
1	Tray III - Trial Stems	301073	11	Stem trial type K-18/175	304396
2	Stem trial type K-12/215	304382	12	Stem trial type K-20/175	304401
3	Stem trial type K-14/215	304387	13	Stem trial type K-22/175	304406
4	Stem trial type K-16/215	304392	14	Stem trial type K-12/135	304380
5	Stem trial type K-18/215	304397	15	Stem trial type K-14/135	304385
6	Stem trial type K-20/215	304402	16	Stem trial type K-16/135	304390
7	Stem trial type K-22/215	304407	17	Stem trial type K-18/135	304395
8	Stem trial type K-12/175	304381	18	Stem trial type K-20/135	304400
9	Stem trial type K-14/175	304386	19	Stem trial type K-22/135	304405
10	Stem trial type K-16/175	304391	20	Key 13-17	308422



	Denomination	Ord.No.			
1	Tray IV - common tools	301074	6	Modular stem extractor	304452
2	Hexagonal screwdriver - long	304450	7	Guiding bar for trial component	304462
3	Moment key	304456	8	T-screwdriver	304457
4	Guiding bar handle	304454	9	Slide hammer extender	304464
5	Guiding bar modular stem	304453	10	Trial component screw	304460
			11	Clamp	304458

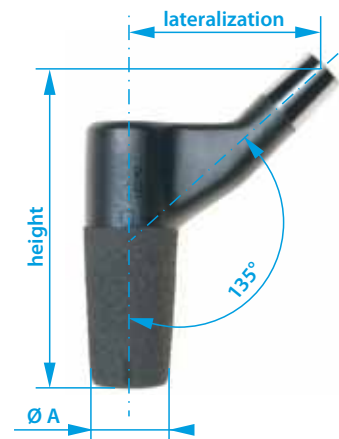
Note: The layout of trays is indicative only.

Implants

PROXIMAL SEGMENTS Types A & AX

Type	Ø A	Height	Lateralization	Marks	Order No.
A	18	85	44	18-85 A	324301
A	18	95	44	18-95 A	324302
A	20	85	44	20-85 A	324306
A	20	95	44	20-95 A	324307
A	23	85	44	23-85 A	324311
A	23	95	44	23-95 A	324312
AX	18	85	50	18-85 AX	324321
AX	18	95	50	18-95 AX	324322
AX	20	85	50	20-85 AX	324326
AX	20	95	50	20-95 AX	324327
AX	23	85	50	23-85 AX	324331
AX	23	95	50	23-95 AX	324332

Connecting screw w/safety peg is delivered as part of proximal segment.



STEM CEMENTLESS Type K

Type	Ø B	Length	Marks	Order No.
K	12	135	12/135 K	324346
K	12	175	12/175 K	324347
K	12	215	12/215 K	324348
K	14	135	14/135 K	324351
K	14	175	14/175 K	324352
K	14	215	14/215 K	324353
K	16	135	16/135 K	324356
K	16	175	16/175 K	324357
K	16	215	16/215 K	324358
K	18	135	18/135 K	324361
K	18	175	18/175 K	324362
K	18	215	18/215 K	324363
K	20	135	20/135 K	324366
K	20	175	20/175 K	324367
K	20	215	20/215 K	324368
K	22	135	22/135 K	324371
K	22	175	22/175 K	324372
K	22	215	22/215 K	324373



Note: All dimensions to be read in mm.

Combining RMD Stem with Other BEZNOSKA Implants

RMD stem



Metal head



Cobalt head



Ceramic head

Cementless
acetabular cup
type SF



Cemented
acetabular cup
type 02



Cemented
acetabular cup
type Poldi



Acetabular cage
typeBS



Oval revision
acetabular cup
typeTC



Revision
acetabular
reinforcement
ring & cage RSC





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