Surgical Technique

smith&nephew

SLR-PLUS◇

Cementless Revision Stem



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Nota Bene

The technique description herein is made available to the healthcare professional to illustrate the authors' suggested treatment for the uncomplicated procedure. In the final analysis, the preferred treatment is that which addresses the needs of the patient.

Comments from the Author's Clinic

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Cementless systems have been successfully used for many decades for primary hip replacement. This preference is also evident in the use of cementless implants in revision surgery to replace loosened implants, although in the past negative trade-offs often had to be accepted. The cementless revision devices previously available were suitable only for very straightforward or for very complex cases. Now, however, there is a system to suit the middle range of hip revision arthroplasty, and thus for the vast majority of cases: the SLR-PLUS◇ Revision Stem can be used to manage up to 80% of all revision cases according our experience.

The geometry of the SLR-PLUS stem makes use, above all, of integrating the load-bearing bone substance in the diaphyseal region for anchoring the implant. The different stem lengths, available in a modular set, can ensure immediate stable anchoring at the femoral cortex. The long-established titanium-aluminum-niobium alloy with the tried and tested surface roughness provides the ideal conditions for secondary stability through osteointegration, thus ensuring long-term clinical success.

To ensure an even faster onset of osteointegration and greater capacity for bridging defects, for many years now, here at the Orthopaedic Hospital Gersthof, Vienna we have only been using the hydroxylapatite-coated stem for revision surgery with an SLR-PLUS stem. The SLR-PLUS lateral stem is available coated and uncoated.

Prof. Dr. med. K. Zweymüller
Orthopaedic Hospital of the City of Vienna-Gersthof

Indications for the SLR-PLUS◇ standard stem

The SLR-PLUS◇ revision stem is designed for prosthetic arthroplasty in revision surgery.

The main indication for this stem is revision of a loose cemented implant. In this condition, the femur will frequently be found to be damaged all along the cement mantle, and the remaining cortex will be very thin. In such cases, the aim should be to obtain distal implant fixation, and to preserve the thinned proximal bone stock.

In the past decade, experience with non-cemented revision arthroplasty suggests that, wherever possible, a non-cemented device should be used: non-cemented replacement obviates the problems of methyl methacrylate toxicity and of foreign body granuloma formation. The implant will be firmly seated, allowing the host bone to recover and regenerate rapidly, to augment the periprosthetic bone stock.

A second indication for this stem is revision of loose cementless implants of whatever pattern and conditions following infections where a temporary girdlestone situation has arisen. Posttraumatic conditions with or without bone defects can also be treated with the SLR-PLUS stem.

Thus, the following main indications are:

- loosened cemented hip endoprostheses
- loosened cementless hip endoprostheses
- re-implantation following infection
- posttraumatic conditions

Indications for the SLR-PLUS lateral stem

The SLR-PLUS lateral stem has been designed to optimise the lateralisation of the femur (offset) in revision surgery. Lateralisation also increases soft tissue tension, which has the advantage of preventing luxation of the head out of the cup. Sometimes the use of a SLR-PLUS lateral stem may require the use of a shorter neck than would be used with the standard stem. This helps to avoid an undesirable lengthening of the leg.

The use of the SLR-PLUS lateral stem is thus indicated in the following situations:

- to prevent an undesirable medialisation of the femoral stem
- in the case of insufficient soft tissue tension
- to reduce the risk of postoperative luxation
- to compensate for differences in leg length

Contraindications for the SLR-PLUS◇ standard and SLR-PLUS lateral stem

The main indication for the SLR-PLUS revision stem only excludes severe revision cases, where the implant cannot be stabilized as a result of extensive bone rarefaction far into the diaphyseal region. These cases can be treated with the MODULAR-PLUS◇ revision stem system, which is also anchored in the distal half of the femur.

The use of the SLR-PLUS stem is contraindicated in the following situations:

- extensive bone defects extending far distal to the lesser trochanter and thereby reducing the stable anchoring of the SLR-PLUS revision stem to less than half
- bone defects following tumour resections

Preoperative Planning

The planning of the correct prosthesis size and of the appropriate offset, as well as the neck length are preoperatively established using ap and axial x-ray templates. Preoperative planning should always be carried out for orientation. X-ray templates for the SLR-PLUS standard and the SLR-PLUS lateral revision stem are available with a 15% magnification.

It should be noted, however, that X-Ray templates are not as reliable for determining implant sizing in revision cases as they are in planning for primary implantations and can therefore only provide an approximate estimate of the actual stem size required.

Surgical Technique

Usually the cup is inspected first and, if necessary, inserts are removed or alternatively the cup implant is exchanged.

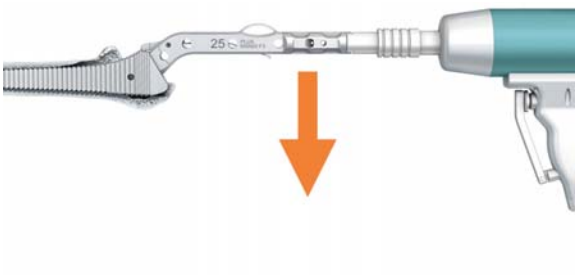
After the removal of the previous implant and of any remaining cement, the canal is prepared to receive the revision device.

It is important to ensure that all of the cement is removed; removal may require an antero-lateral window being made in the femur (Zweymüller, K., Steindl, M., Melmer, T. (2005). «Anterior Windowing of the Femur Diaphysis for Cement Removal in Revision Surgery.» Clin Orthop Rel Res 441, 227–236).

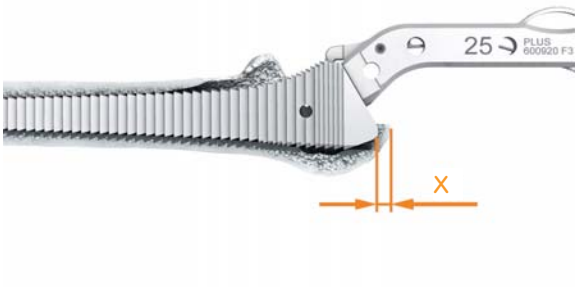
A bony console should be drilled in a closed process with an intramedullary drill so that the rasp cannot take a «false route» when inserted. This also applies to revisions of luxated cementless implants.



The smallest SLR-PLUS◇ rasp should be used to begin with. The offset adapter, which is available in different models, is connected to the appropriate rasp.



Initially, the rasping is conducted manually, using a slap hammer. Later for larger sizes, the rasping machine can be used. It is important to introduce the rasp precisely into the longitudinal axis of the femur to avoid implant positions in varus. The instrument's weight helps in finding the optimal position in the femur canal.



Step-by-step, the implant bed is rasped for the suitable prosthesis sizes using progressively larger rasp sizes.

The shoulder of the rasp corresponds to the height of the implant measured at the shoulder of the prosthesis. This should comply with the preoperatively defined distance to the greater trochanter (if still present).
In most cases, however, the existing proximal osteolysis and the laxity of scar tissue has to be taken into account. To avoid postoperative luxation, the prosthesis should be positioned so as to ensure sufficient soft tissue tension. This can also cause the shoulder of the implant to settle proximal to the original trochanter apex.

The situation may arise that the planned prosthesis size does not correspond to the intraoperatively rasped size. If there is a difference of two or more sizes, the rasp may not have reached the necessary depth due to either being inserted at the wrong angle to the longitudinal axis of the femur or due to an obstacle, such as residues of bone cement or protrusions of bone. In these cases the prosthesis would be too small and cortical anchoring would not be ensured. Residual foreign bodies or bony protrusions could fracture the bone diaphysis. If in doubt, a special x-ray examination should be carried out (image converter).



Once the optimum size and stability of the rasp and its height position are achieved, the offset adapter is removed from the positioned rasp.

Repositioning the trial



The modular neck is manually set onto the broach.

Modular necks are available as “standard” or “lateral” for rasp sizes 1–6 and 7–12.

Care should be taken that the modular neck is correctly seated on the matching surface of the detachable rasp and engages properly.



The trial ball-head is fitted onto the modular neck.

The joint is repositioned and leg length, soft-tissue tension, and range of motion are checked.

If necessary the trial ball-head and/or the modular neck (standard or lateral) are changed until the results are satisfactory. If luxation is still possible even though the lateralized modular neck is used and the rasp is securely seated, check if the next size stem should be used.
This then generally protrudes further proximally out of the bony shaft compared to the smaller size and can therefore lead to leg lengthening. The patient should be made aware of this risk before the surgery.

The use of a retention inlay in the cup, however, can significantly reduce postoperative luxation, even if an SLR-PLUS◇ lateral stem is used. A retention inlay can be used as a matter of routine with a BICON-PLUS◇ cup. It should also be noted that because of the retaining effect of this inlay, resulting in increased luxation resistance, it may in some cases also be possible to use a shorter neck length. This can prevent unintentional leg lengthening.

The modular neck can now be removed from the rasp either manually or with a bone clamp.

The offset adapter is connected to the rasp. The detachable rasp is removed from the canal using the slap hammer or the rasping machine.

Implanting the stem



The correct size SLR-PLUS◇ revision stem is introduced manually as deep as possible into the canal, and is then seated with the impactor, using appropriately measured strokes.

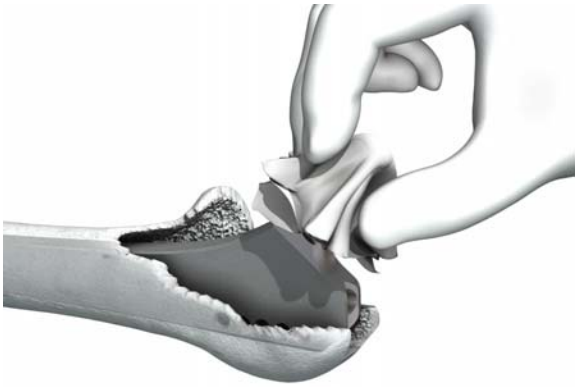
During impact, the protective cover remains positioned on the cone.

It is not permitted to impact the stem past the prepared bony bed or to change the prepared rotational alignment. This would inevitably fracture the shaft.

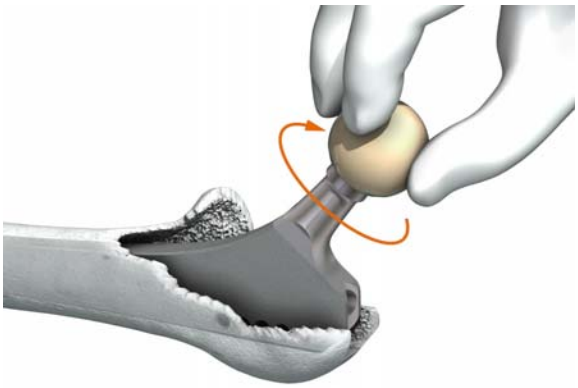


If the intraoperatively determined bone conditions indicate that the shaft could fracture, the use of a titanium band cerclage is recommended to stabilize the bone before starting the preoperative process with the rasp. This helps to considerably reduce the risk of fracture during bone preparation and when impacting the implant and should therefore, ideally, always be used.

The trial ball-head is then fitted to the cone and a trial reposition is carried out. It is recommended that the trial inlay be left for trial repositioning in the cup, because it cannot be determined until this stage if the standard inlay can be used or if another inlay, such as a retention inlay, has to be used. If conditions are stable, especially when checking the movement of the hip, the definitive inlay is fitted into the cup shell. Only then is the definitive ball-head fitted.



Before fitting the original ball-head, the tapered trunnion conus is carefully cleaned by hand.



The ball-head is then attached to the trunnion with a slight turning motion and permanently fixed with a blow delivered with the plastic hammer.



Metal objects must never be used to deliver impact to prosthetic heads. If a metal hammer is used, a plastic coupling or the head impactor must be used to protect the head from direct contact with the hammer.

Caution

Pressing the prosthetic head onto the trunnion solely by hand provides inadequate fixation.

The standard cone 12/14 is suitable for ceramic or metal ball heads from Smith & Nephew Orthopaedics AG.

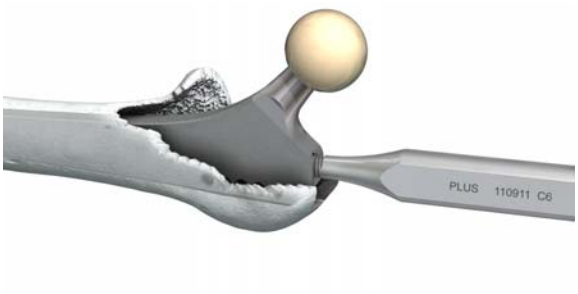
Reposition and wound suture

The definitive repositioning of the head in the cup then follows. If a retention inlay is used, the repositioning process of the ball should be followed as described in the surgical technique of the BICON-PLUS◇ cup

Postoperative Treatment

Postoperative treatment should be provided according to the standards in the particular clinic. It should, however, be noted that revision surgery requires individual postoperative treatment, depending on the degree of preoperative bone destruction and the intraoperatively achieved stability of the implant. In some cases the operated hip can be mobilized immediately and be partially load bearing, although mobilization without full load bearing is indicated for some time. During physiotherapy there is also the risk of postoperative luxation of the head out of the cup to be considered, as the stability can be considerably affected by soft tissue defects due to previous surgery.

Explantation of the SLR-PLUS◇ Revision Stem



The SLR-PLUS stem can be removed using the extraction screw M8.

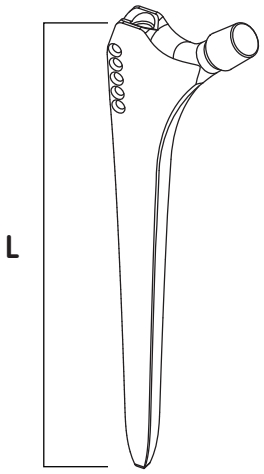


If the stem cannot be removed with the extraction screw, the surgeon can also use the extraction block.

It is important to insert the extraction screw axially.

Implants standard

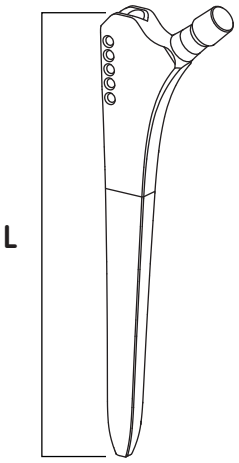
Art. No. S&N	Art. No. PLUS	Size	Length (L)
75002795	11801S	1	170 mm
75002797	11802S	2	175 mm
75002799	11803S	3	181 mm
75002801	11804S	4	186 mm
75002803	11805S	5	191 mm
75002805	11806S	6	197 mm
75002807	11807S	7	203 mm
75002809	11808S	8	209 mm
75002811	11809S	9	215 mm
75002813	11810S	10	221 mm
75002815	11811S	11	227 mm



Sizes 3–11 are also available with Ti/HA coating:

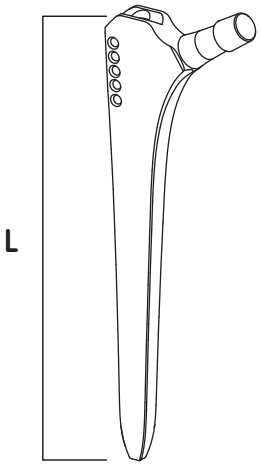
Art. No. S&N	Art. No. PLUS	Size	Length (L)
75002816	11863	3	181 mm
75002817	11864	4	186 mm
75002818	11865	5	191 mm
75002819	11866	6	197 mm
75002820	11867	7	203 mm
75002821	11868	8	209 mm
75002822	11869	9	215 mm
75002824	11870	10	221 mm
75002825	11871	11	227 mm

(Not available in USA and Canada.)



Implants lateral

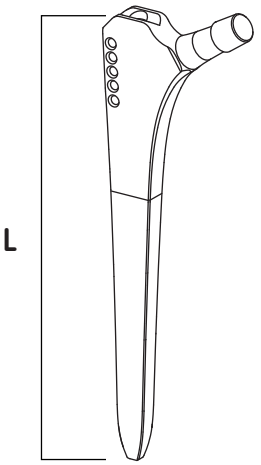
Art. No. S&N	Art. No. PLUS	Size	Length (L)
75001926	11000151	1	170 mm
75001927	11000152	2	175 mm
75001928	11000153	3	181 mm
75001929	11000154	4	186 mm
75001930	11000155	5	191 mm
75001931	11000156	6	197 mm
75001932	11000157	7	203 mm
75001933	11000158	8	209 mm
75001934	11000159	9	215 mm
75001935	11000160	10	221 mm
75001936	11000161	11	227 mm



Sizes 3–11 are also available with Ti/HA coating:

Art. Nr. S&N	Art. Nr. PLUS	Größe	Länge (L)
75000200	11000450	3	181 mm
75000201	11000451	4	186 mm
75000202	11000452	5	191 mm
75000203	11000453	6	197 mm
75000204	11000454	7	203 mm
75000205	11000455	8	209 mm
75000206	11000456	9	215 mm
75000207	11000457	10	221 mm
75000208	11000458	11	227 mm

(Not available in USA and Canada.)



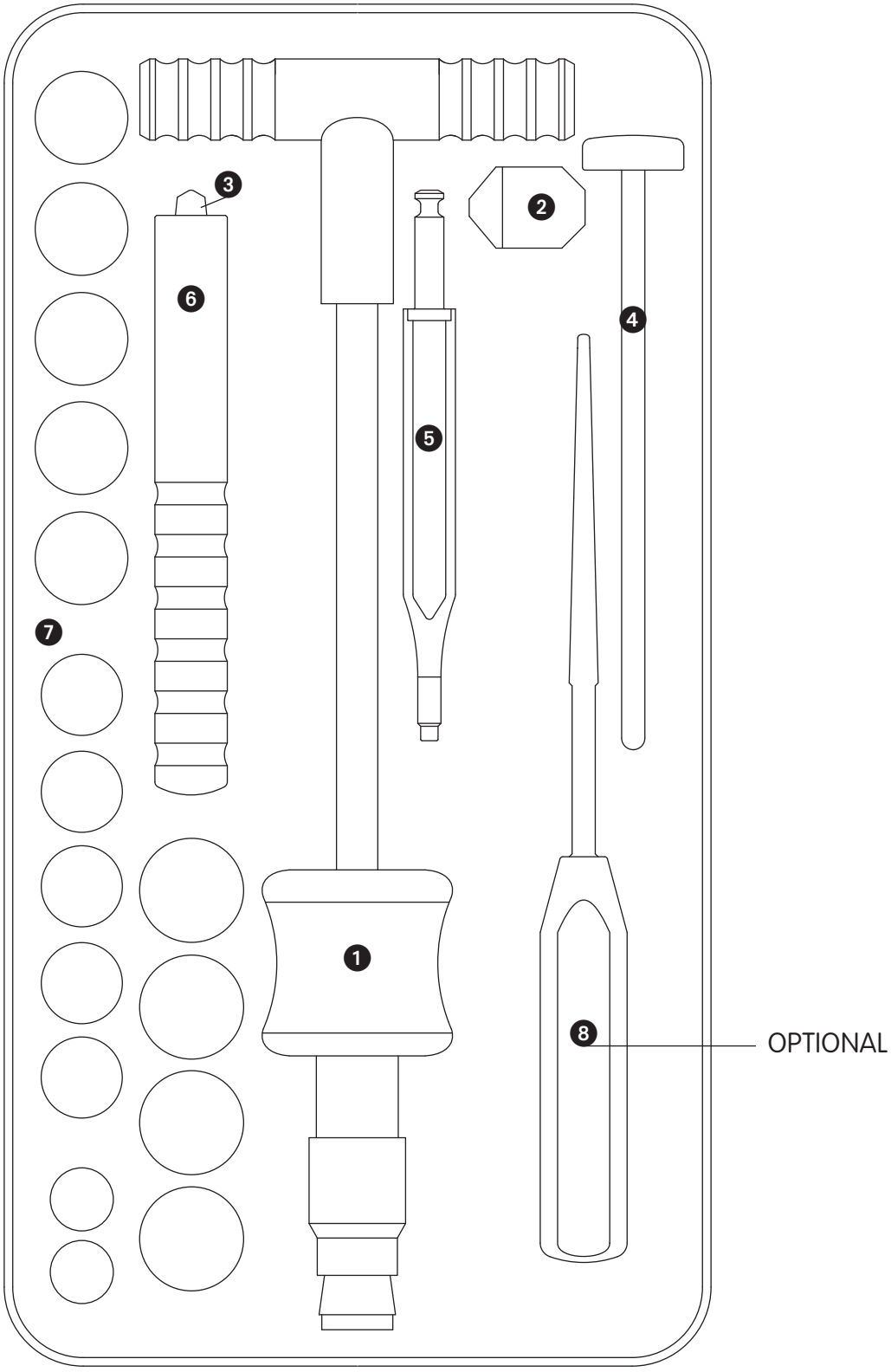
Instrumentation

SL/SLR-PLUS® Basic Case Trial Rasp
Set. No. S&N: 75200142
Set. No. PLUS: 0942000

	Art. No. S&N	Art. No. PLUS	Description
	75002198	**110450**	**Case Basic Instruments**
	75007661	990019	Easy Tray Lid
❶	75002319	110901	Slap Hammer
❷	75002320	110902	Extraction block
❸	75002321	110903	Impactor
❹	75002322	110904	Box Chisel
❺	75002325	110911	Extraction screw M8
❻	75002160	110242	Head Impactor
❼	75004074	160022	Trial ball head 22 M
	75004075	160023	Trial ball head 22 L
	75004060	160001	Trial ball head 28 S
	75004061	160002	Trial ball head 28 M
	75004062	160003	Trial ball head 28 L
	75004063	160004	Trial ball head 28 XL
	75004064	160005	Trial ball head 28 XXL
	75004065	160011	Trial ball head 32 S
	75004066	160012	Trial ball head 32 M
	75004067	160013	Trial ball head 32 L
	75004068	160014	Trial ball head 32 XL
	75004069	160015	Trial ball head 32 XXL
	75004070	160016	Trial ball head 36 S
	75004071	160017	Trial ball head 36 M
	75004072	160018	Trial ball head 36 L
	75004073	160019	Trial ball head 36 XL

Optional:

	Art. No. S&N	Art. No. PLUS	Description
❽	75004495	21000138	Curved Rasp
	75007254	600620	MIS Offset Box Chisel (instead of 110904)

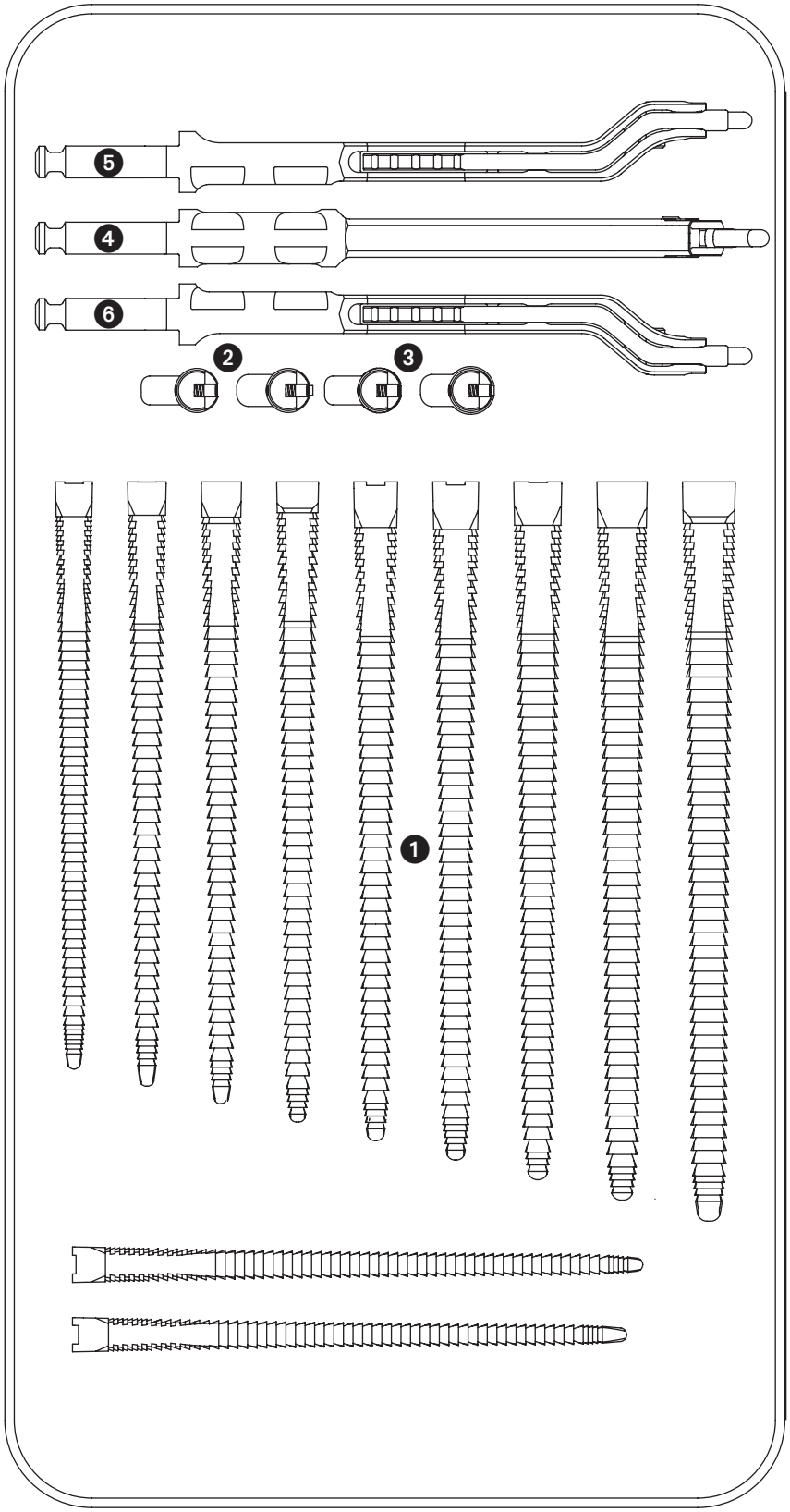

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OPTIONAL

SLR-PLUS◇ Trial Broaches with Adapter 10 mm
Set. No. S&N: 75200150
Set. No. PLUS: 0942015

	Art. No. S&N	Art. No. PLUS	Description
		21000569	**Case Instruments**
	75007661	990019	Easy Tray Lid
	75017269	21000558	Trial Rasp 1
❶	75017270	21000559	Trial Rasp 2
	75017271	21000560	Trial Rasp 3
	75017272	21000561	Trial Rasp 4
	75017273	21000562	Trial Rasp 5
	75017274	21000563	Trial Rasp 6
	75017275	21000564	Trial Rasp 7
	75017276	21000565	Trial Rasp 8
	75017277	21000566	Trial Rasp 9
	75017278	21000567	Trial Rasp 10
	75017279	21000568	Trial Rasp 11
❷	75004604	21000254	Modular neck Standard 1–6
	75004605	21000255	Modular neck Standard 7–12
❸	75004606	21000256	Modular neck Lateral 1–6
	75004607	21000257	Modular neck Lateral 7–12
❹	75007309	600922	Adapter 10 mm

Optional:

	Art. No. S&N	Art. No. PLUS	Description
❺	75007310	600923	Double offset adapter left 17/13 mm
❻	75007311	600924	Double offset adapter right 17/13 mm


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Sterilization

Implants

All the implants described in this surgical technique are supplied by the manufacturer in a sterile condition. Resterilization is not allowed.

Instruments

The system instruments are non-sterile when delivered. Before use, they must be cleaned by the usual methods in accordance with hospital regulations and sterilized in an autoclave in accordance with the national legal regulations and recommendations. (For detailed information please refer to the leaflet Lit. No. 1363.)

For correct settings, refer to the user instructions issued by the autoclave manufacturer. Instrument manufacturers and dealers do not accept any responsibility for the sterilization of products by the customer.

Manufacturer
Smith & Nephew Orthopaedics AG
Erlenstrasse 4a
6343 Rotkreuz
Switzerland

For further information please contact
our local sales office.
www.smith-nephew.com

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