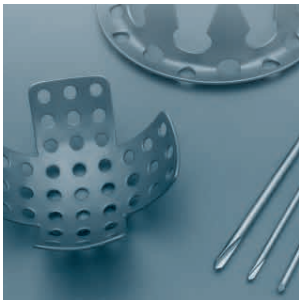
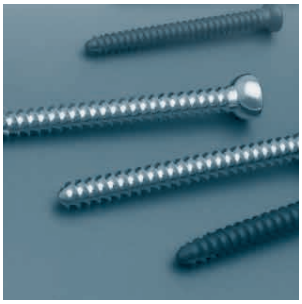






MEDIN®

FEMORAL NAIL

OPERATION INSTRUCTIONS

Femoral Nail

INDICATIONS FOR THE FEMORAL INTRAMEDULLARY NAIL
The nail enables osteosynthesis of femoral shaft fractures.
It is not suitable for stabilization of fractures of proximal or distal parts of the femur.

COMPOSITION OF THE SET OF IMPLANTS
The MEDIN intramedullary nail implant system consists one size of nail, locking screws in the distal or proximal part. The nail should preferably be closed with a stopper. Femoral nails make it possible to use a compression screw instead of the stopper, so that static compression of the fracture is performed directly at the operating table.

MEDIN intramedullary femoral nails are hollow without a notch, with circular cross-section. Nails with diameters of 10–15 mm and lengths of 320–500 mm are available. The proximal 22 mm of the nail are strengthened: diameters 10 and 11 mm to 11.5 mm, diameter 12 mm to 13 mm, diameter 13 mm to 14 mm; diameter 15 mm has no strengthening. The nails are constructed in a way that enables disregarding of the strengthening of the proximal part and pre-drilling is determined by the nail's diameter (generally we pre-drill to a diameter which is 1 mm larger that the chosen nail's diameter). The nail is slightly curved, so that it forms a sector of a circle with a diameter of 2.3 m. The non-strengthened part of the nail is equipped with three dimples. The nail can be used bilaterally, i.e. it can be used universally in both the right and left femur.

This brochure should only serve as an illustrative guideline for the femoral nail and the relevant instruments. The main purpose of this brochure is to provide doctors and scrub nurses with quick orientation, correct composition and usage of the instruments and implant, so that the best results of the surgery are reached. Should you have any questions, contact your MEDIN sales representative.

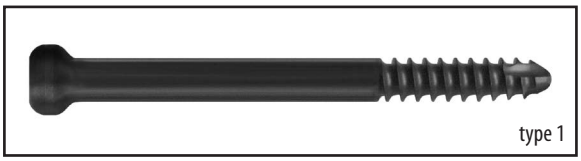
Locking screws

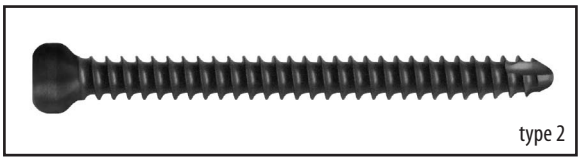
For all types of MEDIN intramedullary nails, there are standard locking screws prepared with a diameter of 5 mm. These are supplied in lengths of 25 to 90 mm, with 5 mm increments, in three types:

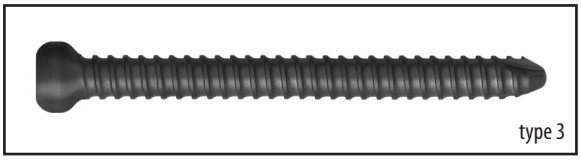
Type 1 has the length of thread 20 mm for all sizes of the screw (note: this type of screw is used in these instructions). For implanting, sleeve 4 and 3.5-drill (marked yellow) and sleeve 3 and 5-drill (marked white) are used.

Type 2 has a thread reaching to the head. For implanting, sleeve 4 and 3.5-drill (marked yellow) are used.

Type 3 has a decreased thread profile; the thread reaches to the head of the screw. For implanting, sleeve 5 and 4.4-drill (marked red) are used.

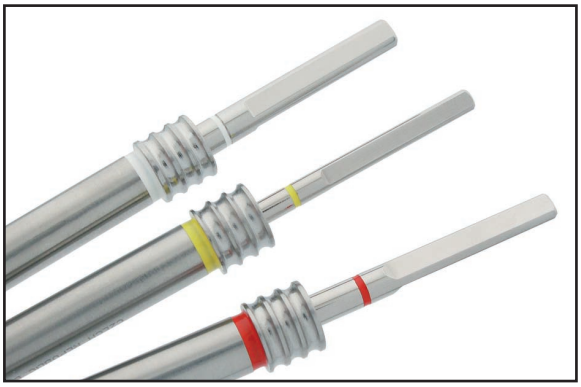

type 1


type 2

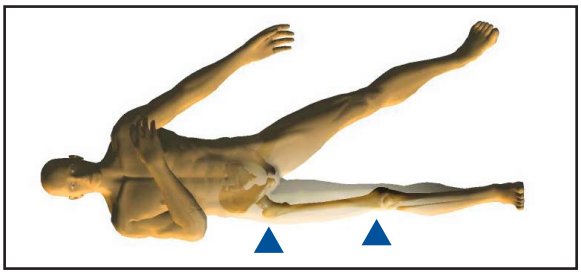

type 3

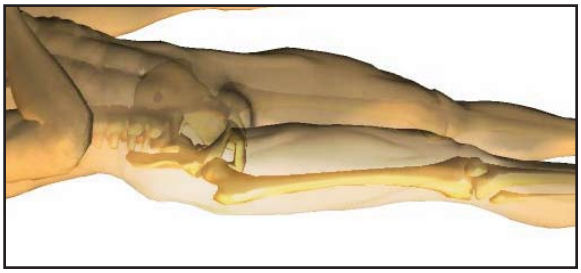
COLOR CODES FOR SLEEVES AND CORRESPONDING DRILLS

Sleeve 3 (129 69 1200) and drill Ø 5 (129 79 4980)	white
Sleeve 4 (129 69 1210) and drill Ø 3,5 (129 79 4990)	yellow
Sleeve 5 (129 79 8460) and drill Ø 4,4 (129 79 8430)	red



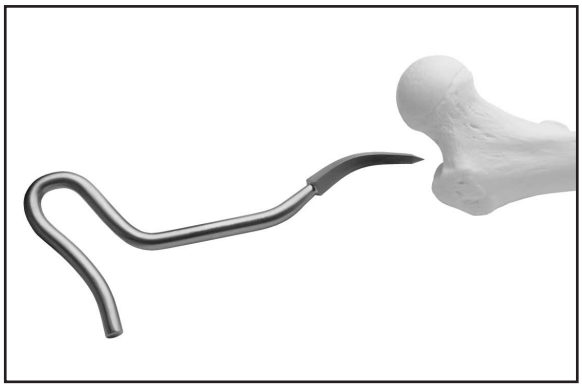
RECOMMENDED PROCEDURE FOR IMPLANT INSERTION

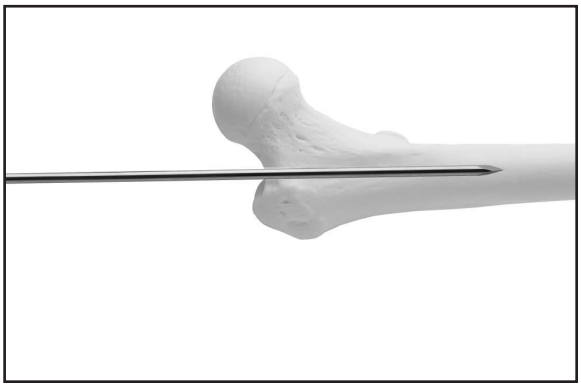




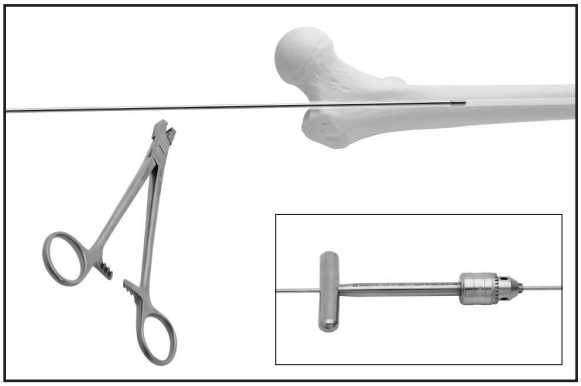
At the author's workplace it is preferred to place the patient on an extension table in supine position, the unaffected limb is abducted in neutral rotation and the limb rest is lowered to the maximum (dorsiflexion of the hip) or the unaffected limb is flected in limb and knee ("gyneacologic" position); the injured limb is in neutral rotation in the body-axis and slightly abducted. It is also possible to place the patient on the unaffected limb's side. If the operation is performed early, skeletal traction is not used. The position must allow x-ray control of the whole operated femur; the fracture site in both projections, the rest of the femur at least in AP and the site of distal locking in lateral projection (but preferably in both).

At least rough repositioning is done; the operating area is prepared and draped. We make the incision in the extension of the thigh axis, from the greater trochanter proximally. We open the medullary cavity of the femur with a **perforator** at the medial edge of the greater trochanter dorsally. Inserting the whole edge of the perforator creates an opening with diameter of 12.5 mm, which is needed to make an opening for non-predrilled nail insertion.

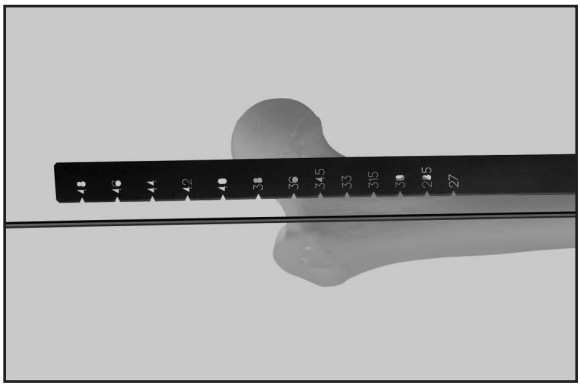




As needed, a canal with diameter of 5 mm is created in the spongious bone of the proximal part of the femur by an **awl**, then a **guide wire with olive, length 1150 mm**, is inserted through the fracture site and if required the repositioning of the fracture is finished. The **guide wire with olive** is used solely for pre-drilling of the medullary cavity.

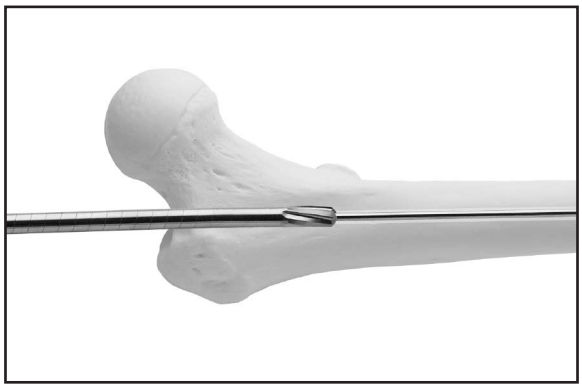


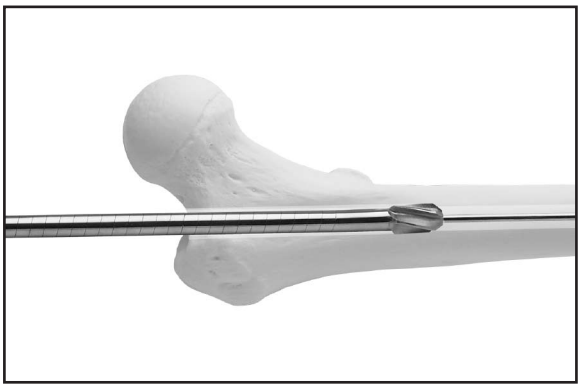
The length of the **nail** is determined either with the use of a **radiopaque ruler** or with the help of the inserted **guide wire** (we verify the location of its distal end and on a **wire** of equal length we gauge the part protruding from the bone and measure the rest of the length).



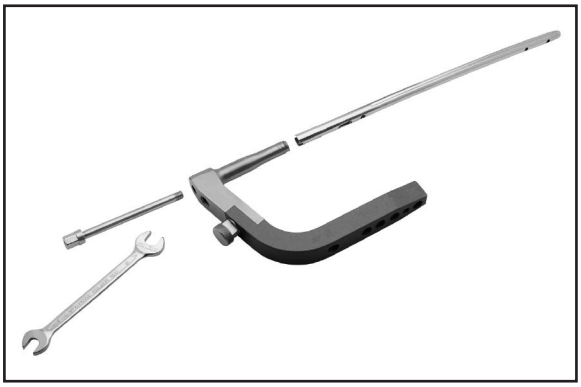
If a non-predrilled **nail** is used, the selected **nail** of diameter 10 or 11 mm is inserted, and then locked as described below.

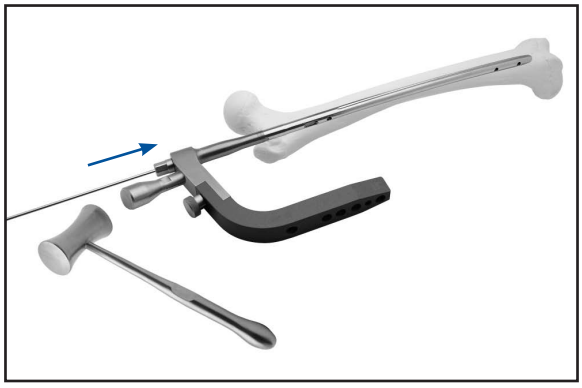
Pre-drilling with **flexible reamers** must be done gradually with the complete set of **reamers** up to the chosen size, it is always necessary to start with a **reamer with diameter of 8 mm**, which is adapted for forward cutting. The drilling should be finished with a **reamer** with a diameter 1 mm larger than that of the selected **nail**.

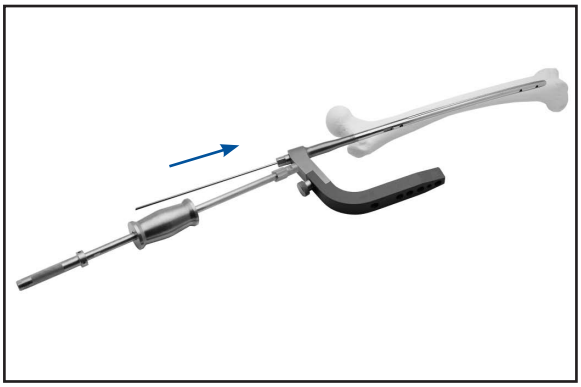




After irrigation (**guide wire** is interchanged with a **tube** enabling the irrigation and a **guide wire without olive** is inserted) the chosen **nail** is completed with the **aiming device** (same aiming device for tibial or femoral nails, a different one for reconstruction nail). The aiming device can be struck directly against the adapted part – **impactor**. The **impactor** is screwed into the **aiming device** in the same way as the **mallet**. It is however recommended to use (screw) the **mallet**. The **guide rod of the mallet** is placed on the **aiming device** eccentrically to the nail's axis to make the manipulation during **femoral nail** insertion easier. The **nail** is inserted by strokes of the **mallet**. Unwanted rotation of the **nail** during insertion must be prevented. After the **nail** insertion the **guide wire** is removed.

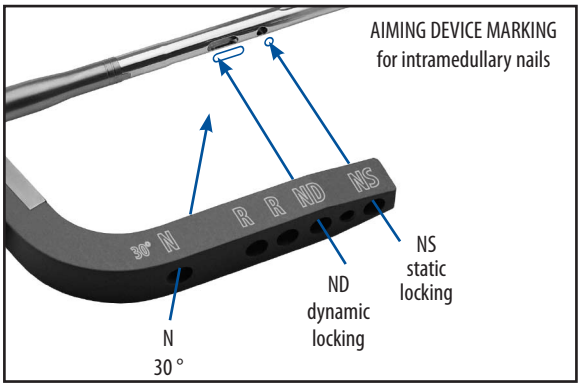


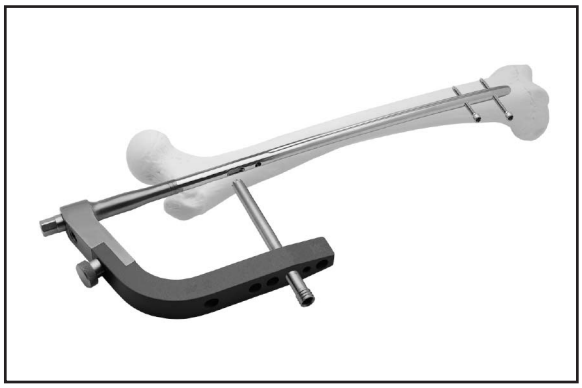


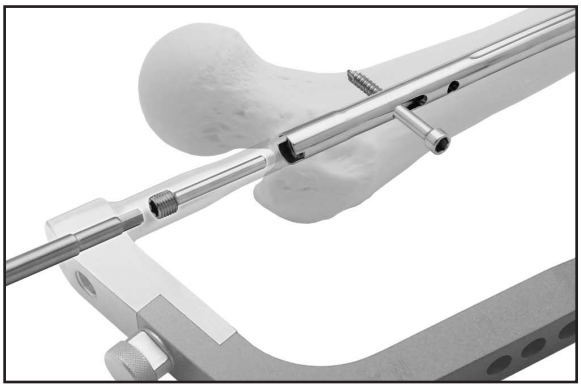


Proximal locking does not cause any inconvenience due to application of the **aiming device**. The mallet should be removed before locking. 1 or 2 **locking screws** can be inserted. The openings in the **nails** only allow lateromedial insertion in the frontal plane.

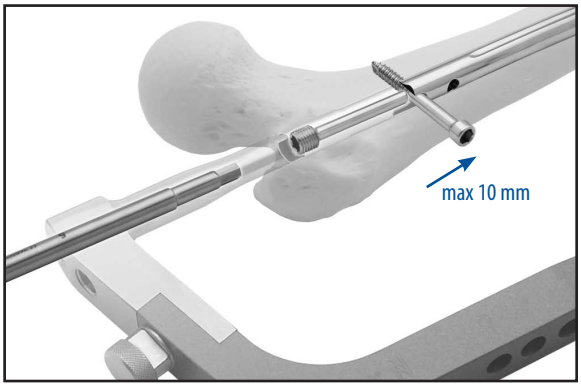
The upper opening for **screws** is oval; insertion of a **screw** by the **aiming device** enables dynamic and static locking. Compression of the fracture site can be achieved directly on the operating table by using the **compression screw** inserted at the upper end axially into the **nail** cavity using the above described way of locking. The maxi-



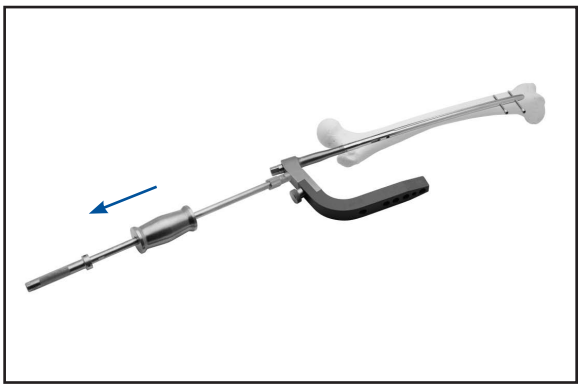




mum extent of compression is 10 mm. (Distal locking must be performed, proximally only 1 **screw** is inserted into the oval opening in the **nail**. The compression screw will lean against the proximal **locking screw** in the nail cavity and its further insertion would push away the proximal bone fragment distally against the **nail**).



In the case of a bigger distraction of the fracture site, which can occur during **nail** insertion, it is more favorable to perform the approach of the fragment by an alternative procedure, retaining the **aiming device**. The **grip** and the **mallet** can be temporarily removed. Then we perform distal locking and we complete the **mallet** again. We then approach the site of the fracture by reverse impacts of the **mallet** (like during extraction).

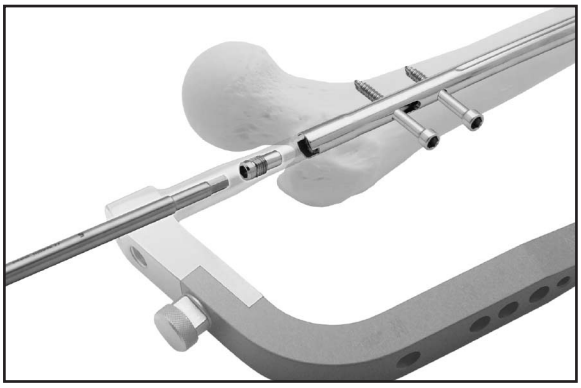


Through the selected opening in the **aiming device** we insert **sleeve 2** completed with the **trocar** for easier insertion. In the spot of contact of the point of the **trocar** we make a skin incision in the required range of approx. 15 mm. We insert the **sleeve** to the bone at first by applying a hand pressure, then by tapping with a **hammer**. By an impact on the **trocar** we make a dent in the bone for easier placement of the drill. We remove the **trocar** and strike the **sleeve** so that its toothed inner rim is well fitted on the bone. We insert **Sleeve 3** or **4** into the **sleeve**. **Sleeve 3** is intended for the **drill with diameter 5 mm**; **sleeve 4** is intended for the **drill with diameter 3.5 mm**. With the **drill with diameter 3.5 mm** we bore

openings in both cortical bones. With the **drill with diameter 5 mm** we bore an opening in the nearer cortical bone through the inner **sleeve 3**. We remove the inner **sleeve** and using the **depth gauge** we determine the required length of the inserted **locking screw**. Any uncertainty regarding the position of the scale line used for gauging will be dispelled by setting the **depth gauge** into the zero position (completely pulled in), when the position of the scale line is unambiguous. We read directly the required length of the **locking screw**; correction of the distance from **sleeve 2** to the outer cortical bone is already done on the depth gauge!
The **locking screws** are self-tapping and can be inserted at this stage. However **screw-tap 1** fastened to the **manual chuck** can be used. The second **locking screw** can be inserted in the same way. We insert the **screw** via **sleeve 2** with a **screwdriver**.

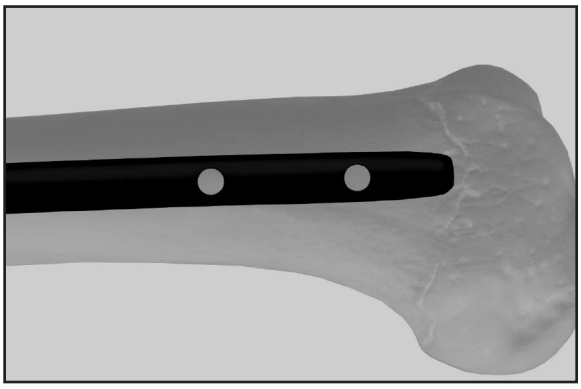
Type 1 **locking screw** does not have the thread along its entire length, so its extraction can only be performed using a **collet** completed with a **screwdriver**. Adaptation adding the **collet** to the **screwdriver** enables to unscrew the **screw** while pulling.
Additional **sleeve 4** (129 79 3560) is also supplied; this can be inserted into **sleeve 2** and enables insertion of **K-wire with diameter 2.5 mm** to verify the location of the **locking screw** before drilling. **Sleeve 1** can be completed with the **aiming device** in the same manner for distal locking.

Before distal locking we remove the **aiming device** by loosening the **screw of the aiming device** with the **wrench** from the instrumentation and taking the **aiming device** out. If we do not plan compression of the fracture directly on the operating table by a **compression screw**, the **nail** cavity can be closed with a **stopper**.



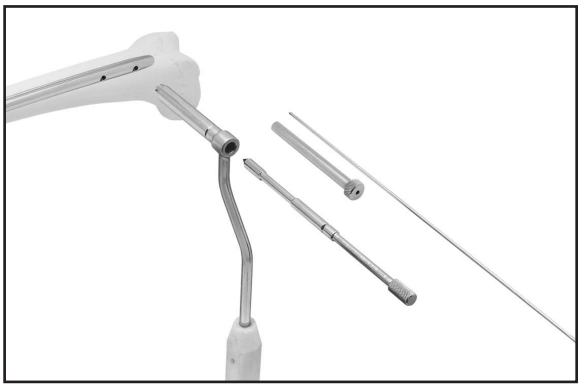
Distal locking is more difficult. Practice led us to the choice of locking "from the hand" using the **aiming device**. Firstly the C-arm of the mobile x-ray apparatus is set precisely into the axis.

The openings for the **locking screws** must appear as precise circles on the screen. After skin incision the **aiming device** with **trocar** is inserted to the bone in the same way as in the case of proximal locking. After removal of the **trocar** the **aiming device** is tapped towards the bone. Adjustments are done under x-ray control.



Sleeve 4 (129 79 3560) can be inserted into the **aiming device** and the position verified by insertion of a **K-wire with diameter 2.5 mm**.

Then **sleeves 3** and **4**, possibly **5**, are inserted and both cortical bones are drilled with **3.5 mm drill**; **sleeve 4** is removed and the nearer cortical bone is predrilled with **drill with diameter 5 mm**. **Sleeve 3** is removed. The **depth gauge** is used for determining the length of the **locking screw**. **Screw-tap 1** is used if deemed appropriate. The chosen **screw** is inserted with a **screwdriver**, still via the **aiming device**.

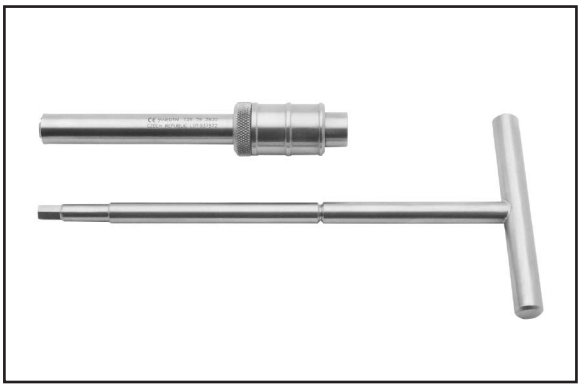


We insert 1-2 distal **locking screws**; the openings in the **nails** only allow lateromedial insertion in the frontal plane.

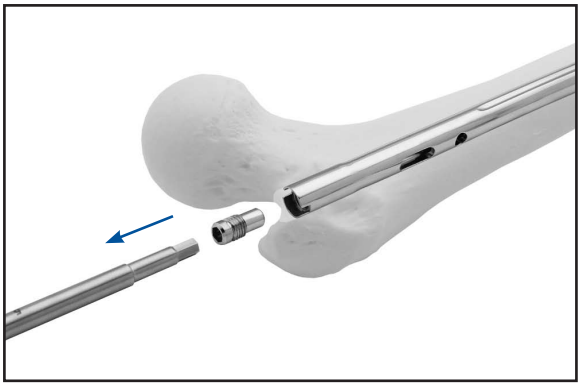
After irrigation the wounds are sutured. A suction drain is regularly inserted to the place of **nail** insertion into the femur; it may not suck directly from the medullary cavity. The wound is covered with a soft dressing and x-ray documentation is taken. Skeletal traction, if used, is removed.

RECOMMENDED TECHNIQUE FOR FEMORAL NAIL EXTRACTION

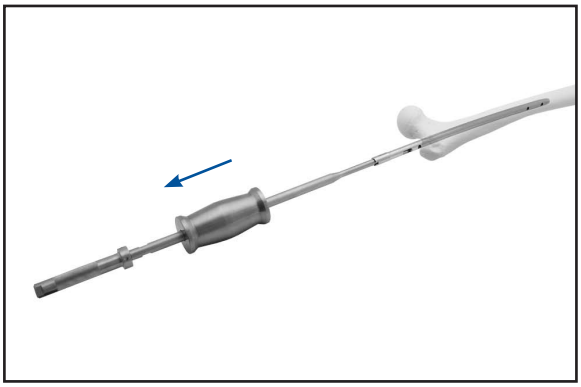
Firstly the **locking screws** must be removed (if not done earlier during the healing process). Extraction should be done with a **screwdriver** with a **collet**, which enables unscrewing while pulling. After a skin incision we insert a **collet** with **trockar** to the **screw** which is to be extracted. The point of the **trocar** heads to the inbus **screw** head. We remove the **trockar** and replace it with a **screwdriver** which we complete with the **collet** till the "click".



The **stopper** or the **compression screw** must be removed from the proximal opening of the **nail**.



The **extraction bar** is screwed into the inner thread in the **nail's** proximal part. The **nail** is hammered out by blowing the **mallet** against the **handle**.

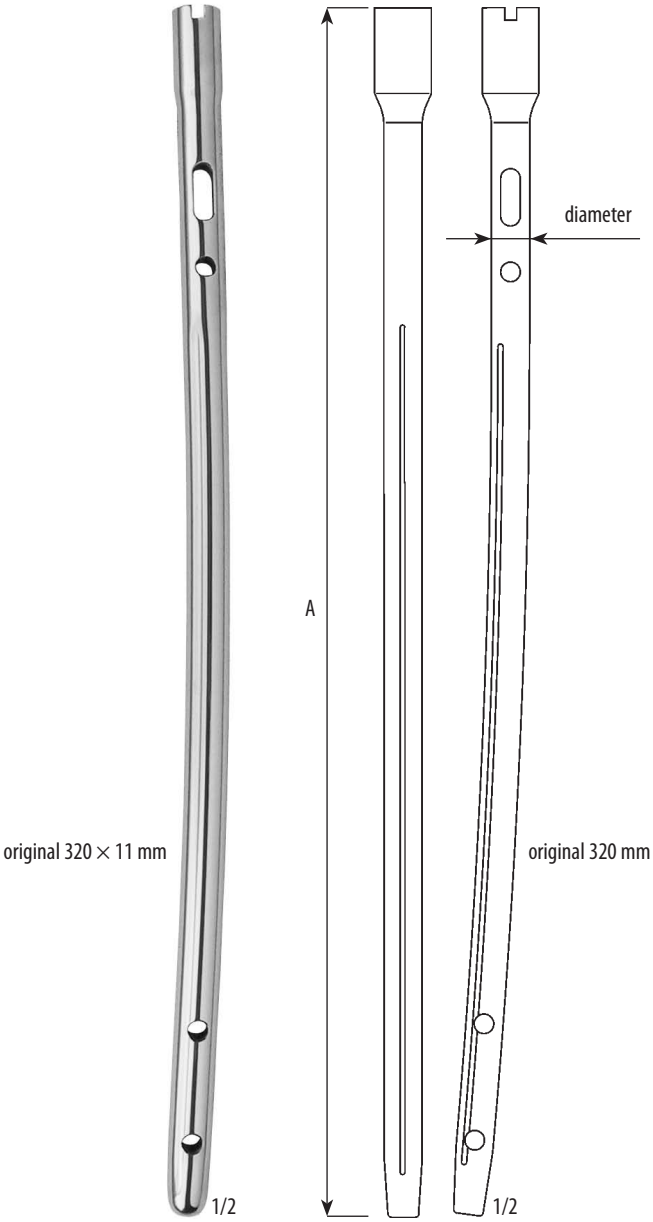


RECOMMENDED PROCEDURE FOR OSTEOSYNTHESIS WITH NON-PREDRILLED INTRAMEDULLARY NAILS

The range of MEDIN tibial and femoral intramedullary nails includes some diameter sizes that are adapted for non-predrilled insertion; for femoral nails these are diameters 10 and 11. Understandably the drilling of the medullar cavity does not take place; otherwise the procedures do not differ from the above described technique of osteosynthesis.

NOTES: Before nail insertion, once the selected nail is completed with the aiming device, it is necessary to verify that all openings meant for screw insertion correspond to the openings in the aiming device.
Use a mallet for nail insertion in a reasonable extent. In a standard case the nail should be inserted only by hand as far as possible.
The implants are made of either titanium or steel alloy. These two must never be combined in the same patient.

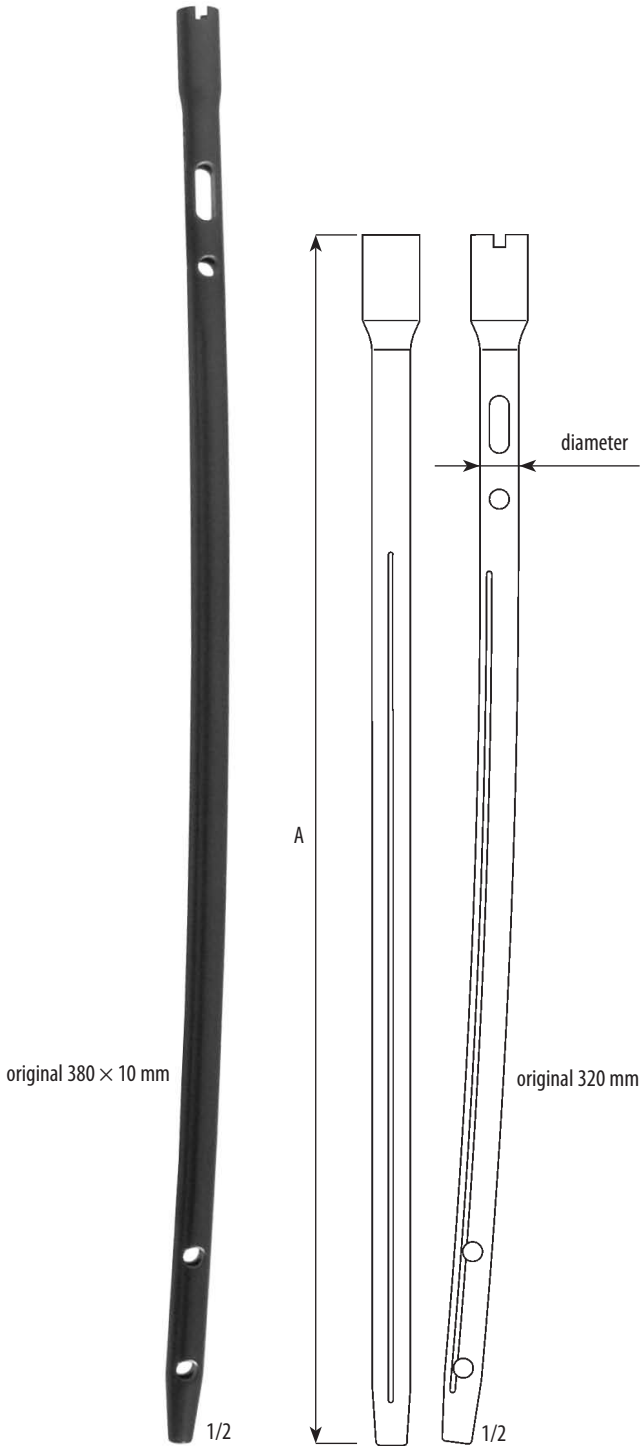
FEMORAL INTRAMEDULLARY NAILS



	A	diameter
129 79 2700	320 mm	10 mm
129 79 2710	340 mm	10 mm
129 79 2720	360 mm	10 mm
129 79 2730	380 mm	10 mm
129 79 2740	400 mm	10 mm
129 79 2750	420 mm	10 mm
129 79 2760	440 mm	10 mm
129 79 2770	460 mm	10 mm
129 79 2780	480 mm	10 mm

	A	diameter
129 79 2800	320 mm	11 mm
129 79 2810	340 mm	11 mm
129 79 2820	360 mm	11 mm
129 79 2830	380 mm	11 mm
129 79 2840	400 mm	11 mm
129 79 2850	420 mm	11 mm
129 79 2860	440 mm	11 mm
129 79 2870	460 mm	11 mm
129 79 2880	480 mm	11 mm
129 79 2900	320 mm	12 mm
129 79 2910	340 mm	12 mm
129 79 2920	360 mm	12 mm
129 79 2930	380 mm	12 mm
129 79 2940	400 mm	12 mm
129 79 2950	420 mm	12 mm
129 79 2960	440 mm	12 mm
129 79 2970	460 mm	12 mm
129 79 2980	480 mm	12 mm
129 79 2990	320 mm	13 mm
129 79 3000	340 mm	13 mm
129 79 3010	360 mm	13 mm
129 79 3020	380 mm	13 mm
129 79 3030	400 mm	13 mm
129 79 3040	420 mm	13 mm
129 79 3050	440 mm	13 mm
129 79 3060	460 mm	13 mm
129 79 3070	480 mm	13 mm
129 79 3080	500 mm	13 mm
129 79 3100	360 mm	14 mm
129 79 3110	380 mm	14 mm
129 79 3120	400 mm	14 mm
129 79 3130	420 mm	14 mm
129 79 3140	440 mm	14 mm
129 79 3150	460 mm	14 mm
129 79 3160	480 mm	14 mm
129 79 3200	320 mm	15 mm
129 79 3210	340 mm	15 mm
129 79 3220	360 mm	15 mm
129 79 3230	380 mm	15 mm
129 79 3240	400 mm	15 mm
129 79 3250	420 mm	15 mm
129 79 3260	440 mm	15 mm
129 79 3270	460 mm	15 mm
129 79 3280	480 mm	15 mm
129 79 3290	500 mm	15 mm

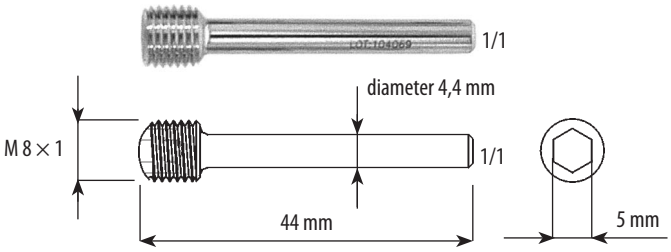
FEMORAL INTRAMEDULLARY NAILS; TITANIUM



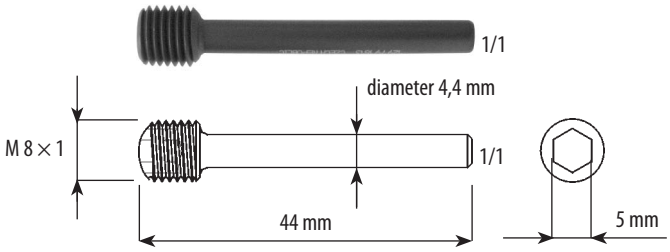
titanium	A	diameter
129 79 2703	320 mm	10 mm
129 79 2713	340 mm	10 mm
129 79 2723	360 mm	10 mm
129 79 2733	380 mm	10 mm
129 79 2743	400 mm	10 mm
129 79 2753	420 mm	10 mm
129 79 2763	440 mm	10 mm
129 79 2773	460 mm	10 mm
129 79 2783	480 mm	10 mm
129 79 2803	320 mm	11 mm
129 79 2813	340 mm	11 mm
129 79 2823	360 mm	11 mm
129 79 2833	380 mm	11 mm
129 79 2843	400 mm	11 mm
129 79 2853	420 mm	11 mm
129 79 2863	440 mm	11 mm
129 79 2873	460 mm	11 mm
129 79 2883	480 mm	11 mm
129 79 2903	320 mm	12 mm
129 79 2913	340 mm	12 mm
129 79 2923	360 mm	12 mm
129 79 2933	380 mm	12 mm
129 79 2943	400 mm	12 mm
129 79 2953	420 mm	12 mm
129 79 2963	440 mm	12 mm
129 79 2973	460 mm	12 mm
129 79 2983	480 mm	12 mm

NOTES: ■ TITANIUM version – material: Ti6Al4V ELI, in accordance with ISO 5832-3.

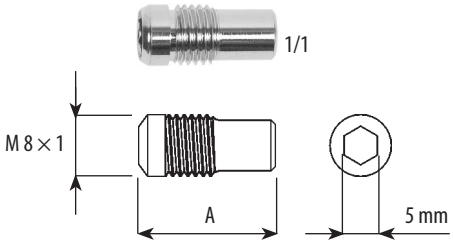
IMPLANTS FOR FEMORAL INTRAMEDULLARY NAILS



COMPRESSION SCREW
129 79 1810

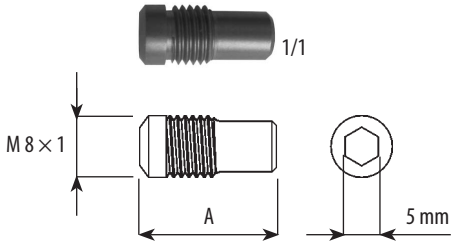


COMPRESSION SCREW
129 79 1813
titanium



STOPPER

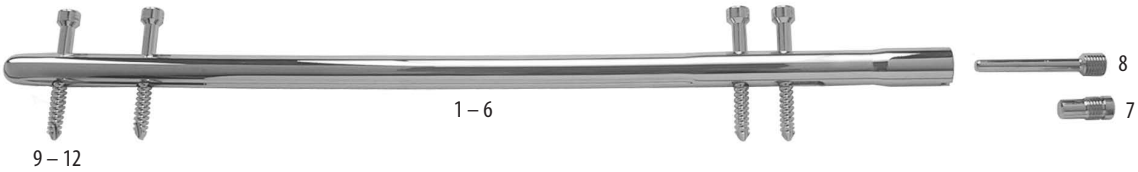
	A
129 77 1610	18 mm



STOPPER
titanium

	A
129 77 1613	18 mm

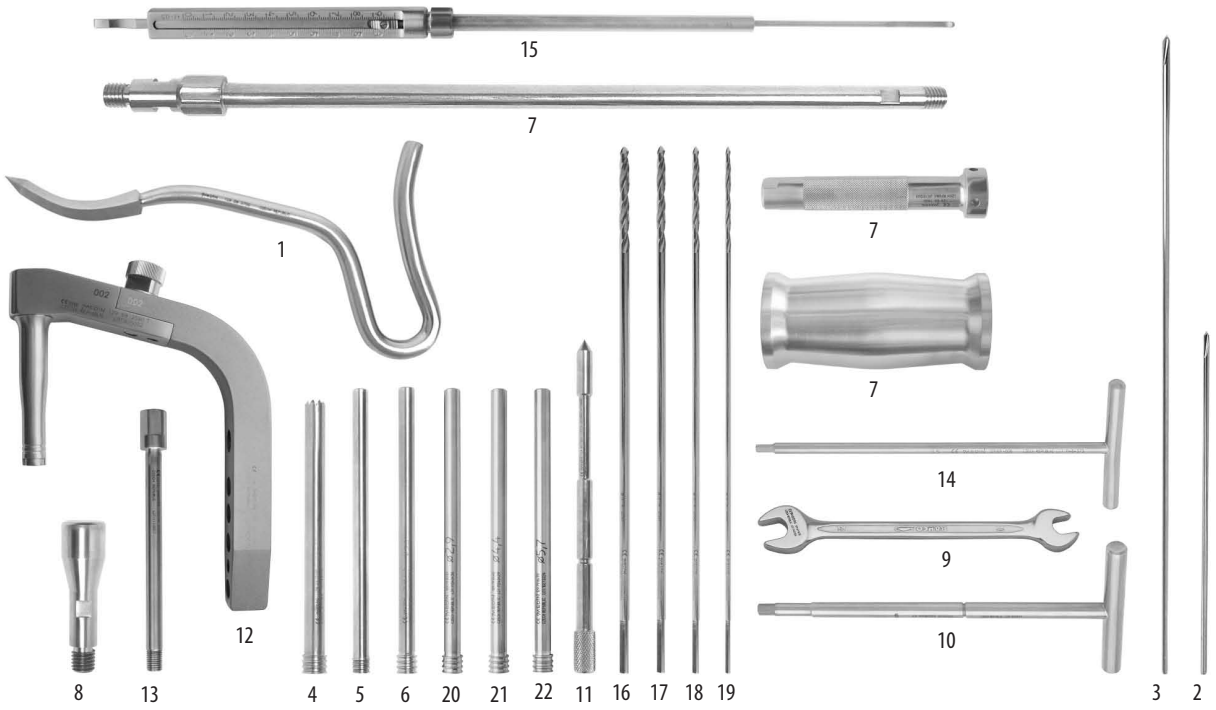
RECOMMENDED SET OF IMPLANTS FOR FEMORAL INTRAMEDULLARY NAILS



		titanium	
1	**129 79 2700 ÷ 2780**	**129 79 2703 ÷ 2783**	FEMORAL INTRAMEDULLARY NAIL; diameter 10 mm
2	**129 79 2800 ÷ 2880**	**129 79 2803 ÷ 2883**	FEMORAL INTRAMEDULLARY NAIL; diameter 11 mm
3	**129 79 2900 ÷ 2980**	**129 79 2903 ÷ 2983**	FEMORAL INTRAMEDULLARY NAIL; diameter 12 mm
4	**129 79 2990 ÷ 3080**		FEMORAL INTRAMEDULLARY NAIL; diameter 13 mm
5	**129 79 3100 ÷ 3160**		FEMORAL INTRAMEDULLARY NAIL; diameter 14 mm
6	**129 79 3200 ÷ 3290**		FEMORAL INTRAMEDULLARY NAIL; diameter 15 mm
7	**129 77 1610**	**129 77 1613**	STOPPER
8	**129 79 1810**	**129 79 1813**	COMPRESSION SCREW
9	**129 79 1500 ÷ 1760**	**129 79 1503 ÷ 1763**	LOCKING SCREW
10	**129 79 1510 ÷ 1310**	**129 79 1513 ÷ 1313**	LOCKING SCREW
11	**129 79 4810 ÷ 4940**	**129 79 4813 ÷ 4943**	LOCKING SCREW
12	**129 79 9631 ÷ 9761**	**129 77 9634 ÷ 9764**	LOCKING SCREW WITH LOWER PROFILE OF THE THREAD

NOTES: ■ TITANIUM version – material: Ti6Al4V ELI, in accordance with ISO 5832-3.

INSTRUMENTS FOR TIBIAL, FEMORAL AND RETROGRADE INTRAMEDULLARY NAILS



129 79 9240
set

			number of pcs
1	**129 09 0700**	PERFORATOR CURVED	1
2	**129 09 2510**	K-WIRE 2,5×160 mm	1
3	**129 09 2590**	K-WIRE 2,5×300 mm	1
4	**129 69 1190**	SLEEVE 2	1
5	**129 69 1200**	SLEEVE 3	1
6	**129 69 1210**	SLEEVE 4	1
7	**129 69 1600**	MALLET	1
8	**129 69 1620**	IMPACTOR	1
9	**129 69 1630**	WRENCH, 10/12	1
10	**129 69 1640**	SCREWDRIVER T; 5 mm; 175 mm	1
11	**129 69 1650**	TROCAR	1
12	**129 69 2590**	AIMING DEVICE	1
13	**129 69 2830**	SCREW OF AIMING DEVICE	1
14	**129 69 4050**	SCREWDRIVER T; 3,5 mm; 175 mm	1
15	**129 79 2111**	DEPTH GAUGE	1
16	**129 79 4980**	DRILL; 5,0 mm	1
17	**129 79 4990**	DRILL; 3,5 mm	2
18	**129 79 8430**	DRILL; 4,4 mm	1
19	**129 79 8440**	DRILL; 2,9 mm	1
20	**129 79 8450**	SLEEVE 6	1
21	**129 79 8460**	SLEEVE 5	1
22	**129 79 8470**	SLEEVE 7	1

OPERATION INSTRUCTIONS

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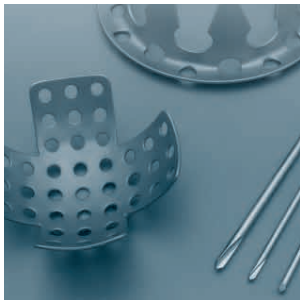

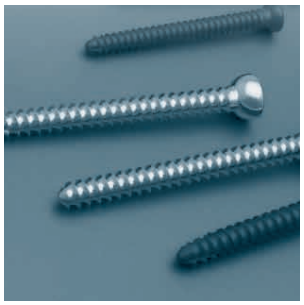

FEMORAL NAIL

2009