



TIBIAL NAIL

### Tibial Nail

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### Indication of Tibial Intramedullary Nail

The nail enables synthesis of diaphysis fractures of type A, B and distal tibial part of type A (A1, A2) and B (B1, B2) – according to Müller. It is not suitable for proximal fractures stabilisation.

### Composition of implant system

MEDIN implant system of intramedullary nail consists of one nail size, locking screws in distal and proximal part. It is recommended to close the nail with the stopper or it is possible to use compression screw instead of the stopper and to perform static compression of the fracture directly on the operating table.

This brochure should be only considered as an illustrative guideline of tibial nail and the instrumentation. The main purpose of this brochure is to provide a quick orientation for surgeons and suture nurses. To show the correct composition and usage of the instrumentation and implants so that the best surgery result would be achieved. If you have any queries do not hesitate to contact sales people of MEDIN Inc.



### Tibial intramedullary nails

Medin tibial intramedullary nails of diameters from 8 to 10 mm are entire and diameters from 9 to 12 mm are hollow. The nails are without a groove on the surface, have a circular section.

There are tibial nails of diameter 8 mm, lengths from 240 to 360 mm after 15 mm. Nails of diameters 9 and 10 have sizes from 270 to 420 mm. Nails of diameters 11 and 12, sizes from 270 to 390 mm are also available.



Angle 10° curves proximal 80 mm and angle 4° curves in the distal 60 mm all sizes and lengths. Nails of diameters 8, 9 and 10 mm have a part of proximal 22 mm wider to diameter 11,5 mm. Nails of 12 mm diameters have a part of 22 mm wider to diameter 13 mm.

The pre-drilling is according to the nail diameter, the enlarged proximal part does not have to be considered (is constructionally solved). E.g. we pre-drill a nail of diameter 11 mm about 1 mm more, which is 12 mm. The nail is universal, can be used in the left and also in the right tibia. The surgeons must have the choice of sizes according to locking screws.

Locking screws of different versions are prepared for the nailing:

**Shape 1** – normalized cortical thread with diameter of 5 mm, screw size L= 25 to 90 mm after 5 mm

**Shape 2** – normalized cortical thread in size of 20 mm, with diameter 5 mm, screw size L= 25 to 90 mm after 5 mm

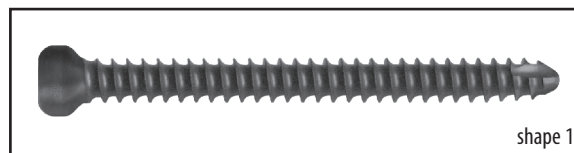
**Shape 3a)** – low normalized cortical thread of diameter 5 mm, screw size L=25 to 90 mm after 5 mm

**Shape 3b)** – low normalized cortical thread of diameter 3,5 mm, screw size L=25 to 75 mm after 2 mm

**Shape 4a)** – special locking screw with cortical thread at a screwhead of diameter 5 mm, screw size L=25 to 90 mm after 5 mm

**Shape 4b)** – special locking screw with cortical thread at a screwhead of diameter 3,5 mm, screw size L=25 to 90 mm after 5 mm

Locking screws of diameters 3,5 mm are for the nails with diameters 8 mm. Locking screws of diameters 5 mm are for other diameters: 9-12 mm.



shape 1



shape 2



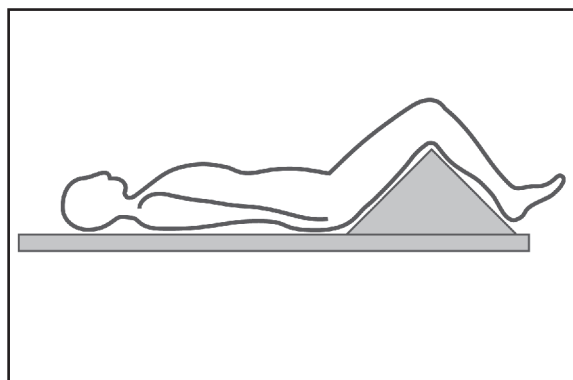
shape 3a; 3b



shape 4a; 4b

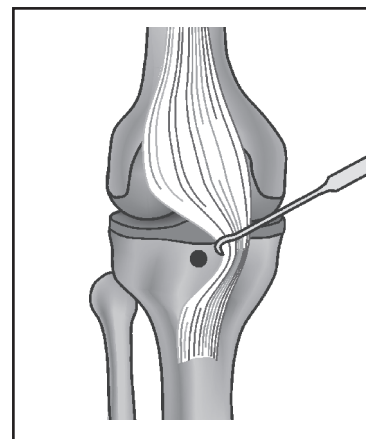
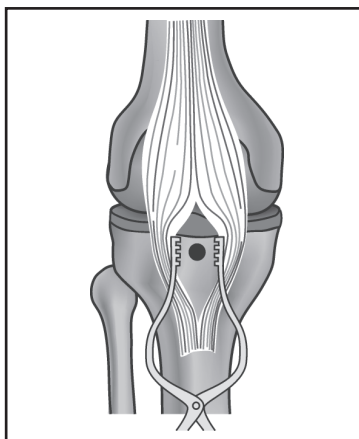
### RECOMMENDED INSTRUCTION OF IMPLANTS USAGE

Place the patient on the table and support the operated limb by a triangular support so that it proximately forms the right angle and the shank is freely placed on the mat (traction is performed during operation by one-shot move).



Different variant: The patient is placed on the extension table and traction is realised skeletally by calcanea drilling or soft traction by eight bandage hock. The position of the patient with the operated limb in the body axis in the neutral rotation in the hock flexion in a way that the shank is positioned slightly sloping distally. The X-ray check must be possible in two levels and the whole length.

The fracture is under control of X-ray in two levels and at least repositioned. When the field of operation is ready and screening is done, lengthwise section is lead above centre *lig. proprium patellae*. The ligament is broken apart; each part is taken aside and kept by raspatory stuck in the bone or by retractor. Above the upper edge of *tuberositas tibiae* medullar cavity is opened by a **perforator** from the instrumentation. (When buying the instrumentation, it is possible to choose from two types of perforators, there is a place for one of them in the casing). If the whole perforator's blade is inside, formed hole (both types) has diameter 12,5 mm. Introducing of **introducer with olive** (size 950 mm) follows up to distal fragment with necessary fragments repositioning. Pre-drilling follows, mill with the whole set of **milling cutters** (after 0,5 mm) up to diameter 1 mm bigger than the diameter of the chosen nail. The milling must always start with a **milling cutter** of diameter 8 mm, because only this **milling cutter** is adjusted for facing mesh.



Relative to axis of tibia, it is sometimes suitable to locate trepan hole slightly medially from the middle line. It is then possible to perform skin section close to medial edge *lig. proprium patellae* and to remove the ligament laterally. If the perfored hole (perfored by a **perforator** from the instrumentation) has a diameter 12,5 mm, it is not necessary to respect larger proximal nail end, pre-drilling is done according to the diameter of chosen **nail**.



If the pre-drilling is not performed during nailing, intra-medullary **nail** is introduced directly, entire **nails** of diameters 8, 9 or 10 mm can be used.

The nail length is either deducted by **X-ray contrast ruler** or we can help ourselves by introduced **introducer** (we check the position of its distal end and we measure the part that sticks out of the bone by the **introducer** of the same length and we measure the remaining length).

# TIBIAL NAIL

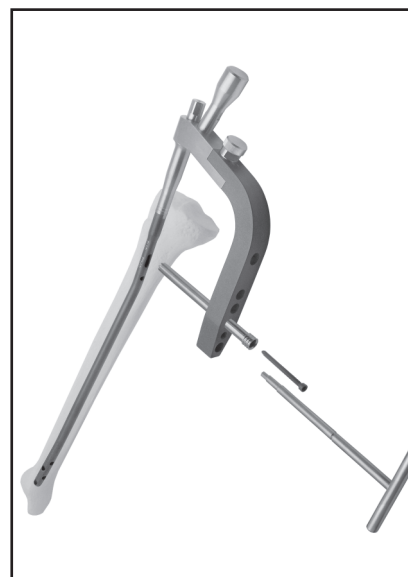
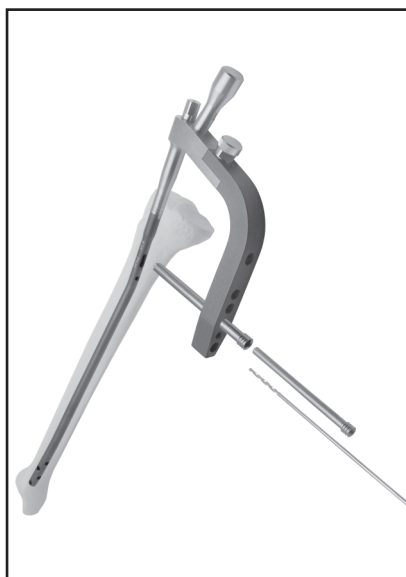
## SURGICAL TECHNIQUE



When the cavity is milled, we change the **introducer** for **flushing tube** and flush the cavity. We introduce the **introducer without the olive** but only in case of introducing the cannulated **nail**. We complete chosen **nail** with **aimer** with the help of **screw** (the same **aiming device** for tibial and femoral nail, different stirrup for reconstruction nail) and we start to introduce the **nail**. Slam the adapted part of the **aimer** – **impactor**. The **impactor** is screwed into the **aimer** in the same way as a **hammer**. It is recommended to use (to screw) the hammer. The **guide rod of the hammer** and also of the **impactor** must be strongly tightened during using, so that they don't get strained.



The **guide rod of the hammer** is placed on the **aiming device** eccentrically toward axis of the nail for easier manipulation. The **nail** is introduced by the hits of the **hammer**. Undesired rotation of the **nail** must be prevented during introduction. A groove is milled on the **aiming device**. The groove can be seen under X-ray and it shows how far the **tibial nail** is stuck. The **introducer** is removed after nail introduction.



Proximal locking is not problematic when using the **aimer**. It is suitable to remove the **hammer** before locking. One or two **locking screws** can be introduced. The holes in the **nails** only enable introduction mediolateral respective lateromedial. The upper hole for the **screw** is oval, **screw** introduction by **aimer** enables dynamic and static locking. The compression of the fracture place can be achieved directly on the operating table by **compression screw** introduced on the upper end axially into the nail cavity during lastly mentioned way

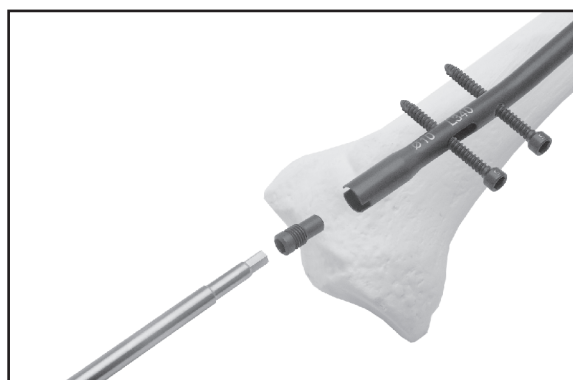
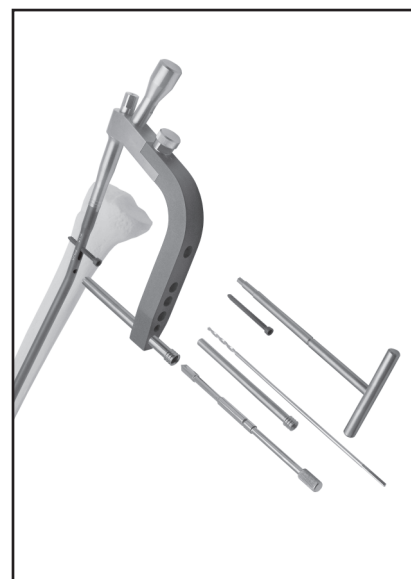
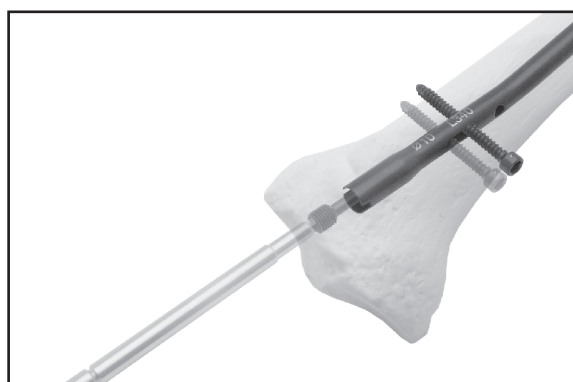
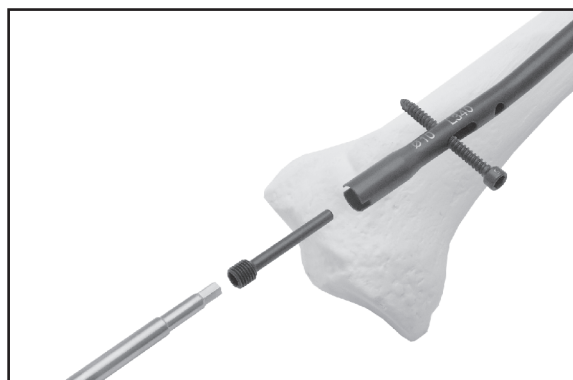
of locking. Maximal compression extent is 10 mm. (Distal locking must be performed, only one **screw** can be introduced proximally into the oval hole of the **nail**. **Compression screw** leans on the proximal **locking screw** in the nail cavity and with the next introduction compresses distal fragment of the bone to the proximal one).

During **nail** introducing the distraction of the fracture place may happen and also the necessity of bringing the fragments closer by more than 10 mm. Then it is convenient to keep the **aimer**, possibly remove the **handle** and the **hammer weight**, perform the distal locking and complete the **hammer** again. Approach and certain place compression can be achieved by opposite **hammer** hits (as during extraction). This procedure can be combined with the procedure mentioned in the previous paragraph.

Drilling **sleeve 2** completed with **trocár** is introduced via chosen hole of the **aimer** for easier introduction. At the contact place of trocár point incise the skin about 15 mm according to need. We introduce the **sleeve** to the bone by pressure of hand first then by **hammer** tapping. Make a depression in the bone by an impact on the **trocár** for easier **drill** fixing. Remove the **trocár** and tap the **sleeve** in a way that the serrated inner edge fits well on the bone. Put the drill **sleeves 4** into **sleeve 2**. **Sleeve 4** is for **drill of diameter 3,5 mm** and **screw shape 1**. We drill holes in both cortices with a **drill of diameter 3,5 mm**. Remove **sleeve 4** and determine a needed length of introduced **locking screw** with a **depth gauge**. Doubts about the mark placing, against which we deduct the length on the scale, dispel by setting the **depth gauge** on zero level (etirely retracted) where the mark placing is completely explicit. We deduct needed length of **locking screw**, correction of distance from **sleeve 2** to outer cortex is done on the scale! **Locking screws** are self tapping and they can be introduced in this phase. It is possible to use **screw tap** fixed in the **hand chuck**. You can introduce the second **locking screw** in the same way. The **screw** is introduced by a **screwdriver** with **sleeve 2**.

**Locking screw shape 2** does not have the thread along the whole length and so after drilling both cortices with a **drill of 3,5 mm diameter**, we change the drilling **sleeve 4** for **sleeve 3**. We drill the closer cortex with a **drill of 5 mm diameter** and then we introduce the **locking screw**. The extraction can be performed with the help of **screw extractor** completed with the **screwdriver**. If we add a **screw extractor** to the **screwdriver**, it is possible to unscrew the **screw** and pull at the same time. Drilling **sleeves 5** of inner diameters 4,4 mm are suitable for **screws 3** and **sleeve 6** with inner diameter 2,9 mm with appropriate drill diameters. **Screw** introducing of shape 3a is the same as **screw** introducing of shape 1 but screw 3b of diameter 3,5 mm is introduced with **sleeve 7** because of different size of the screw's head.

A drilling **sleeve 1** is also supplied but it is not a part of the nail locking instrumentation. It can be pushed into **aiming device** and it allows **K-wire** introduction with 2,5 mm diameter (lengths 160 and 300 mm) to check the position of **locking screw** before drilling.





Before distal locking we remove the **aimer** by loosening **aimer's screw** with socket **wrench** from the instrumentation and by pushing the **aimer** out. We can perform the fracture compression directly on the table with **compression screw** or to close the cavity with a **stopper**.

Distal locking is more difficult. After some experience locking „by hand“ was chosen. First, C arm of mobile X-ray is exactly set in the axis. The nail holes for **locking screws** must be exactly of circle shape on the screen. After the skin incision, introduce the **double aimer with holder**. Check the position of the **sleeve** by X-ray and push the **sleeve** to the bone by a **hammer**. Then introduce the **trocars** in the same way as during proximal locking.

**Sleeve 1** can be inserted in the **aimer** and the position is checked by **K-wire 2,5 mm** introduction. Then **sleeves 3 and 4** (possibly **5 or 6**) are inserted, both cortices are drilled with appropriate **drill**, **drilling sleeve** is removed. The length of **locking screw** is measured with the **depth gauge**. **Screw tap** can be used for **screw shape 1 and 2** according to consideration. Chosen **screw** is introduced via sleeve of the **aimer**.

We introduce 1–4 distal **locking screws**, nail holes enable introduction in two levels.

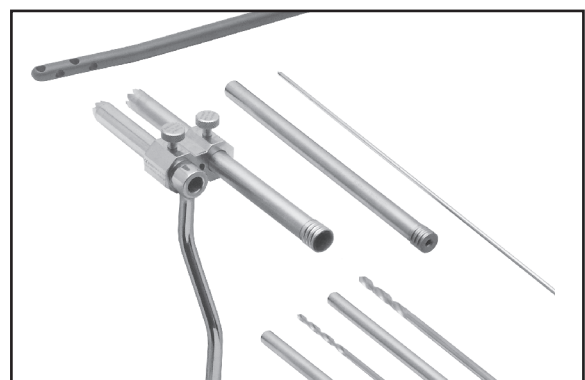
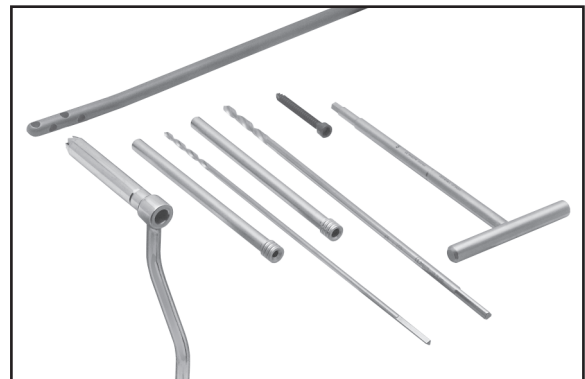
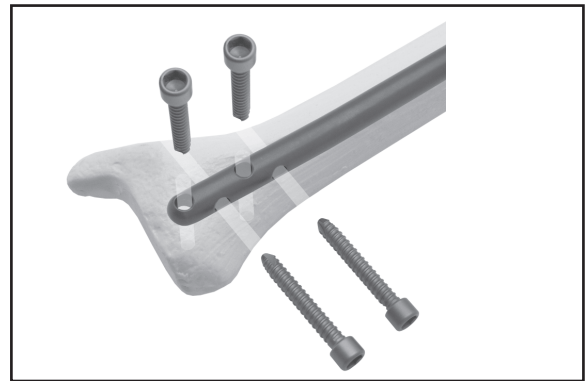
Wound above *lig. proprium patellae* is rinsed and all wounds are closed with sutura.

X-ray documentation is usually performed by snaps of chosen views from the screen of amplifier; however the standard X-ray snap in two projections of large format is necessary for exact axis determination of synthesis bone.

If the skeletal traction was introduced, it is removed. We do not fix the operated limb, it is also suitable to use elastic bandage above the knee over soft bandage.

### COLOUR MARKING OF DRILLING SLEEVES AND RELEVANT 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
Sleeve 6 (129 79 8450) and drill Ø 2,9 (129 79 8440)	green



## RECOMMENDED INSTRUCTION OF TIBIAL NAIL EXTRACTION

First remove the **locking screws** (if it did not happen during fracture healing already). The extraction is only possible with a **screwdriver** added with a **screw extractor** (for screw shape 2) that enables unscrewing and pulling at the same time. After the skin incision, introduce the **screw extractor** with **trocars** to the extracted **screw**. Trocar point heads towards the screwhead imbus. Remove the **trocars** and replace it with a **screwdriver** that is completed with the **screw extractor** by pressure until it clicks.

The **stopper** must be removed from the proximal nail hole, possibly **compression screw**. The **extraction bar** and a **handle** together with the **weight** is screwed on the inner thread in the proximal nail part. The **nail** is slammed out by impact of **weight** on the **handle**.

## RECOMMENDED INSTRUCTION OF OSTEOSYNTHESIS BY NON PRE-DRILLED INTRAMEDULLARY NAILS

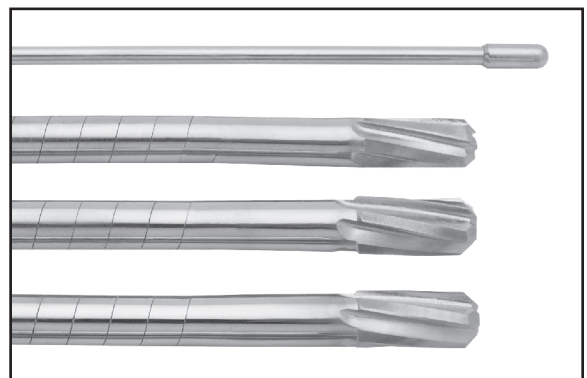
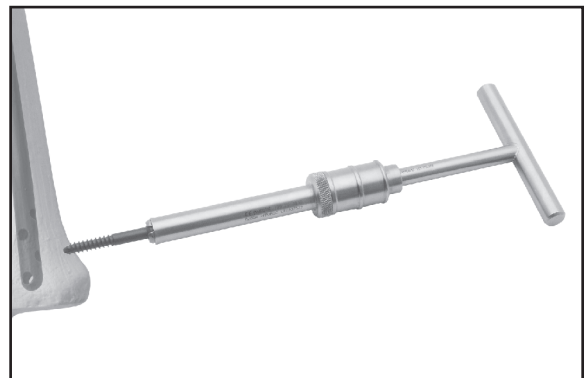
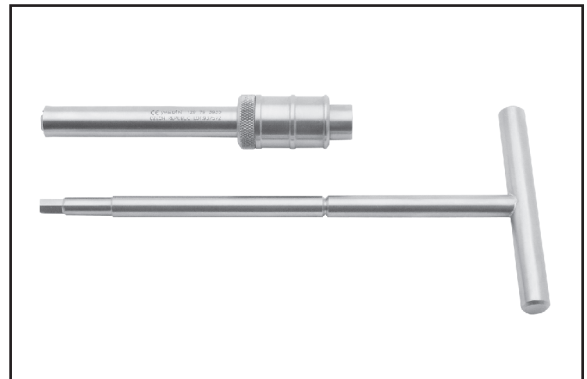
In the group of intramedullary tibial nails MEDIN, there are some diameters changed to non pre-drilled introduction - entire tibial nails of diameters 8, 9 and 10 mm, milling of medullary cavity is not needed, otherwise the instructions do not differ from the above mentioned ways of osteosynthesis.

## MILLING CUTTERS INTRAMEDULLARY

Different **milling cutters** MEDIN serve for pre-drilling of medullary cavity. Complete set starts with **milling cutter** of diameter 8 mm and continues after 0,5 mm up to diameter 16,5 mm. Sizes up to 16 mm are standard sizes of the set, size 16,5 mm is offered individually, alternatively with firm drill 16,5 mm. **Terminal** enables connection of **milling cutters** and a drill to commonly used propulsive units.

THE DRILL MUST NOT BE USED IN REVERSE! „Unreeling“ of the flexible spindle of the **milling cutter** might happen even during slightest weighting.

We request using the **milling cutters** only with original **guide wires** MEDIN, diameter 3 mm and length 950 and 1150 mm, ended with an Olive. It is prohibited to use the **milling cutters** without the **guide wires**. Milling operation has to start with the cutter of 8 mm, this is the only one specially adjusted for face angle. It is not recommended to omit some sizes of cutters; consequently it is necessary to do the milling after 0,5 mm.

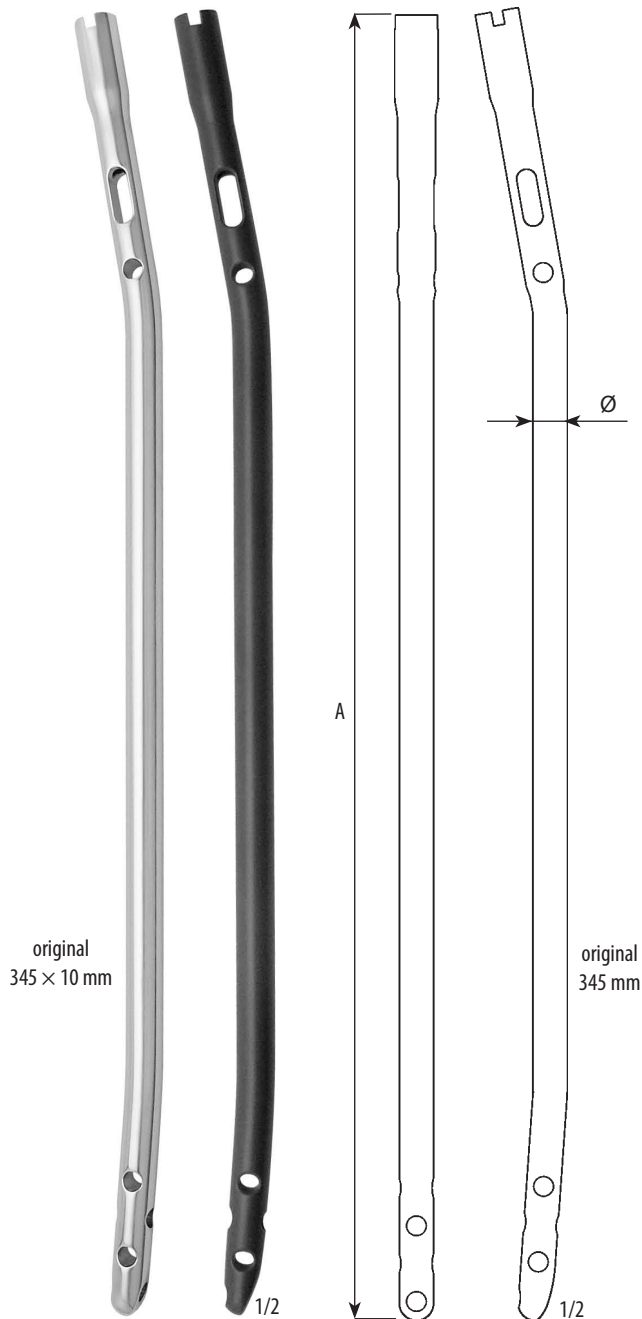




# TIBIAL NAIL IMPLANTS



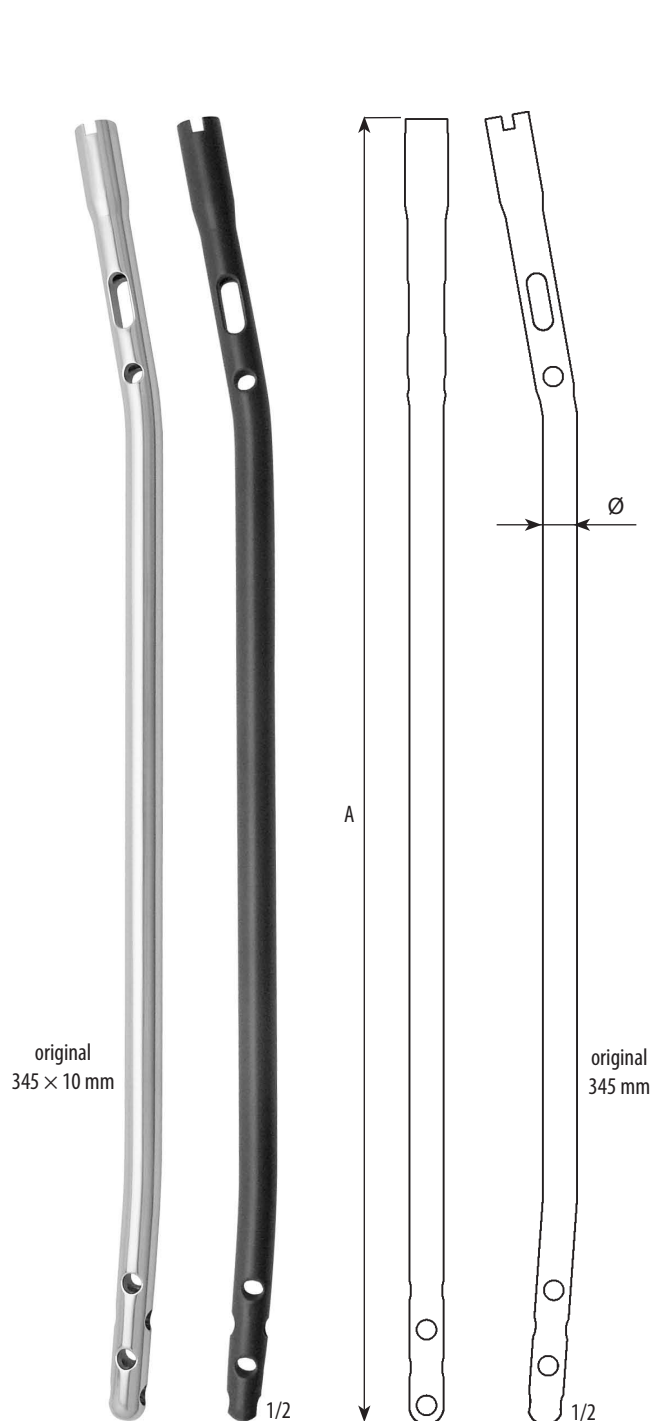
## TIBIAL INTRAMEDULLARY NAILS



	titanium	A	Ø
129 77 6020	129 77 6023	240 mm	8 mm
129 77 6030	129 77 6033	255 mm	8 mm
129 77 6040	129 77 6043	270 mm	8 mm
129 77 6050	129 77 6053	285 mm	8 mm
129 77 6060	129 77 6063	300 mm	8 mm
129 77 6070	129 77 6073	315 mm	8 mm
129 77 6080	129 77 6083	330 mm	8 mm
129 77 6090	129 77 6093	345 mm	8 mm
129 77 6100	129 77 6103	360 mm	8 mm
129 77 6110	129 77 6113	270 mm	9 mm
129 77 6120	129 77 6123	285 mm	9 mm
129 77 6130	129 77 6133	300 mm	9 mm
129 77 6140	129 77 6143	315 mm	9 mm
129 77 6150	129 77 6153	330 mm	9 mm
129 77 6160	129 77 6163	345 mm	9 mm
129 77 6170	129 77 6173	360 mm	9 mm
129 77 6180	129 77 6183	375 mm	9 mm
129 77 6190	129 77 6193	390 mm	9 mm
129 77 6490	129 77 6493	405 mm	9 mm
129 77 6500	129 77 6503	420 mm	9 mm
129 77 6200	129 77 6203	270 mm	10 mm
129 77 6210	129 77 6213	285 mm	10 mm
129 77 6220	129 77 6223	300 mm	10 mm
129 77 6230	129 77 6233	315 mm	10 mm
129 77 6240	129 77 6243	330 mm	10 mm
129 77 6250	129 77 6253	345 mm	10 mm
129 77 6260	129 77 6263	360 mm	10 mm
129 77 6270	129 77 6273	375 mm	10 mm
129 77 6280	129 77 6283	390 mm	10 mm
129 77 6290	129 77 6293	405 mm	10 mm
129 77 6300	129 77 6303	420 mm	10 mm

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

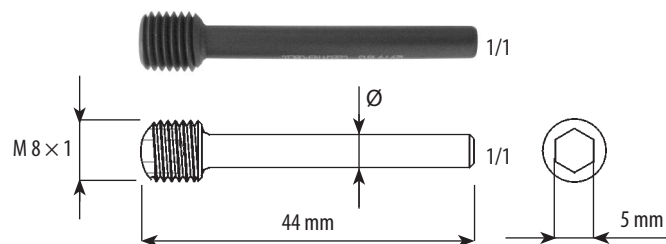
## TIBIAL INTRAMEDULLARY NAILS CANNULATED



cannulated		A	Ø
	titanium		
129 77 7610	129 77 7613	270 mm	9 mm
129 77 7620	129 77 7623	285 mm	9 mm
129 77 7630	129 77 7633	300 mm	9 mm
129 77 7640	129 77 7643	315 mm	9 mm
129 77 7650	129 77 7653	330 mm	9 mm
129 77 7660	129 77 7663	345 mm	9 mm
129 77 7670	129 77 7673	360 mm	9 mm
129 77 7680	129 77 7683	375 mm	9 mm
129 77 7690	129 77 7693	390 mm	9 mm
129 77 7700	129 77 7703	405 mm	9 mm
129 77 7710	129 77 7713	420 mm	9 mm
129 77 6750	129 77 6753	270 mm	10 mm
129 77 6760	129 77 6763	285 mm	10 mm
129 77 6770	129 77 6773	300 mm	10 mm
129 77 6780	129 77 6783	315 mm	10 mm
129 77 6790	129 77 6793	330 mm	10 mm
129 77 6800	129 77 6803	345 mm	10 mm
129 77 6810	129 77 6813	360 mm	10 mm
129 77 6820	129 77 6823	375 mm	10 mm
129 77 6830	129 77 6833	390 mm	10 mm
129 77 6840	129 77 6843	405 mm	10 mm
129 77 6850	129 77 6853	420 mm	10 mm
129 77 6310	129 77 6313	270 mm	11 mm
129 77 6320	129 77 6323	285 mm	11 mm
129 77 6330	129 77 6333	300 mm	11 mm
129 77 6340	129 77 6343	315 mm	11 mm
129 77 6350	129 77 6353	330 mm	11 mm
129 77 6360	129 77 6363	345 mm	11 mm
129 77 6370	129 77 6373	360 mm	11 mm
129 77 6380	129 77 6383	375 mm	11 mm
129 77 6390	129 77 6393	390 mm	11 mm
129 77 6400	129 77 6403	270 mm	12 mm
129 77 6410	129 77 6413	285 mm	12 mm
129 77 6420	129 77 6423	300 mm	12 mm
129 77 6430	129 77 6433	315 mm	12 mm
129 77 6440	129 77 6443	330 mm	12 mm
129 77 6450	129 77 6453	345 mm	12 mm
129 77 6460	129 77 6463	360 mm	12 mm
129 77 6470	129 77 6473	375 mm	12 mm
129 77 6480	129 77 6483	390 mm	12 mm

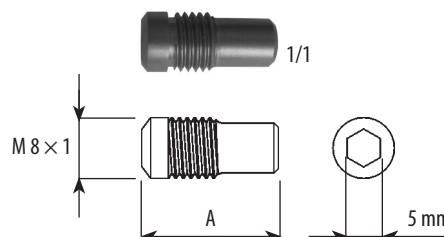
NOTES: ■ TITANIUM version – material: Ti6Al4V ELI, in accordance with ISO 5832-3.

## IMPLANTS FOR TIBIAL INTRAMEDULLARY NAILS



COMPRESSION SCREW

	titanium	Ø
<b>129 79 1800</b>	<b>129 79 1803</b>	3,2 mm
<b>129 79 1810</b>	<b>129 79 1813</b>	4,4 mm



STOPPER

	titanium	A
<b>129 77 1610</b>	<b>129 77 1613</b>	18 mm
<b>129 77 1970</b>	<b>129 77 1973</b>	23 mm
<b>129 77 1980</b>	<b>129 77 1983</b>	28 mm

NOTES: Compression screw 129 79 1803 is used for tibial intramedullary nails diameter 8 mm. Stopper 129 77 1613 is used for reconstruction nails too.

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

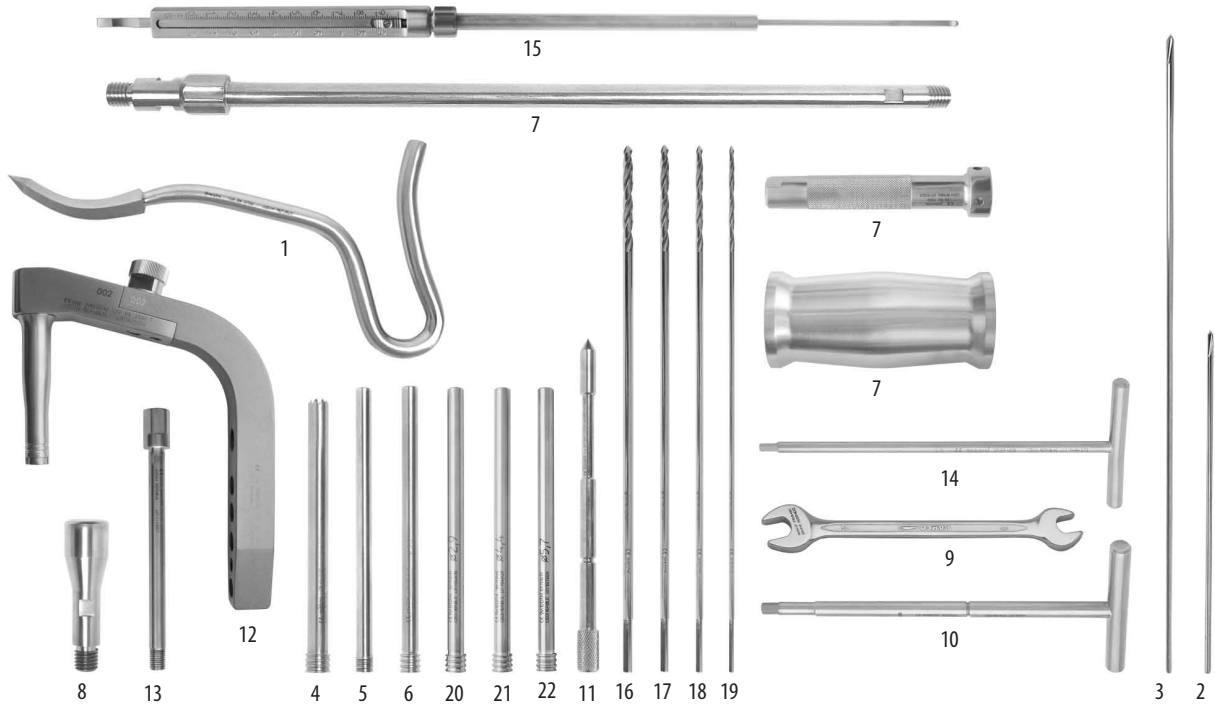
## RECOMMENDED SET OF IMPLANTS FOR TIBIAL INTRAMEDULLARY NAILS



	titanium	
1	<b>129 77 6020 ÷ 6100</b>	<b>129 77 6023 ÷ 6103</b> TIBIAL INTRAMEDULLARY NAIL; Ø 8 mm
2	<b>129 77 6110 ÷ 6500</b>	<b>129 77 6113 ÷ 6503</b> TIBIAL INTRAMEDULLARY NAIL; Ø 9 mm
3	<b>129 77 6200 ÷ 6300</b>	<b>129 77 6203 ÷ 6303</b> TIBIAL INTRAMEDULLARY NAIL; Ø 10 mm
4	<b>129 77 7610 ÷ 7710</b>	<b>129 77 7613 ÷ 7713</b> TIBIAL INTRAMEDULLARY NAIL CANNULATED; Ø 9 mm
5	<b>129 77 6750 ÷ 6850</b>	<b>129 77 6753 ÷ 6853</b> TIBIAL INTRAMEDULLARY NAIL CANNULATED; Ø 10 mm
6	<b>129 77 6310 ÷ 6390</b>	<b>129 77 6313 ÷ 6393</b> TIBIAL INTRAMEDULLARY NAIL CANNULATED; Ø 11 mm
7	<b>129 77 6400 ÷ 6480</b>	<b>129 77 6403 ÷ 6483</b> TIBIAL INTRAMEDULLARY NAIL CANNULATED; Ø 12 mm
8	<b>129 77 1610 ÷ 1980</b>	<b>129 77 1613 ÷ 1983</b> STOPPER
9	<b>129 79 1800</b>	<b>129 79 1803</b> COMPRESSION SCREW
10	<b>129 79 1810</b>	<b>129 79 1813</b> COMPRESSION SCREW
11	<b>129 79 1500 ÷ 1760</b>	<b>129 79 1503 ÷ 1763</b> LOCKING SCREW
12	<b>129 79 1510 ÷ 1310</b>	<b>129 79 1513 ÷ 1313</b> LOCKING SCREW
13	<b>129 79 4670 ÷ 4800</b>	<b>129 79 4673 ÷ 4803</b> LOCKING SCREW
14	<b>129 79 4810 ÷ 4940</b>	<b>129 79 4813 ÷ 4943</b> LOCKING SCREW
15	<b>129 77 6551 ÷ 6741</b>	<b>129 77 6554 ÷ 6744</b> LOCKING SCREW WITH LOWER PROFILE OF THE THREAD
16	<b>129 79 9631 ÷ 9761</b>	<b>129 79 9634 ÷ 9764</b> LOCKING SCREW WITH LOWER PROFILE OF THE THREAD

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

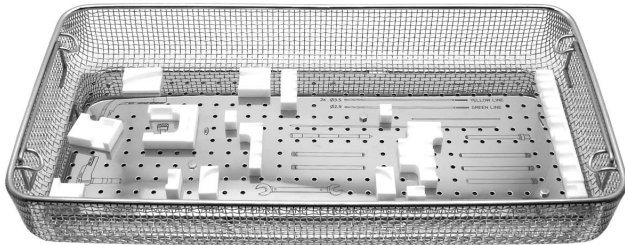
## INSTRUMENTS FOR TIBIAL, FEMORAL AND RETROGRADE INTRAMEDULLARY NAILS



### 129 79 9240

set

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

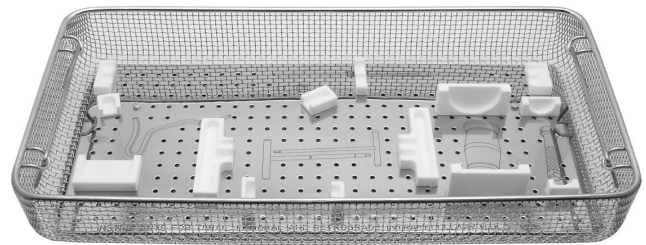


SIEVE FOR INSTRUMENTS FOR INTRAMEDULLARY NAILS

**129 69 4530**

480 × 240 × 50 mm

Fig. 1



SIEVE FOR INSTRUMENTS FOR INTRAMEDULLARY NAILS

**129 69 4540**

480 × 240 × 70 mm

Fig. 2

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**TIBIAL NAIL****2010**