



# Sirus<sup>®</sup> Intramedullary Tibia Nail System

Surgical Technique



Anatomic Nail for Reamed and Nonreamed Technique

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# Sirus® Intramedullary Nail for Tibia

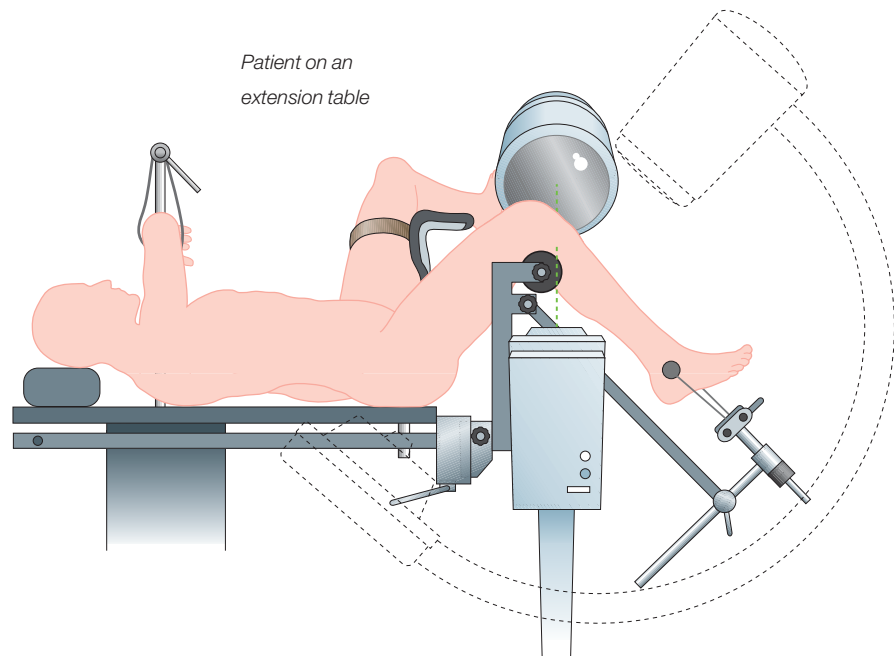
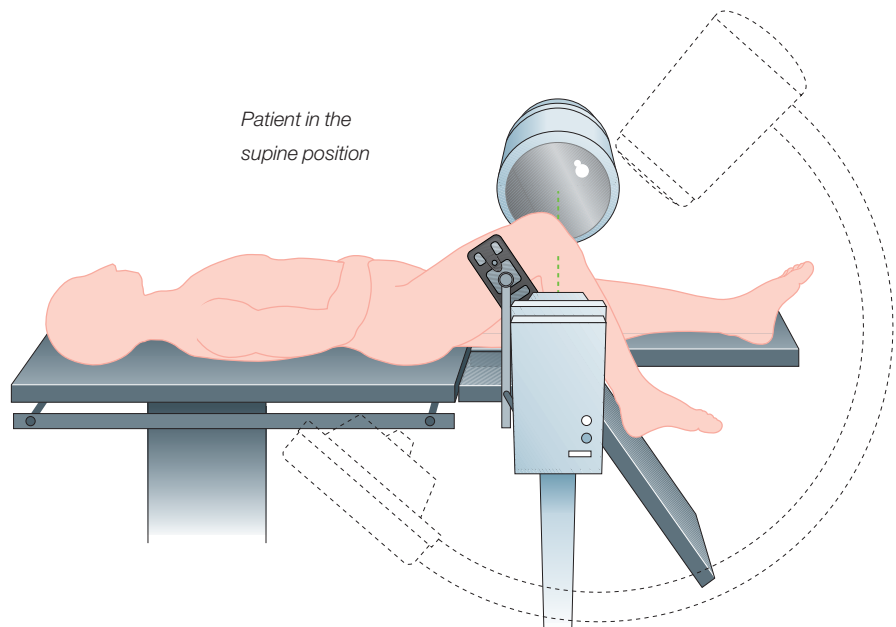
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# Surgical Technique

## Positioning of the Patient

The patient is placed on the operating table in the supine position. It should be possible to flex the knee of the injured leg at least through 90°. The use of a femoral holding device is helpful.

After the patient is in the correct position, the C-arm must be adjusted so that the tibia can be imaged in both planes along its whole length. Positioning of the patient on an extension table is also possible.

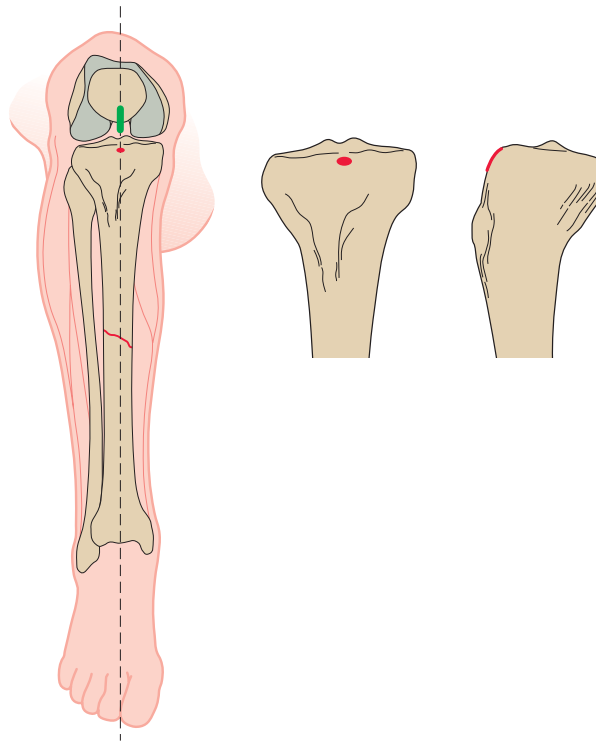


# Opening of the Medullary Canal

## Incision of the skin

## Entry point of the intramedullary nail

The entry point of the intramedullary nail lies in the prolongation of the axis of the diaphysis at the upper margin of the tibia. In the case of percutaneous insertion, a longitudinal incision of about 25mm is made at the lower margin of the patella.



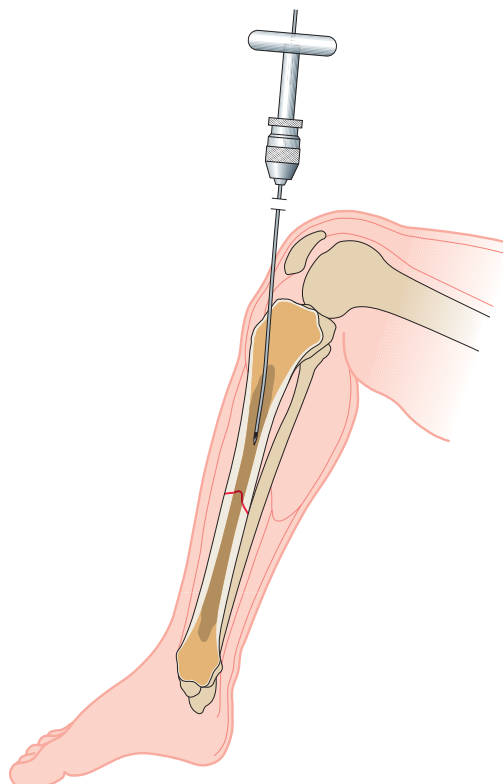
- Incision for percutaneous insertion (green)
- Entry point of insertion of the intramedullary nail (red)
- Insertion of the guide rod into the medullary canal

## 1. Insertion of the guide rod

The guide rod  $\varnothing$  3.0mm, length 365mm, is clamped into the universal chuck. The approach into the entry point in most cases is possible along the medial edge of the ligamentum patellae. A transligamental approach is also possible. The tip of the guide rod is placed at the entry point and driven forward, about 150mm into the medullary canal. Finally, the universal chuck is removed and the correct position of the guide rod in both planes is confirmed with the image intensifier.

### NOTE

In very proximal fractures the approach sometimes has to be lateral of the ligamentum patellae to avoid valgus malalignment.



*Insertion of the guide rod into the medullary canal*

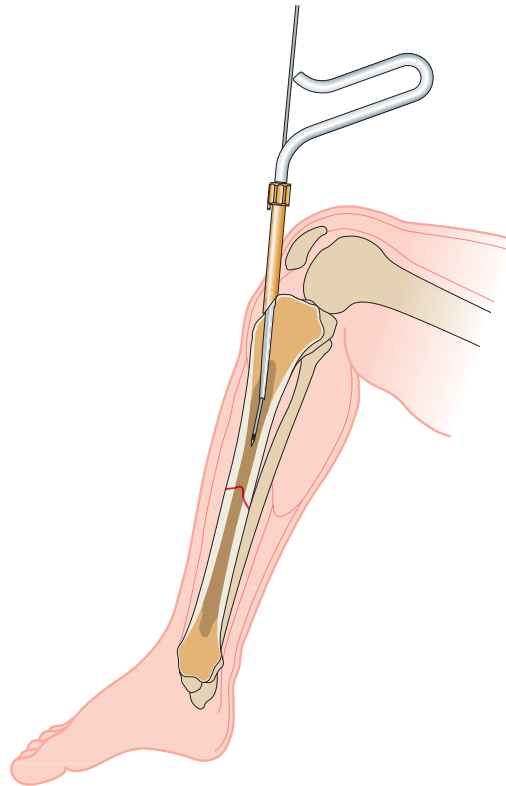
# Nonreamed Method

## 1. Opening of the medullary canal

The tissue protection sleeve ( $\varnothing$  10mm) is inserted over the guide rod ( $\varnothing$  3.0mm, length 365mm). The cannulated awl is driven forward over the guide rod, with light rotating movements until the stop on the tissue protection sleeve is reached.

### NOTE

The solid  $\varnothing$  8.3mm intramedullary nail for tibia cannot be inserted over the guide wire.

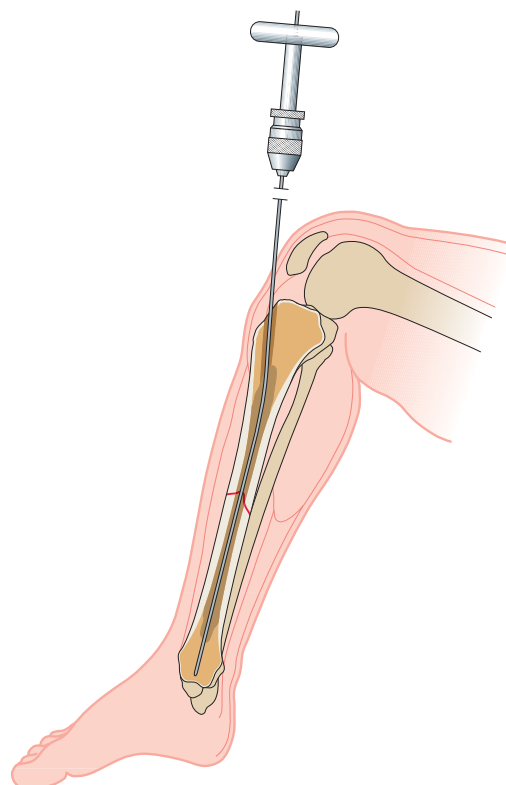


*Opening of the medullary canal with the awl and the tissue protection sleeve over the guide rod*

## 2. Insertion of the guide wire

After removal of the awl, the guide rod and the tissue protection sleeve, the smooth guide wire ( $\varnothing$  3.0mm) is inserted into the medullary canal with the universal chuck. Using image intensifier in both planes, the guide wire is pushed forward into the distal fragment and positioned centrally in the distal tibial metaphysis.

For continuing procedures for the nonreamed method, go to page 14.



*Insertion of the guide wire with the universal chuck*

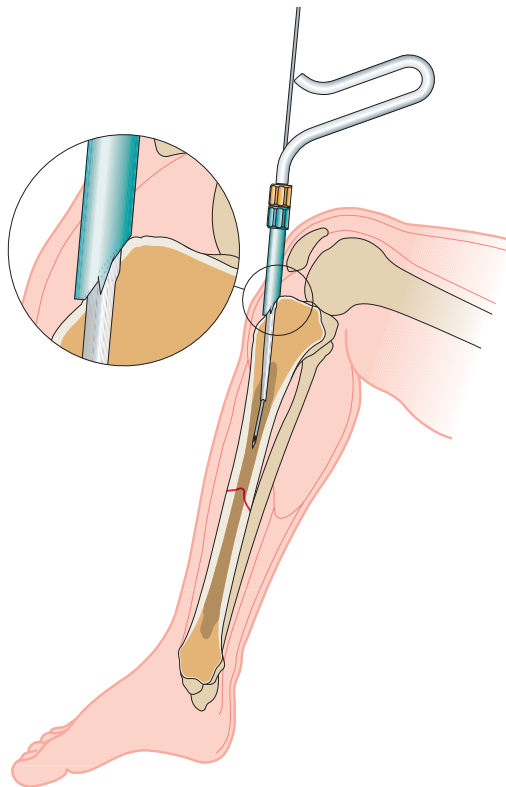
# Reamed Method

## NOTE

For the reamed method, the instrumentation for the medullary reaming is needed.

### 1. Opening of the medullary canal and insertion of the outer tissue protection sleeve

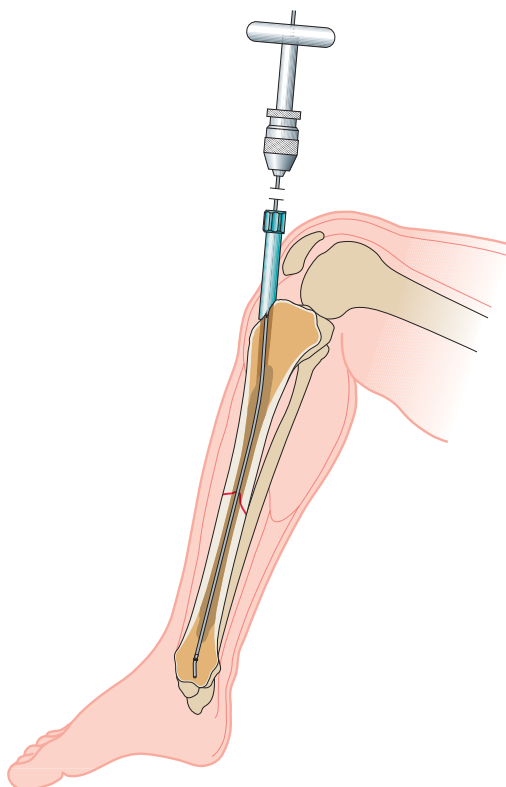
If the medullary canal is to be reamed, the outer tissue protection sleeve ( $\varnothing$  12mm) must first be pushed over the inner tissue protection sleeve ( $\varnothing$  10mm). After the medullary canal is opened, the outer tissue protection sleeve  $\varnothing$  12mm remains in position and is anchored with a light hammer-hit on the head of the tibia after the awl and the inner protection sleeve ( $\varnothing$  10mm) have been removed.



*Tissue protection sleeve (for the reamed method) is pushed over the inner tissue protection sleeve (for opening with the awl)*

### 2. Insertion of the reaming rod with offset ball tip

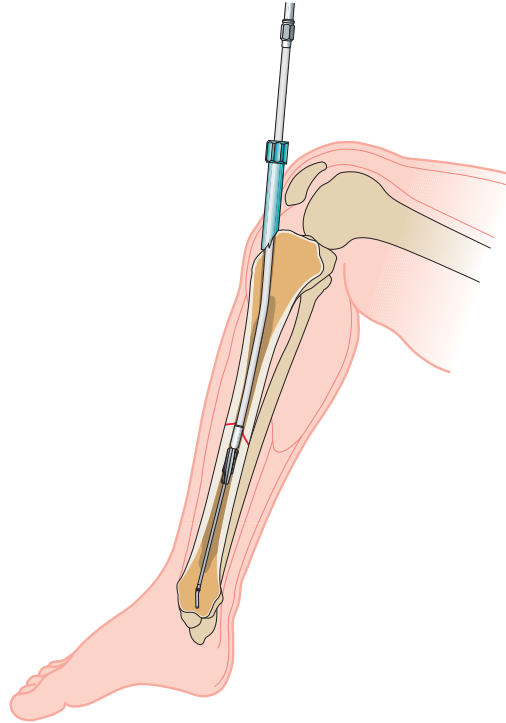
Under image intensifier the ball-tip guide wire ( $\varnothing$  3.0mm) is inserted into the medullary canal with the universal chuck. The correct position of the ball-tip and correct reposition of the fracture zone is then confirmed in both planes.



*Insertion of the reaming rod with offset ball tip for the medullary canal drill*

### 3. Reaming of the medullary canal

Ream the medullary canal to the desired internal diameter in 0.5mm increments. The diameter of the last step should be about 1mm larger than the diameter of the selected intramedullary nail for tibia. To prevent heat necrosis, reaming must be carried out with reamers. No excessive pressure must be applied.

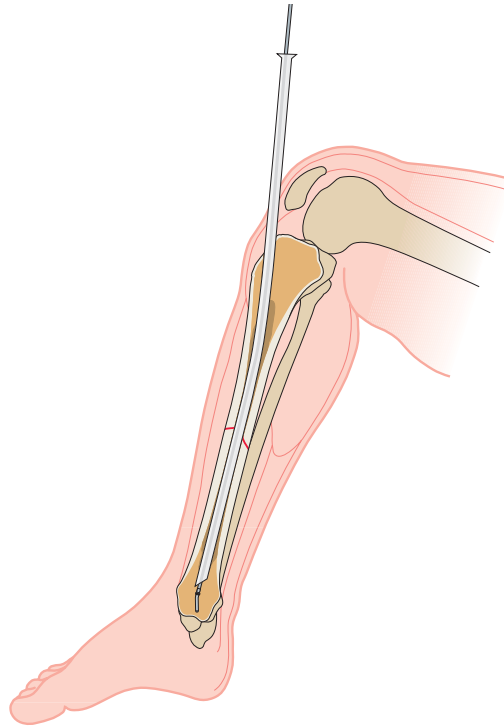


*Reaming of the medullary canal with the flexible intra-medullary reamer*

#### 4. Replacement of the ball-tip guide wire with the smooth guide wire

##### NOTE

The ball-tip guide wire must be replaced by the smooth guide wire since it cannot be removed with the nail inserted. In order to prevent dislocation of the bone fragments during this process, the exchange tube is inserted over the ball-tip guide wire. It is then removed and replaced by the smooth guide wire. Finally, the medullary tube is removed.



*Insertion of the medullary tube to replace the ball-tip guide wire with the smooth guide wire*

# Insertion of the Intramedullary Nail for Tibia

## 1. Fastening of the targeting device

The length and diameter of the intramedullary nail for tibia are intraoperatively determined with the measuring device or preoperatively with the X-ray templates. The targeting device is attached to the previously determined intramedullary nail and fixed with the connection screw for the targeting device. The cams of the targeting device must engage exactly in the groove of the intramedullary nail and the connection screw must be tightened firmly. The targeting device needs to be placed to the medial side.

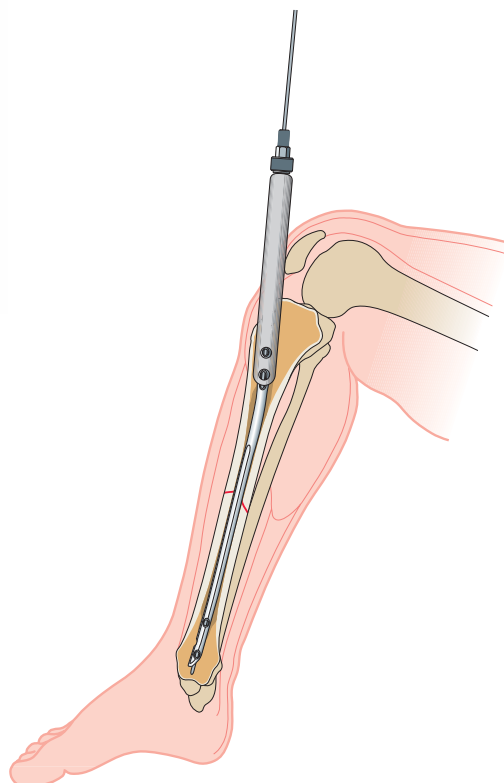


## 2. Insertion of the intramedullary nail for tibia with the targeting device

Using slight pressure and with oscillating movements the intramedullary nail is inserted by hand over the smooth guide wire ( $\varnothing$  3.0mm) into the medullary canal.

### NOTE

If a solid  $\varnothing$  8.3mm intramedullary nail for the tibia is used, no guide wire can be used.



If necessary, the intramedullary nail for the tibia is driven into the medullary canal with light, controlled blows. The Ram (Slaphammer) guide is screwed onto the connection screw and the Ram (Slaphammer) is mounted onto the Ram (Slaphammer) guide. Finally the driving head is screwed onto the Ram (Slaphammer) guide to allow for extraction if necessary.

**NOTE**

It is important that the nail advances into the medullary canal with each blow. If this is not the case, the impaction must be stopped and the cause determined using the image intensifier. If necessary, use a nail with a smaller diameter or ream the medullary canal larger.

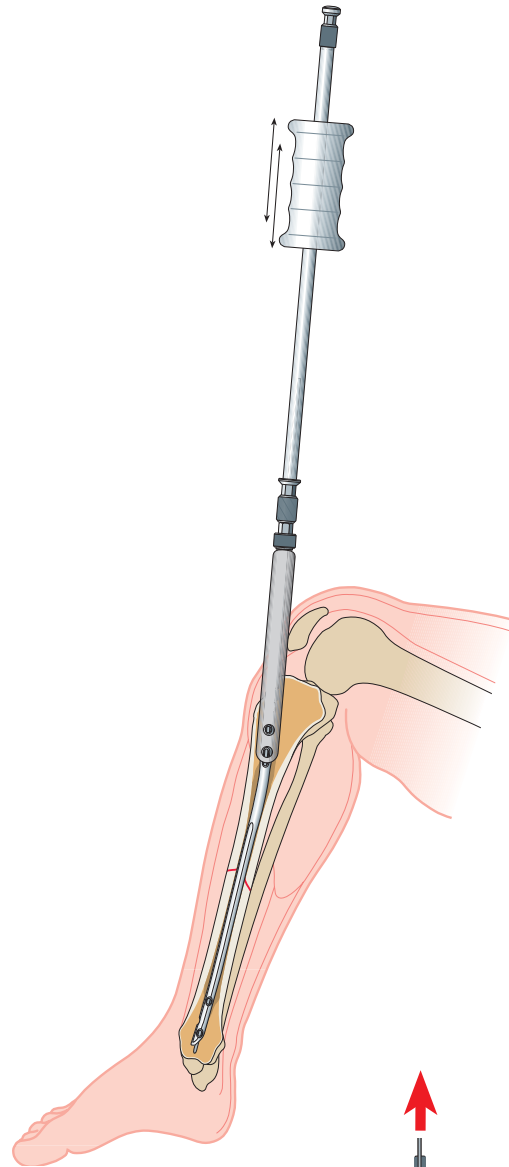
The driving of the intramedullary nail through the fracture zone and the final phase of the insertion should be carried out using the image intensifier. The Ram (Slaphammer) assembly is then removed from the connection screw. The connection screw remains firmly attached to the nail and the targeting device.

**3. Removal of the guide wire**

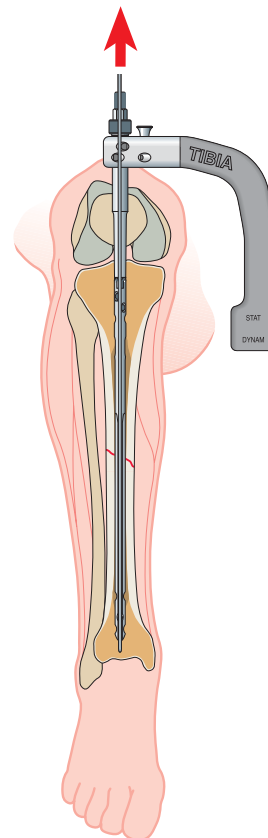
Tip: If it is difficult to remove the guide wire, the Ram (Slaphammer) can be used in combination with the upside-down connected universal chuck.

**4. Confirm the final position of the intramedullary nail**

Confirm the final position of the intramedullary nail for tibia in both planes with the image intensifier.



*Controlled driving-in of the intramedullary nail for tibia with the Ram (Slaphammer)*



*Removal of the guide wire*

# Options for Proximal Locking

## NOTE

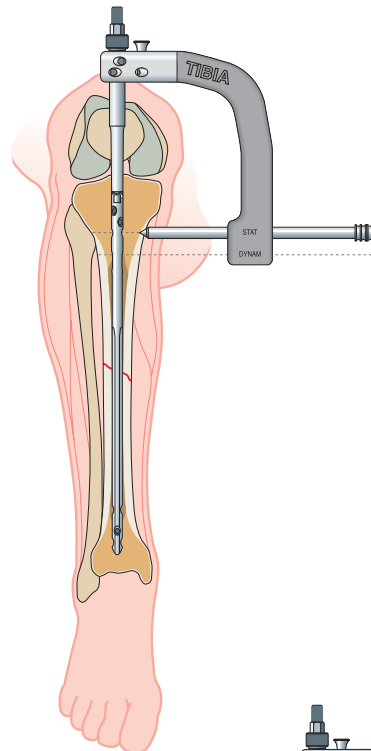
The reaming rod or guide wire must be removed before locking the nail.

The proximal locking can be carried out statically or dynamically. For dynamic locking, only one locking screw has to be positioned in the long hole.

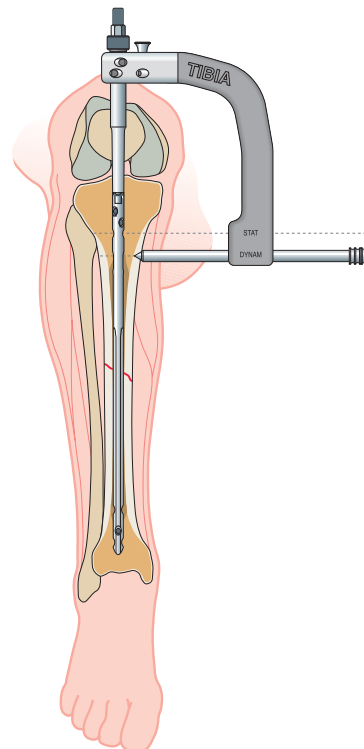
## Proximal locking-static or dynamic

For static locking, there are three possible screw positions (one parallel to the anterior plane, marked STAT; and the two higher placed screws at 45° to the anterior plane).

For dynamic locking, the distal hole on the targeting device marked DYNAM is used.



*Targeting device with tissue protection sleeve and trocar in position for static mediolateral locking*

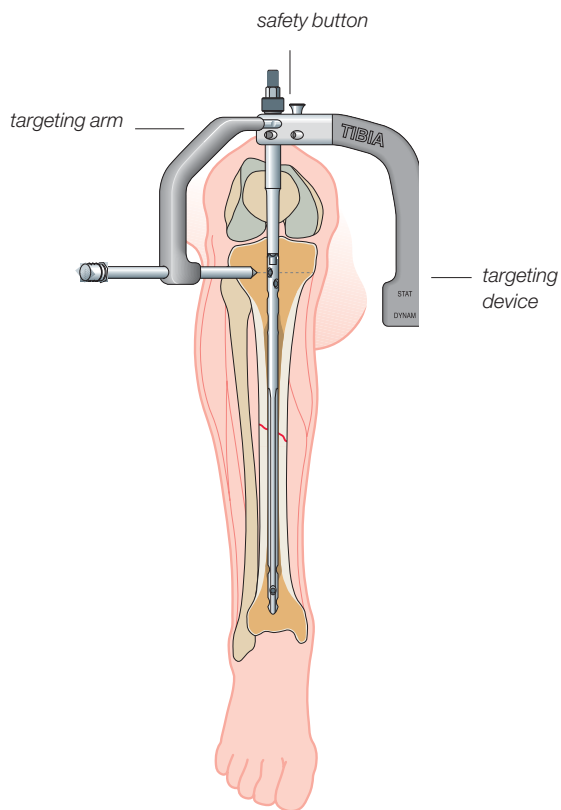


*Targeting device with tissue protection sleeve and trocar in position for dynamic mediolateral locking*

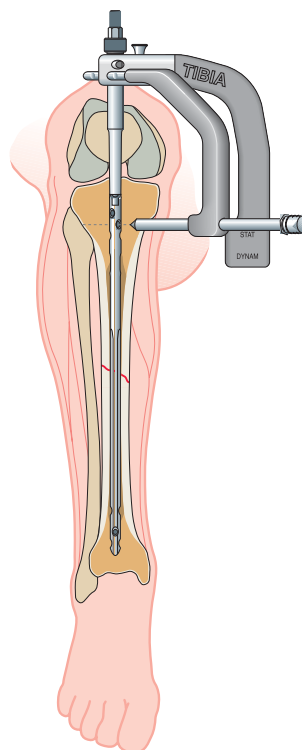
### Use of the static proximal 45° locking

Especially in the case of high proximal fractures, it is possible to use up to four locking options.

In this case, the two 45° locking screws are locked with the additional targeting arm, which is inserted into the targeting device as illustrated here. The safety button on the targeting device serves as a lock. To insert or release the targeting arm, this safety button must be unlocked by lifting up.



Targeting device with targeting arm, tissue protection sleeve and trocar in position for upper static 45° locking



Targeting device with targeting arm, tissue protection sleeve and trocar in position for lower static 45° locking

# Surgical Steps for Proximal Locking

## CAUTION

If fracture compression is required, the distal locking should be completed first. In this case the knee must not be extended. The soft tissues could be damaged and the nail could break through the proximal cortex due to a levering effect in the anterior direction.

Compression can be achieved by using the Ram (Slaphammer) assembly and applying slight Ram (Slaphammer) blows in the proximal direction.

**1. Removal of the guide wire and confirmation that the connection screw is firmly fastened**

**2. Insertion of the tissue protection sleeve with the trocar**

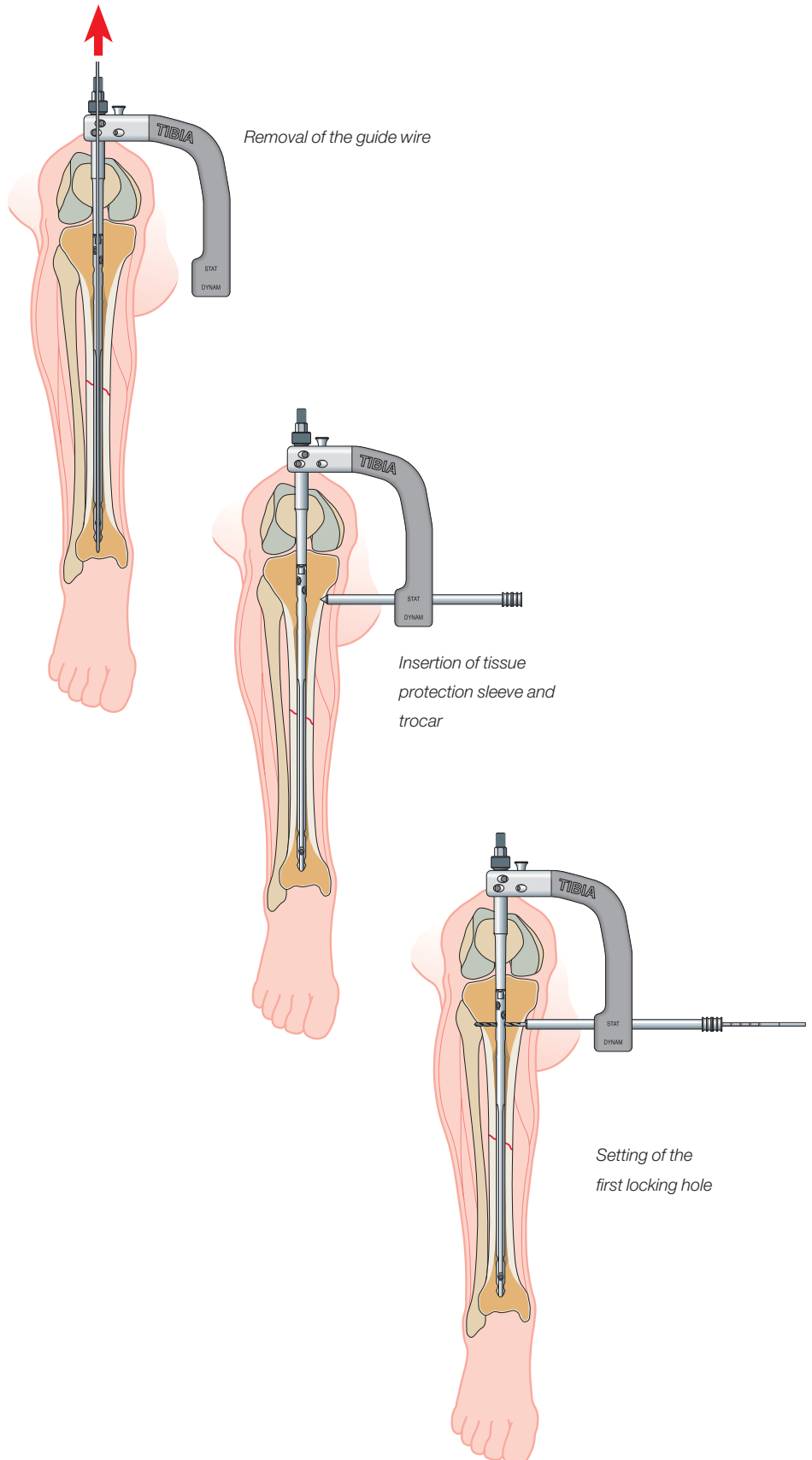
Depending on the fracture a static or dynamic locking should be achieved. For this, the tissue protection sleeve  $\varnothing 10.0/8.0\text{mm}$ , with trocar  $\varnothing 8.0\text{mm}$  insert, is introduced into the appropriate guide hole, marked with STAT or DYNAM.

The skin is incised at the appropriate location and dissected bluntly to the bone with scissors and clamp. The tissue protection sleeve together with the trocar is inserted until it is in close contact with the bone surface.

The trocar is then removed.

**3. Drilling of the locking holes**

The drill guide  $\varnothing 8.0/4.0\text{mm}$  is inserted into the tissue protection sleeve. Both cortices are carefully drilled with the three-fluted drill bit ( $\varnothing 4.0\text{mm}$ ).



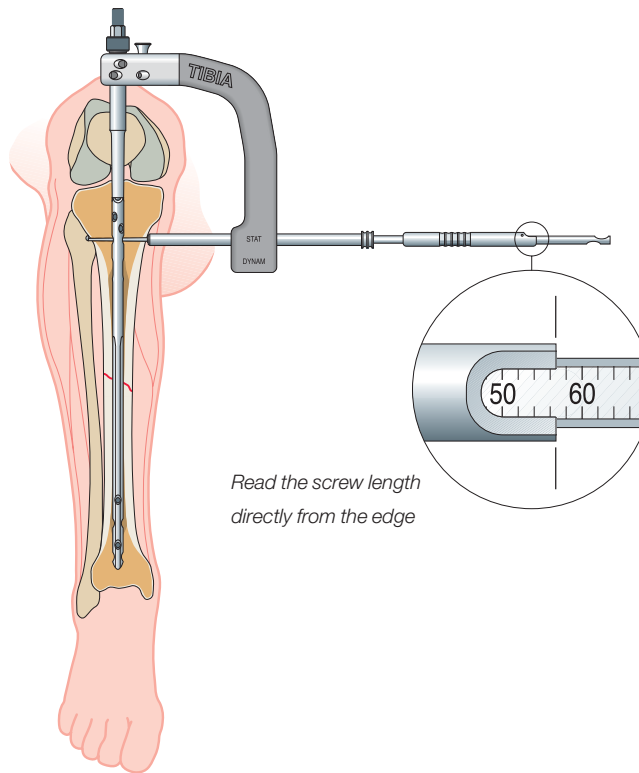
#### 4. Measuring of the screw length

The screw length is determined by the measuring device for locking screws.

Alternatively, the screw length can be read directly from the drill. It is important that the drill's tip only slightly protrudes from the second cortex when the screw length is being read from the drill.

#### NOTE

In both cases the screw length is directly read.

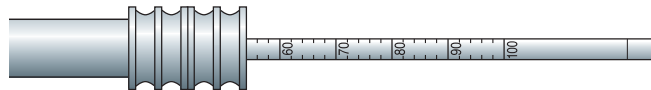


Measuring of the screw length with the measuring device for locking screws

Read the screw length directly from the edge

#### 5. Insertion of the locking screw $\varnothing$ 4.9 mm

The previously determined locking screw ( $\varnothing$  4.9mm) is inserted through the tissue protection sleeve with the solid hexagonal screwdriver.



Direct reading of the screw length on the drill

#### 6. Confirmation of correct locking screw placement

The correct placement of the inserted locking screw must be confirmed in both planes with the image intensifier.

#### 7. Insertion of additional proximal locking screws

For inserting additional proximal locking screw, repeat steps 2 to 6.

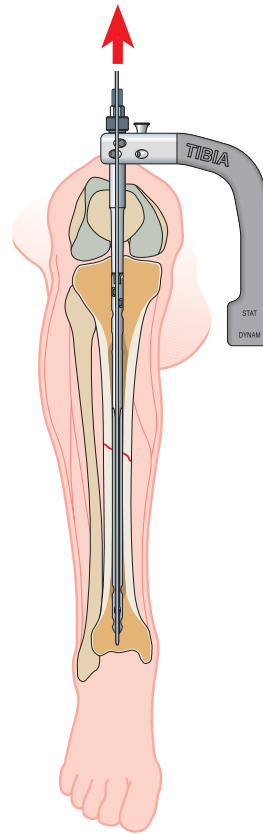
# Surgical Steps for Distal Locking

## CAUTION

**Distally, at least two locking screws must be inserted.**

For the  $\varnothing$  8.3mm and  $\varnothing$  9.3mm tibial nail, distal locking screws ( $\varnothing$  3.9mm) must be used. For the  $\varnothing$  10mm tibial nail, distal locking screws ( $\varnothing$  4.9mm) must be used.

### 1. Removal of the smooth guide wire



*Removal of the guide wire before locking*

### 2. Positioning of the C-arm

The C-arm needs to be positioned so that the locking hole into which the screw is to be inserted appears circular on the monitor and is situated approximately in the center of the image.



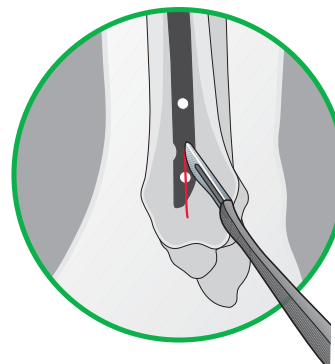
Wrong



Right

### 3. Incision of the skin

The skin is incised over the selected hole. The bone is then exposed by splitting the soft tissues.



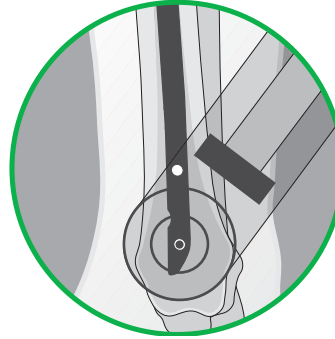
*Incision of the skin with the scalpel*

#### 4. Drilling of the locking holes

Using the C-arm and radiolucent drill attachment, the tip of the drill bit\* is centered above the appropriate locking hole. Afterwards a hole is drilled through both cortices.

#### CAUTION

**For the  $\varnothing$  8.3mm and  $\varnothing$  9.3mm intramedullary nails for tibia distal locking screws (3.9mm) the drill bit ( $\varnothing$  3.2mm) and for the  $\varnothing$  10mm intramedullary nail locking screws (4.9mm) the drill bit ( $\varnothing$  4.0mm) must be used.**



*Positioning of the tip of the drill bit in the center of the intramedullary nail hole with the radiolucent drill attachment*

#### 5. Measuring of the screw length

The screw length is determined by the measuring device for locking screws.

#### 6. Insertion of the locking screw

The previously determined self-tapping locking screw is inserted into the predrilled hole using the hexagonal screwdriver, solid.

#### 7. Confirmation of the correct locking screw placement

The correct placement of each inserted locking screw must be confirmed in both planes with the image intensifier.

#### 8. Insertion of further distal locking screws

For inserting additional locking screws, repeat steps 2 to 6.

# Cap Screw

If the top of the tibial nail is located too deep in the medullary canal, a cap screw may be inserted to fill the gap. The cap screws are available in lengths from 0 to 25mm (in 5mm increments).

## 1. Insertion of the guide wire

The guide wire (Ø 2.0mm, length 440mm) is inserted into the intramedullary nail for tibia through the connection screw of the targeting device.

## 2. Removal of the connection screw and the targeting device

The connection screw and the targeting device are removed. The inserted guide wire remains in the intramedullary nail.

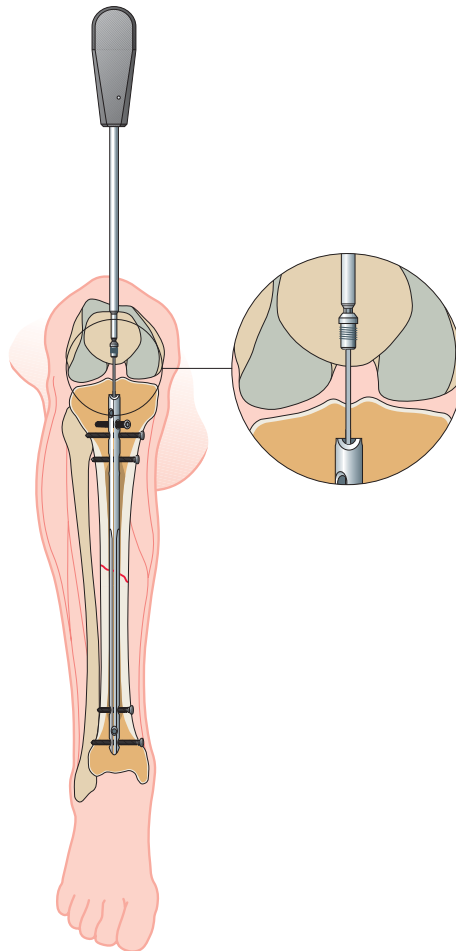
## 3. Insertion of the cap screw

The previously selected cap screw is inserted over the guide wire with the cannulated hexagonal screwdriver.

## 4. Confirmation of correct cap screw placement

The correct position of the cap screw in the intramedullary nail is confirmed with the image intensifier.

## 5. Removal of the guide wire

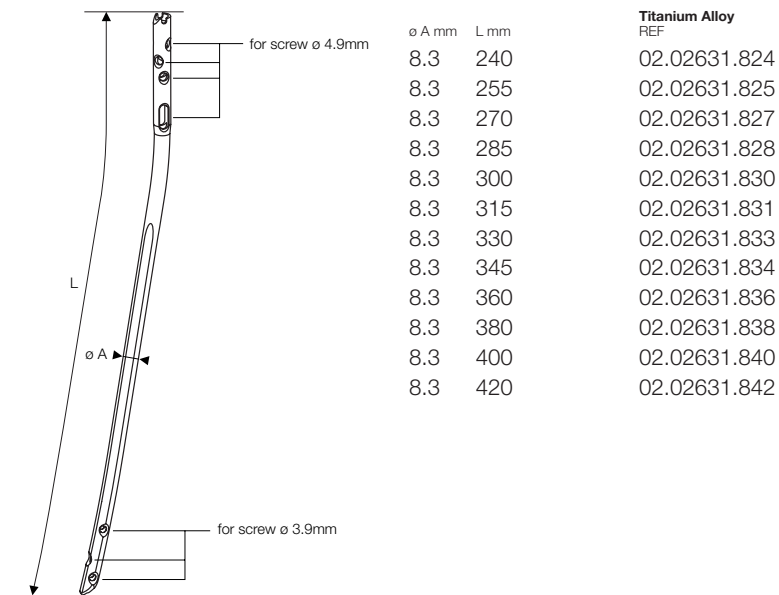


*Insertion of the cap screw over the guide wire with the hexagonal screwdriver*

# Implants Sirius Intramedullary Nail for Tibia



Sirus Intramedullary Nail for tibia solid, sterile





Sirus Intramedullary Nail for tibia cannulated, sterile

	ø A mm	ø B mm	L mm	Titanium Alloy
				REF
	9.3	3.9	240	02.02631.924
	9.3	3.9	255	02.02631.925
	9.3	3.9	270	02.02631.927
	9.3	3.9	285	02.02631.928
	9.3	3.9	300	02.02631.930
	9.3	3.9	315	02.02631.931
	9.3	3.9	330	02.02631.933
	9.3	3.9	345	02.02631.934
	9.3	3.9	360	02.02631.936
	9.3	3.9	380	02.02631.938
	9.3	3.9	400	02.02631.940
	9.3	3.9	420	02.02631.942
	10.0	4.9	240	02.02631.024
	10.0	4.9	255	02.02631.025
10.0	4.9	270	02.02631.027	
10.0	4.9	285	02.02631.028	
10.0	4.9	300	02.02631.030	
10.0	4.9	315	02.02631.031	
10.0	4.9	330	02.02631.033	
10.0	4.9	345	02.02631.034	
10.0	4.9	360	02.02631.036	
10.0	4.9	380	02.02631.038	
10.0	4.9	400	02.02631.040	
10.0	4.9	420	02.02631.042	



Graphic case (with content)  
for locking screws

REF  
110.99.108T

Graphic case (empty)

REF  
100.99.108



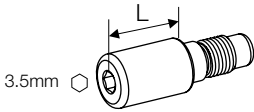
Sirus cap screw, for tibia



quantity\* **Titanium Alloy**  
REF  
1 02.03630.039



Sirus cap screw, for tibia



L mm	quantity*	<b>Titanium Alloy</b> REF
5	1	02.03630.040
10	1	02.03630.041
15	1	02.03630.042
20	1	02.03630.043
25	1	02.03630.044

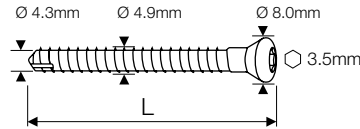


Screw forceps self-holding

quantity\* REF  
1 100.90.005



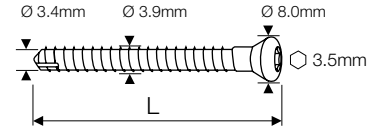
Locking screw ø 4.9mm, self-tapping



Drill ø 4.0mm



Locking screw ø 3.9mm, self-tapping

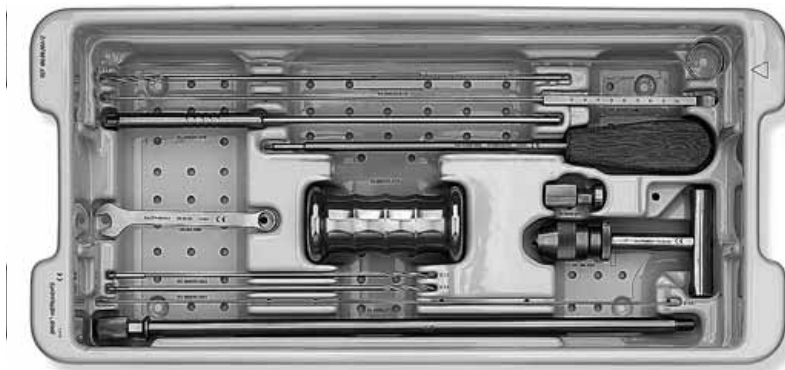


Drill ø 3.2mm

L mm	quantity*	<b>Titanium Alloy</b> REF	L mm	quantity*	<b>Titanium Alloy</b> REF
24	3	02.03149.024	24	3	02.03100.101
26	3	02.03149.026	26	3	02.03100.102
28	3	02.03149.028	28	3	02.03100.103
30	3	02.03149.030	30	3	02.03100.104
32	3	02.03149.032	32	3	02.03100.105
34	3	02.03149.034	34	3	02.03100.106
36	3	02.03149.036	36	3	02.03100.107
38	3	02.03149.038	38	3	02.03100.108
40	3	02.03149.040	40	3	02.03100.109
42	3	02.03149.042	42	3	02.03100.110
44	3	02.03149.044	44	3	02.03100.111
46	3	02.03149.046	46	3	02.03100.112
48	3	02.03149.048	48	3	02.03100.113
50	3	02.03149.050	50	3	02.03100.114
52	3	02.03149.052	52	3	02.03100.115
54	3	02.03149.054	54	3	02.03100.116
56	3	02.03149.056			
58	3	02.03149.058			
60	3	02.03149.060			
64	3	02.03149.064			
68	3	02.03149.068			
72	3	02.03149.072			
76	3	02.03149.076			
80	3	02.03149.080			
85	3	02.03149.085			
90	3	02.03149.090			
95	3	02.03149.095			
100	3	02.03149.100			

\* Indicates the quantity in the graphic case,  
REF stands for 1 piece.

# Instruments Sirius Intramedullary Nail for Tibia



Graphic case (with content)

REF  
110.99.207T

Graphic case (empty)

REF  
100.99.207



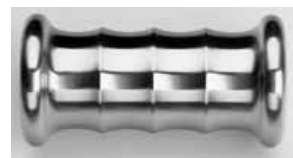
Insert (empty)

REF  
100.99.207/5



Combination wrench hexagonal

Ø mm	L mm	quantity*	REF
11	140	1	100.90.080



Ram (Slaphammer)

quantity*	REF
1	110.45.031



Universal chuck cannulated,  
with T-handle

L mm	quantity*	REF
140	1	100.90.500



Three-fluted drill bit,  
with quick coupling

Ø mm	L mm	quantity*	REF
3.2	250	1	02.00020.053
4.0	250	1	02.00020.054



Three-fluted drill bit,  
with quick coupling

Ø mm	L mm	quantity*	REF
4.0	355	1	02.00020.010

\* Indicates the quantity in the graphic case,  
REF stands for 1 piece.



Hexagonal screwdriver,  
cannulated

Ø mm L mm O mm quantity\* REF  
2.2 340 3.5 1 02.00020.012



Measuring device,  
for locking screws

quantity\* REF  
1 02.00020.048



Connection screw,  
for targeting device

quantity\* REF  
1 02.00020.003



Hexagonal screwdriver,  
solid

Ø mm L mm O mm quantity\* REF  
2.2 340 3.5 1 02.00020.112



Guide wire,  
for cap screws

Ø mm L mm quantity\* REF  
2.0 440 1 02.00020.071



Targeting arm 45°, for tibia

quantity\* REF  
1 02.00020.004



Cleaning wire

Ø mm L mm quantity\* REF  
2.0 465 1 02.00020.014



Awl cannulated

Ø mm quantity\* REF  
10 1 02.00020.001



Tissue protection sleeve

Ø mm quantity\* REF  
10.0/8.0 1 02.00020.005



Ram (Slaphammer) guide

quantity\* REF  
1 02.00020.046



Targeting device, for tibia

quantity\* REF  
1 02.00020.002



Trocar

Ø mm quantity\* REF  
8.0 1 02.00020.006



Driving head

quantity\* REF  
1 02.00020.047



Drill guide

Ø mm quantity\* REF  
8.0/4.0 1 02.00020.007

\* Indicates the quantity in the graphic case,  
REF stands for 1 piece.



Tissue protection sleeve

Ø mm	quantity*	REF
10	1	02.00020.013



SRTD handle

L mm	quantity*	REF
360	-	02.00020.055



Guide rod, with threaded tip

Ø mm	L mm	quantity*	REF
3.0	365	1	02.00020.042



SRTD tissue protection sleeve

Ø mm	quantity*	REF
12.0/8.0	-	02.00020.056



Ratchet wrench

Ø mm	quantity*	REF
11	1	02.00020.049



SRTD drill guide

Ø mm	quantity*	REF
3.2	-	02.00020.057
4.0	-	02.00020.059



Tissue protection sleeve, for tibia

Ø mm	quantity*	REF
12	1	02.00020.051



SRTD prick punch

Ø mm	quantity*	REF
3.2	-	02.00020.058
4.0	-	02.00020.060



Measuring device

quantity*	REF
1	02.00020.045



Guide wire

Ø mm	L mm	quantity*	REF
3.0	950	-	02.00020.043

\* Indicates the quantity in the graphic case,  
REF stands for 1 piece.

Please refer to package insert for complete product information, including contraindications, warnings, precautions, and adverse effects.

Contact your Zimmer representative or visit us at [www.zimmer.com](http://www.zimmer.com)

