Expert Tibial Nail.

Technique Guide

Expert Nailing System

SYNTHES®

Original Instruments and Implants of the Association for the Study of Internal Fixation – AO ASIF

Table of Contents

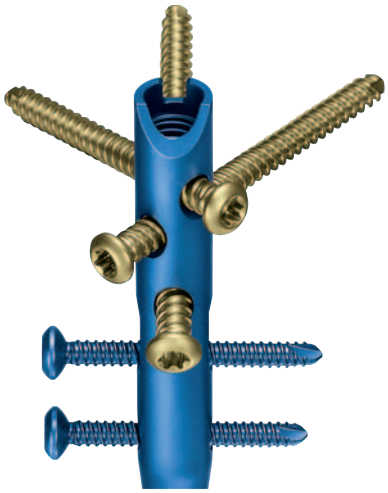
Image intensifier control

Warning
This description is not sufficient for immediate application of the instrumentation. Instruction by a surgeon experienced in handling this instrumentation is highly recommended.

Cleaning of instruments:
For detailed information please refer to "Reprocessing, Care and Maintenance of Synthes Instruments", Article No. 035.000.090.

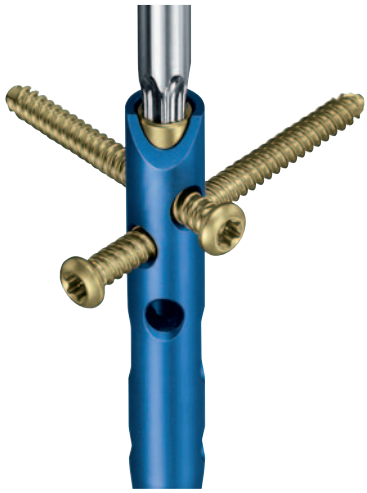
Advanced solutions

Advanced proximal locking options:
– Three unique and innovative locking options, in combination with cancellous bone locking screws, increase the stability of the proximal fragment for proximal third fractures.
– Two state of the art medio-lateral (ML) locking options enable primary compression or secondary controlled dynamization



Improved stability

End caps:
– Securely lock the most proximal oblique locking screw to create a fixed-angle construct
– End cap prevents ingrowth of tissue and facilitates nail extraction
– Self-retaining Stardrive T40 recess for effortless end cap pick-up and ease of insertion
– Cannulated
– 0 mm end cap sits flush with nail.
– 5, 10 and 15 mm end caps extend nail height if nail is over inserted.



Advanced nail design:
- New anatomic bend for ease of nail insertion
- Titanium alloy TAN* for improved mechanical and fatigue properties
- Cannulated nails (from ∅ 8 mm to ∅ 13 mm) for reamed or unreamed techniques, enabling nail insertion over guide wire
- The 2.5 mm or 3.0 mm ball tipped guide wires may be removed through the nail and insertion handle assembly (no exchange tube required).
- Solid nails (from ∅ 8 mm to ∅ 10 mm) for unreamed technique

Advanced distal locking options:
- Distal oblique locking option to prevent soft tissue damage and increase stability of the distal fragment
- Two ML and one antero-posterior (AP) locking options for stability of the distal fragment

Multidirectional locking options for improved stability

All locking screws:
- Double lead thread for more contact points for enhanced stability and ease of insertion
- Thread closer to screw head providing better bone purchase in the near cortex and improved stability
- Titanium alloy TAN* for improved mechanical and fatigue properties
- Self-tapping blunt tip
- Self-retaining Stardrive T25 recess allows improved torque transmission and increased resistance to stripping relative to a hex recess and secure locking screw pick-up.

Cancellous bone locking screws:
- Indicated for the three unique proximal locking options of all tibial nails diameters
- Dual core design for optimized purchase in cancellous bone
- Unicortical
- Lengths: 30 mm – 90 mm

Standard locking screws:
- Larger cross section for improved mechanical resistance
- ∅ 4.0 mm for ∅ 8 mm and ∅ 9 mm tibial nails, lengths: 18 mm – 80 mm
- ∅ 5.0 mm for ∅ 10 mm to ∅ 13 mm tibial nails, lengths: 26 mm – 100 mm

* Titanium-6% aluminum-7% niobium

AO/ASIF Principles of internal fixation

In 1958, the AO/ASIF (Association for the Study of Internal Fixation) formulated four basic principles[1], which have become the guidelines for internal fixation in general, and intramedullary nailing in particular:

The Expert Tibial Nail permits an intramedullary approach for the fixation of proximal, shaft and distal fractures of the tibia. The system consists of a series of cannulated nails, cannulated end caps, dual core locking screws and standard locking screws. All of the implants are made of titanium alloy (TAN*).

Anatomic Reduction
The Expert Tibial Nail is designed to fit anatomically in the medullary canal, allowing indirect reduction of proximal, distal and shaft fractures of the tibia.

Stable Fixation
The Expert Tibial Nail provides stable fixation of fractures by incorporating oblique locking holes in the proximal and distal portions of the nail.

Cancellous bone locking screws are used proximally for better purchase in the cancellous bone. The most proximal locking screw, when used with an end cap, provides a locked, fixed-angle construct. Locking screws in the distal oblique hole and ML hole provide stable fixation of distal fractures.

Preservation of Blood Supply
The instruments and implants in the Expert Tibial Nail permit a more percutaneous technique and less tissue stripping than other treatment methods. An intramedullary approach results in decreased blood loss compared to plate fixation.

Early, Active Mobilization
The Expert Tibial Nail provides secure fixation which permits controlled, early, active rehabilitation conducive to optimal recovery.

[1] M.E. Müller, M. Allgöwer, R. Schneider y R. Willenegger:
Manual de osteosíntesis, 3ª edición. Barcelona: Springer-Verlag Ibérica. 1991

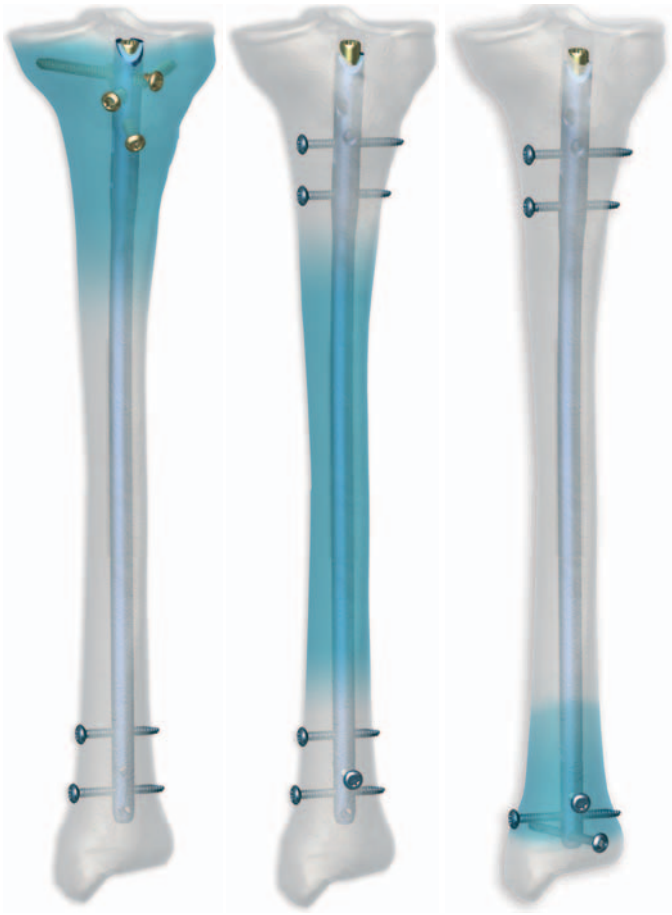
* Titanio, 6%; aluminio, 7%; niobio

Indications

The Expert Tibial Nail is indicated for fractures in the tibial shaft as well as for metaphyseal and certain intraarticular fractures of the tibial head and the pilon tibiale:
– 41-A2/A3
– All shaft fractures
– 43-A1/A2/A3
– Combinations of these fractures

For these indications the Expert Tibial Nail should be used in combination with other implants (not shown in the illustrations):
– 41-C1/C2
– 43-C1/C2

Note: The use of a cannulated Expert Tibial Nail with a large diameter offering more stability associated with the reamed technique is generally recommended for pseudarthroses, tumours, mal-unions and non-unions.



Cases

Fracture involving the proximal component

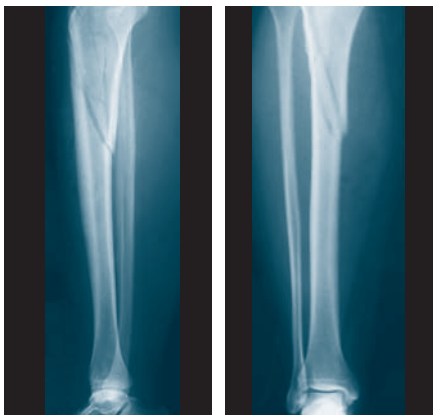
Case 1
The use of the three locking screws in the proximal oblique locking options ensures optimal stabilization of the proximal fragment. The distal segment can be stabilized by using two ML locking options. Stability of the distal fragment can be enhanced by the use of a third locking screw in the AP hole.

Shaft fracture

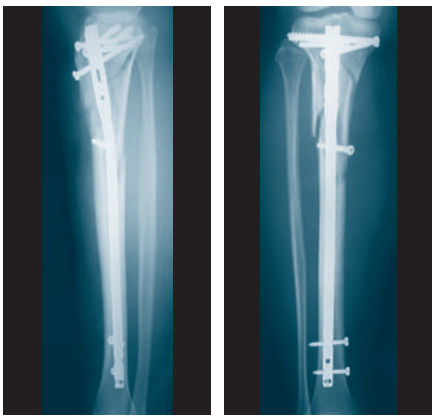
Case 2
For simple shaft fractures, two proximal ML and two distal ML locking screws are normally sufficient to stabilize the fracture. Secondary dynaminization is achieved by removing the proximal static locking screw.

Fracture involving the distal component

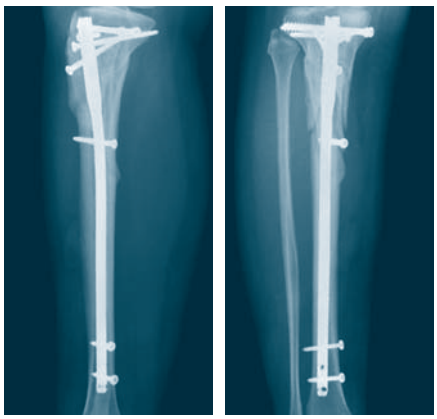
Case 3
The use of four distal locking screws is sometimes necessary to achieve stabilization of the distal fragment. In many cases though, three locking screws placed in the most distal locking options are sufficient to stabilize the distal fragment.



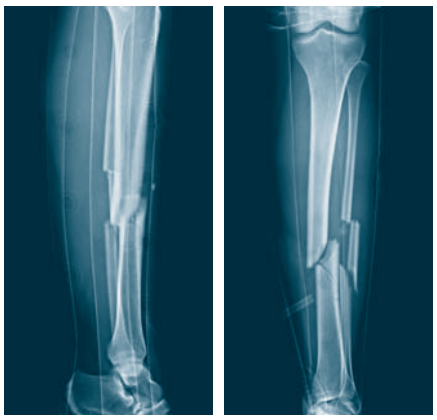
preoperative



postoperative



follow-up (3 weeks after surgery)



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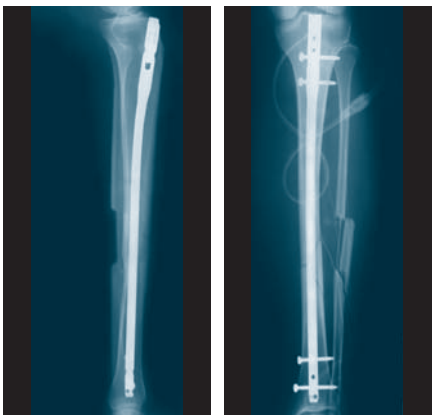
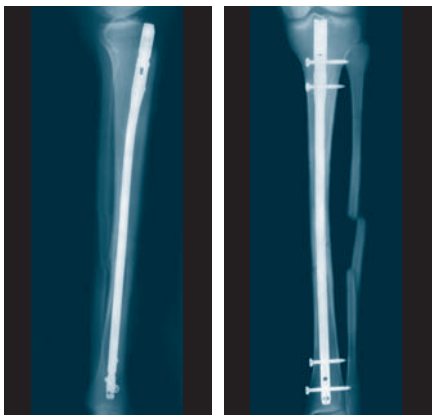
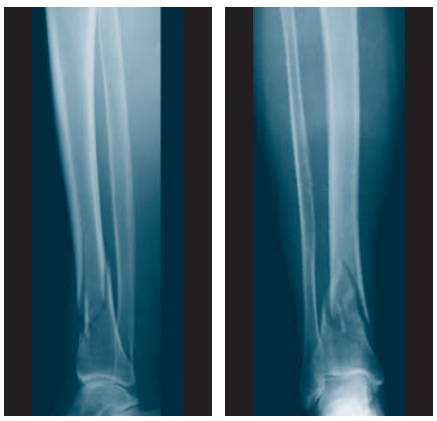


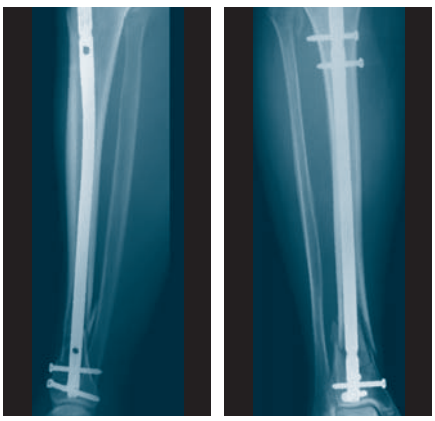
postoperative



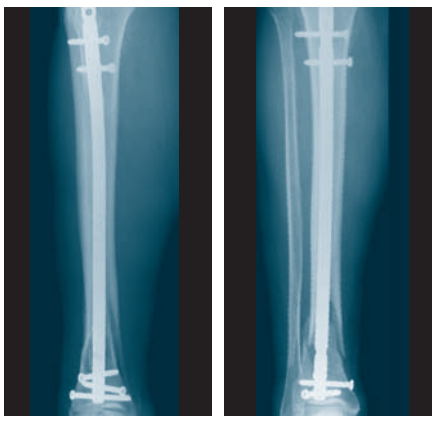
follow-up (1 month after surgery)



preoperative



postoperative

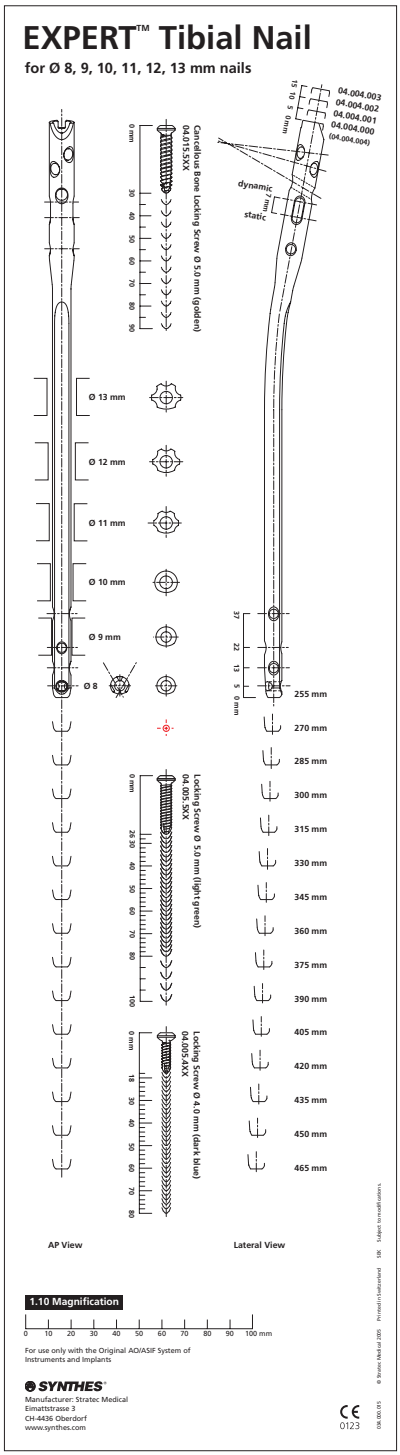


follow-up (4 months after surgery)

Preoperative planning

Use the AO ASIF Preoperative Planner Template for the Expert Tibial Nail to estimate nail diameter and nail length. To estimate nail diameter, place the template on the AP or lateral X-ray of the uninjured tibia and measure the diameter of the medullary canal at the narrowest part that will contain the nail.

To estimate nail length, place the template on the AP X-ray of the uninjured tibia and select the appropriate nail length based on patient anatomy. When selecting nail size, consider canal diameter, fracture pattern, patient anatomy and post-operative protocol.

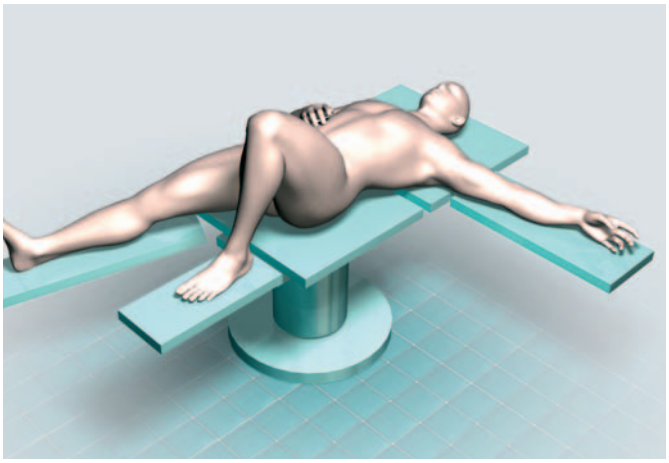


Opening the tiba

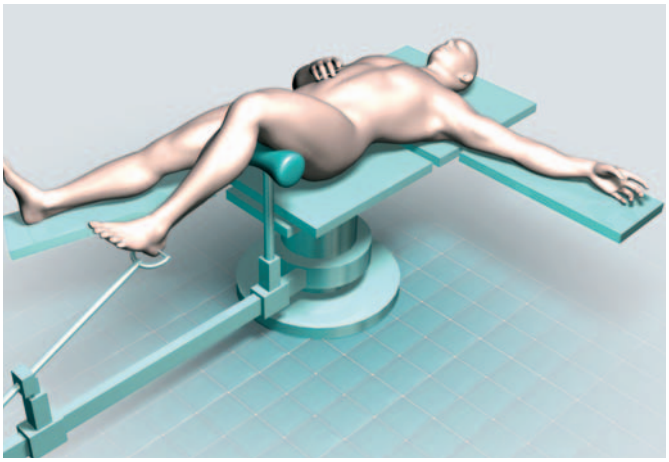
1

Position patient

Position the patient supine on the radiolucent table. Ensure that the knee of the injured leg can be flexed at least 90°. Position the image intensifier such that visualisation of the tibia including the articular surface proximally and distally is possible in AP and lateral views.



Optionally, the procedure can be performed on a fracture table with the leg placed in traction.



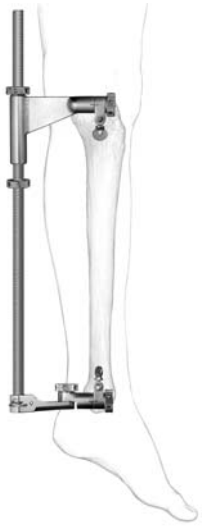
Note: The knee roller can be placed under the lower part of the thigh if it obstructs the view of the tibia plateau in AP view.

2

Reduce fracture

Perform closed reduction manually by axial traction under image intensifier. The use of the Large Distractor (394.350) or Pinless Fixator (186.310) may be appropriate in certain circumstances.

Note: The reduction can be temporarily fixed with reduction clamps. In epiphyseal fractures the condyles or the pilon tibiale are fixed first in order to enable the nail insertion.

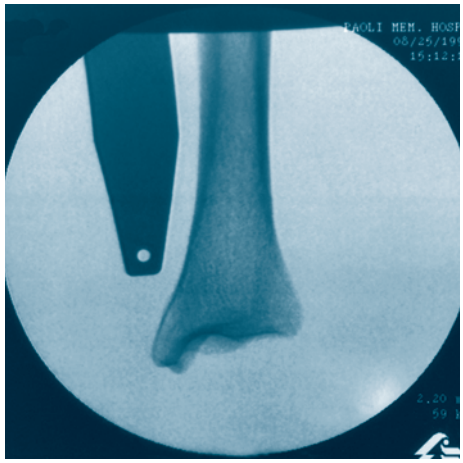


3
Confirm nail length and diameter

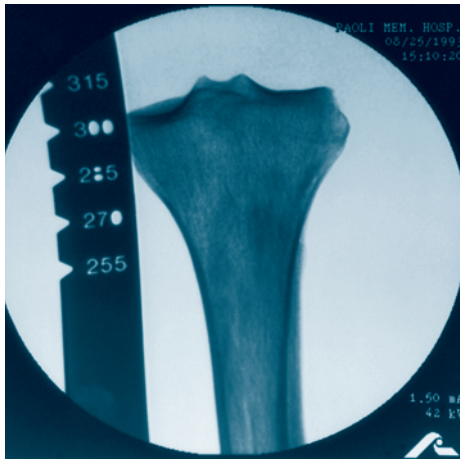
Instrument	
03.010.021	Radiographic Ruler for Tibial Nails, length 450 mm

The required nail length must be determined after reduction of the lower leg fracture.

- Position the C-arm for an AP view of the distal tibia. With long forceps, hold the ruler along the leg, parallel to and at the same level as the tibia. Adjust the ruler until the distal tip is at the level of the physeal scar or the desired nail insertion depth. Mark the skin at that site.

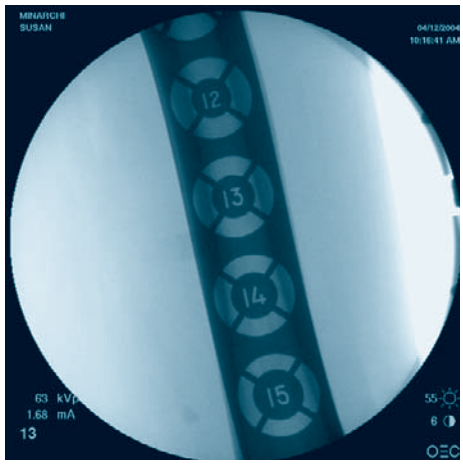


- Move the C-arm to the proximal tibia, replace the distal end of the ruler at the skin mark, and take an AP image of the proximal tibia. Read nail length directly from the ruler image, selecting the measurement at or just below the level of the anterior edge of the tibial plateau.



When using the large distractor, measure the distance from the inferior border of the distal pin to the superior border of the proximal pin to determine optimal nail length.

- Position the C-arm for an AP or lateral view of the tibia at the level of the isthmus. Hold the ruler over the tibia so that the diameter gauge is centered over the narrowest part of the medullary canal. Read the diameter measurement on the circular indicator that fills the canal.



Note: Compression or dynaminization must be taken into account when determining the nail length. A shorter nail should be chosen when active compression is planned for the procedure. The dynamic locking option allows for 7 mm of travel.

Alternatives
Determine the nail length by the above procedure on the uninjured leg or before draping (unsterile) or compare the length of two identical SynReam Reaming Rods ∅ 2.5 mm (352.032).

Place the radiographic ruler over the tibia so that the measuring edge is located over the isthmus. Select the nail diameter shown when the medullary canal/cortex transition is still visible on both sides of the marking.

If the reamed technique is used, the diameter of the largest medullary reamer applied must be 0.5 mm to 1.5 mm larger than the nail diameter.

4
Approach

Make an incision in line with the central axis of the intramedullary canal. Depending on the anatomy of the patient, this incision can be transpatellar, medial or even lateral parapatellar.

The incision starts proximally at the distal third of the patella along the patellar ligament down to the tibial tuberosity.

Mobilise the infrapatellar corpus adiposum laterally and dorsally without opening the synovia. A free access of the nail to the insertion point must be guaranteed.

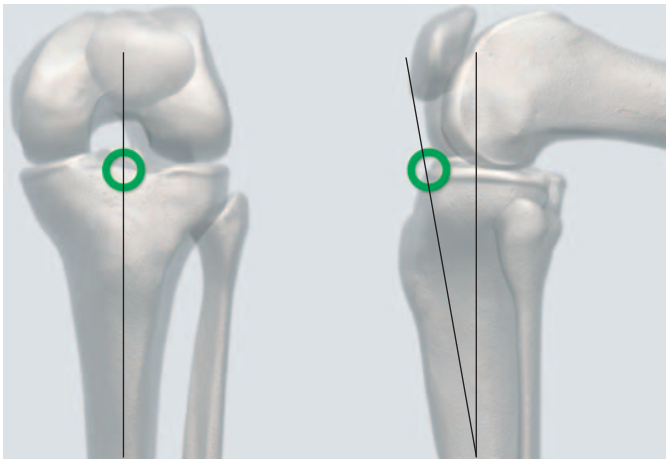
Prepare the entry site of the nail on the ventral edge of the tibial plateau.

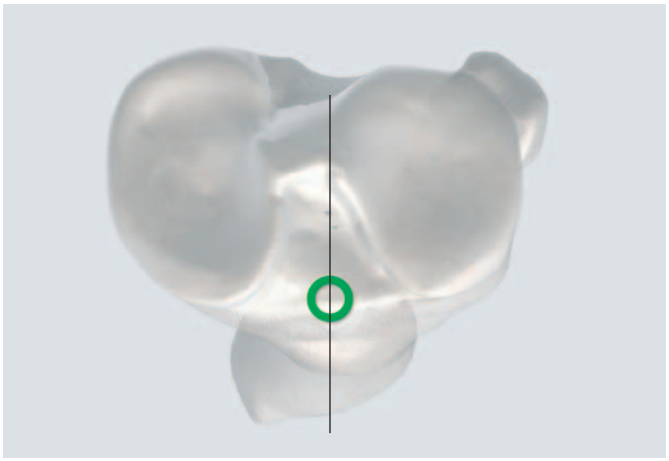
5

Determine entry point

The entry point defines the optimal position of the Expert Tibial Nail in the intramedullary canal. This is more important for proximal and distal third fractures to prevent fragment displacement.

- In AP view the entry point is in line with the axis of the intramedullary canal and with the lateral tubercle of the intercondylar eminence.
- In lateral view the entry point is at the ventral edge of the tibial plateau.





6
Insert guide wire

Instruments	
357.399	Guide Wire ∅ 3.2 mm
393.100	Universal Chuck with T-Handle

Secure the guide wire in the universal chuck. Slightly punch mark the insertion point at a 10° angle to the shaft axis in the lateral view. Hold a sterile Expert Tibial Nail on the side of the lower leg with its distal end parallel to the tibia shaft. The curved proximal nail end determines the definitive angle of insertion for the guide wire.

- Insert the guide wire for approx. 8–10 cm and check the position under the image intensification in the AP and lateral views.

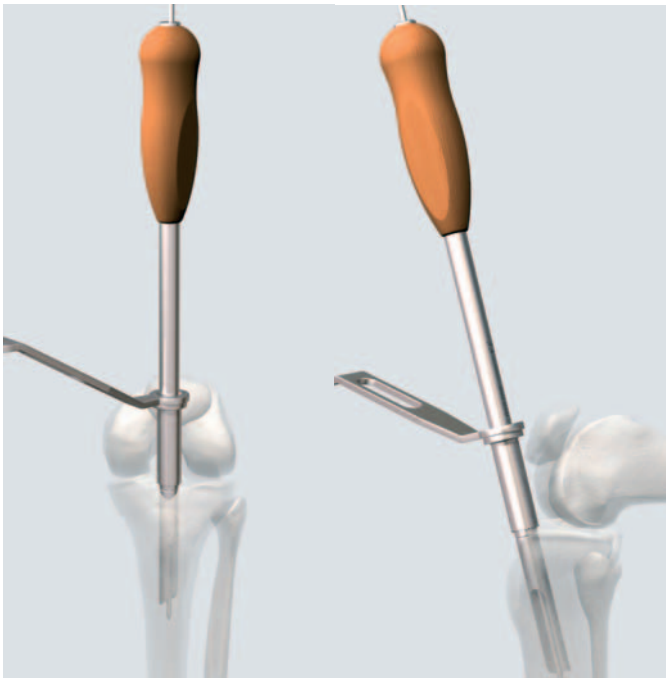
7

Open medullary canal – cutter

Instruments	
357.399	Guide Wire ∅ 3.2 mm
03.010.008	Cutter for Tibial Nails, ∅ 12.0 mm, length 350 mm
03.010.035	Protection Sleeve 14.0/12.0, length 161 mm

Push the protection sleeve and the cutter over the guide wire and open the medullary canal to a depth of 8–10 cm. The guide wire and the cutter should not touch the posterior cortex.

Remove guide wire, cutter and protection sleeve.



7a

Open medullary canal – drill bit

Alternative instruments	
357.399	Guide Wire ∅ 3.2 mm
03.010.036	Drill Bit ∅ 12.0 mm, cannulated, length 300 mm, for No. 532.015
03.010.035	Protection Sleeve 14.0/12.0, length 161 mm

Place the protection sleeve and the drill bit over the guide wire and down to the bone. Drill to a depth of approx. 8–10 cm. The guide wire and the drill bit should not touch the posterior cortex.

Remove guide wire, drill bit and protection sleeve.

7b

Open medullary canal – awl

Alternative instruments	
357.399	Guide Wire ∅ 3.2 mm
03.010.040	Awl ∅ 12.0 mm, cannulated, length 243 mm

Place the cannulated awl over the guide wire and open the medullary canal. Use a twisting motion to advance the awl to a depth of approx. 8–10 cm.

The awl should not touch the posterior cortex.

Remove guide wire and awl.

8

Reaming medullary canal (optional)

Instruments	
189.060	SynReam Intramedullary Reaming System
03.010.093	Rod Pusher for Reaming Rod with Hexagonal Screwdriver ∅ 8.0 mm

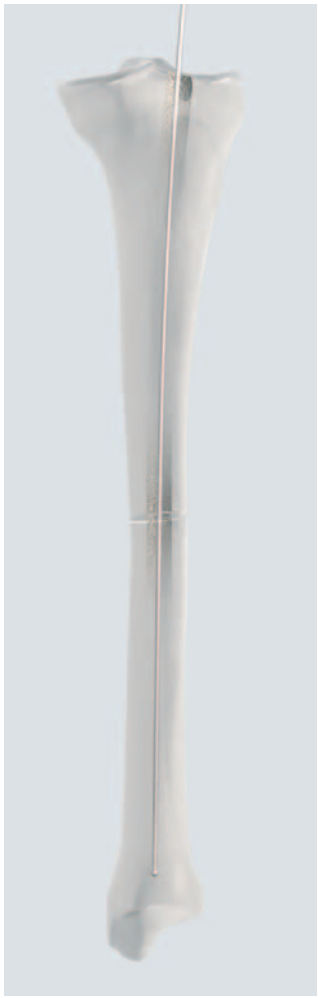
If necessary enlarge the tibia canal with the medullary reamer up to the desired diameter.

Check fracture reduction under the image intensification.

Inserting the reaming rod
Insert the SynReam Reaming Rod ∅ 2.5 mm (352.032) into the medullary canal to the desired insertion depth.

Reaming
Starting with the ∅ 8.5 mm reaming head, ream to a diameter of 0.5–1.5 mm greater than the nail diameter. Ream in 0.5 mm increments and advance the reamer with steady, moderate pressure. Do not force the reamer. Partially retract the reamer often to clear debris from the medullary canal.

Note: All cannulated Expert Tibial Nails can be inserted over the reaming rod. Reaming rod exchange is not required. In case of solid Expert Tibial Nails, remove the reaming rod before nail insertion.



Option

Use the rod pusher to help retain the reaming rod during reamer extraction.

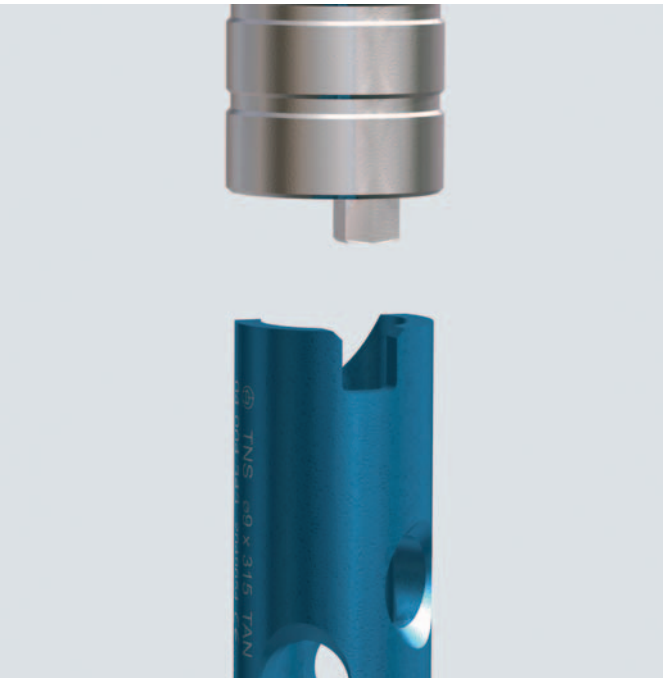
Insert the Nail

1

Assemble the insertion instruments

Instruments	
03.010.045	Insertion Handle, for Tibial and Femoral Nails
03.010.044	Connecting Screw, for Tibial and Femoral Nails
03.010.092	Screwdriver, hexagonal with spherical head 8.0 mm

Orient the insertion handle anteriorly, and match the notch on the handle to the nail.



Place the connecting screw into the insertion handle and thread it into the proximal nail end using the screwdriver.

Verify the nail is oriented properly on the insertion handle, secure the assembly with the screwdriver.

Alternative instrument
(cannulated Expert Tibial Nails only)

03.010.093	Rod Pusher for Reaming Rod with Hexagonal Screwdriver ∅ 8.0 mm

Optionally, slide the connecting screw onto the rod pusher. Slide the assembly through the insertion handle and match the notch on the handle to the nail. Tighten using the rod pusher.

2
Inserting the nail

Note: Hyper flex the knee to aid nail insertion into the medullary canal.

Insert the nail into the intramedullary canal. Use a twisting motion to advance the nail.

- Monitor the nail passage across the fracture, control in two planes to avoid malalignment.
- Insert the nail until it is at or below the tibial opening. Check final nail position in AP and lateral views.

Note: For proximal locking mount the aiming arm only when the nail has been completely inserted, otherwise the aiming arm may loosen during nail insertion.

Optional instruments

03.010.047	Connector, for Insertion Handle
03.010.056	Combined Hammer, 700 g
357.220	Hammer Guide, for No. 357.250 (*)
321.160	Combination Wrench ∅ 11 mm
321.170	Pin Wrench ∅ 4.5 mm
357.398	Cannulated Shaft with 8 mm Hex

If needed, use light, controlled hammer blows to seat the nail. Slide the connector into the grooves on the insertion handle and secure it in place using the combination wrench. Lock the head of the combined hammer in place by tightening the nut onto the threads located below the hammer head using the pin wrench if necessary. Strike the connector directly.

Optionally, the hammer guide can be threaded into the connector and the hammer can be used as a slide hammer. Loosen the nut away from the threads located below the hammer head and secure onto the threads located above the handle.

Note: If nail insertion is difficult, choose a smaller diameter nail or ream the intramedullary canal to a larger diameter.

Important: Confirm that the nail is securely connected to the insertion handle, especially after hammering.

(*) Also adapted for No. 03.010.056

3
Check proximal nail position

Instruments	
03.010.018	Aiming Arm for Tibial Nail
357.399	Guide Wire ∅ 3.2 mm

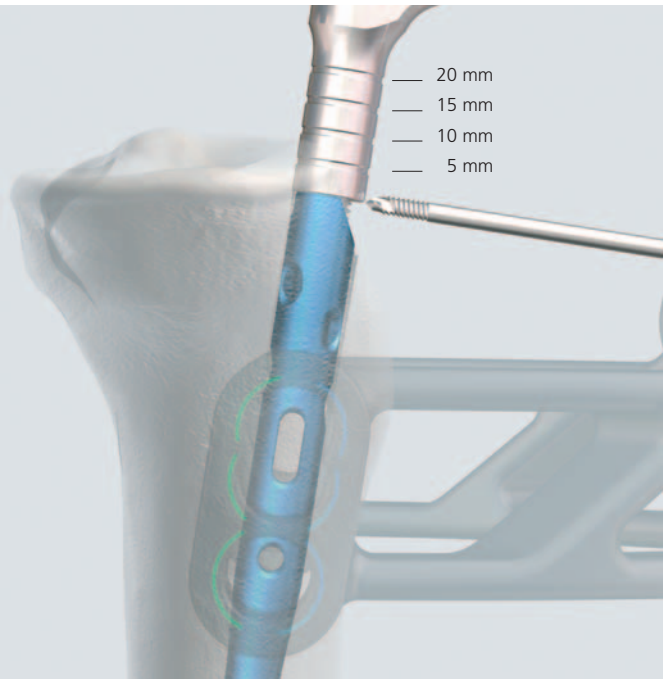
Attach the aiming arm and insert a guide wire in the hole as shown in the illustration.

The tip of the guide wire indicates the exact proximal position of the nail.

Remove the connector and the aiming arm unless proximal locking is the next step.

Check proximal nail position under image intensification in the lateral view.

Note: The distance between the markings on the insertion handle is 5 mm and corresponds to the extensions of the end caps. This feature can be used for over insertion of the nail or for correcting the nail location within the medullary canal.



If primary compression or secondary dynaminization are planned, it is recommended to over insert the nail by more than 7 mm, which corresponds to the maximum distance between the positions in static and dynamic modes.

4

Check distal nail position

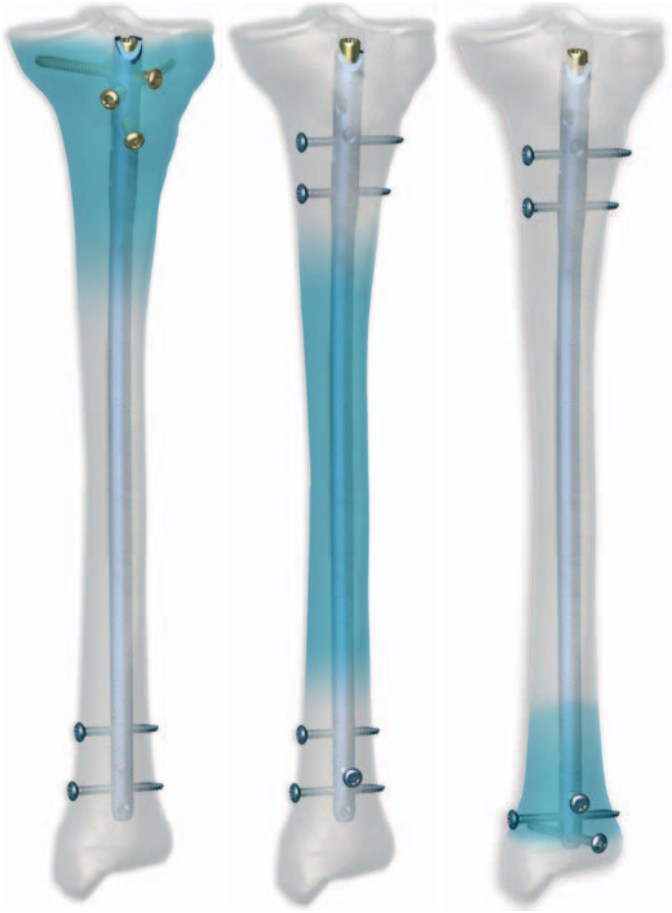
- Check final nail position under image intensification in AP and lateral views.

  Remove the reaming rod.

Important: Confirm that the nail is securely connected to the insertion handle, especially after hammering.

Note: Insertion depth is critical for distal third fractures where a minimum of two locking screws below the fracture line are required to stabilize the distal segment.

Locking options



Proximal segment fractures

For proximal fractures, it is recommended to lock the nail with the knee in extension. This neutralizes the deforming forces on proximal fragments caused by the quadriceps mechanism, and relieves the pressure on the soft tissue usually associated with tibial nail insertion instruments. This position also facilitates assessment of rotational alignment prior to locking.

Diaphyseal segment fractures

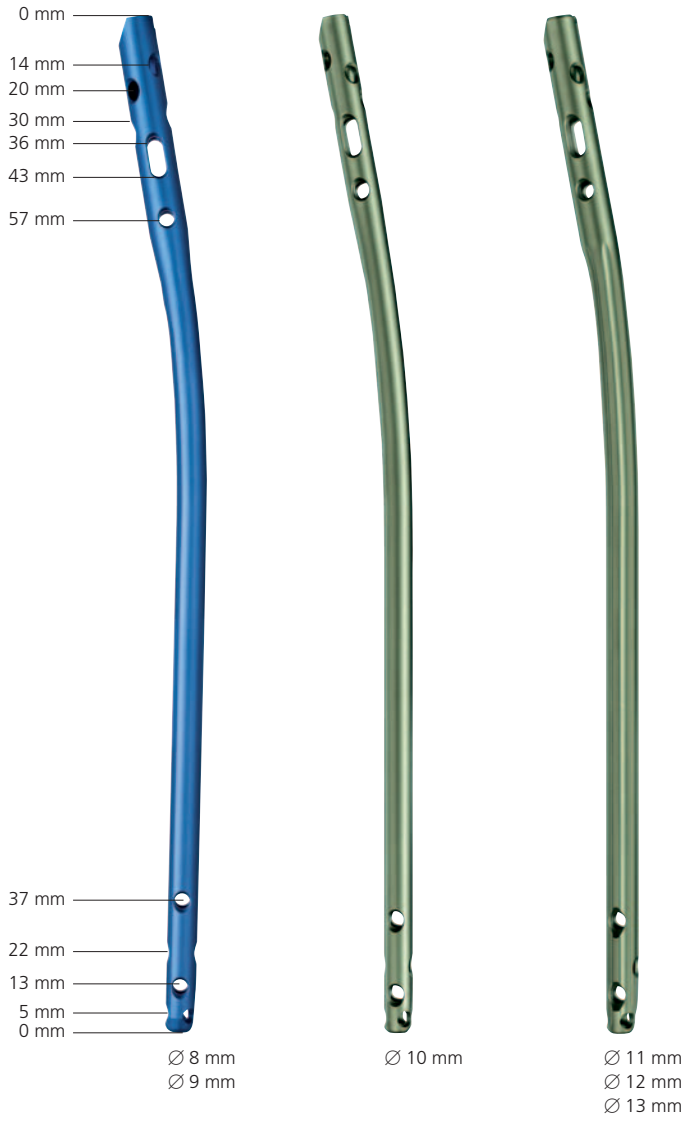
For diaphyseal fractures, it is recommended to lock distally first to allow intraoperative compression.

Distal segment fractures

For distal fractures, it is recommended to lock distally first to facilitate reduction

ML view

Locking holes



1
Distal locking

Use the appropriate locking screws and drill bit for the nail diameter selected.

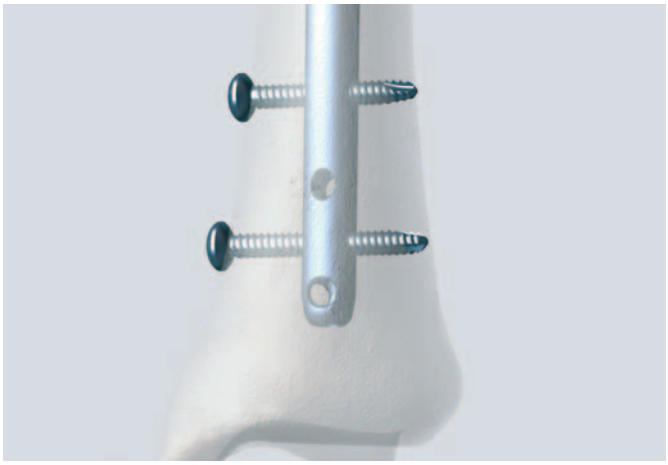
Nail Diameter	Locking Screw	Drill Bit
8 mm and 9 mm (dark blue)	4.0 mm (dark blue)	3.2 mm 03.010.100* or 03.010.103
10 mm to 13 mm (light green)	5.0 mm (light green)	4.2 mm 03.010.101* or 03.010.104

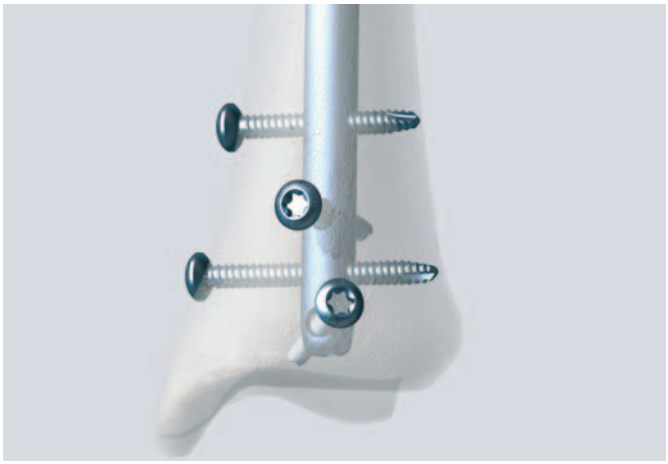
It is recommended to lock distally first, enabling the use of the backstroke** technique to prevent diastasis. Verify the nail has been inserted to the appropriate depth.

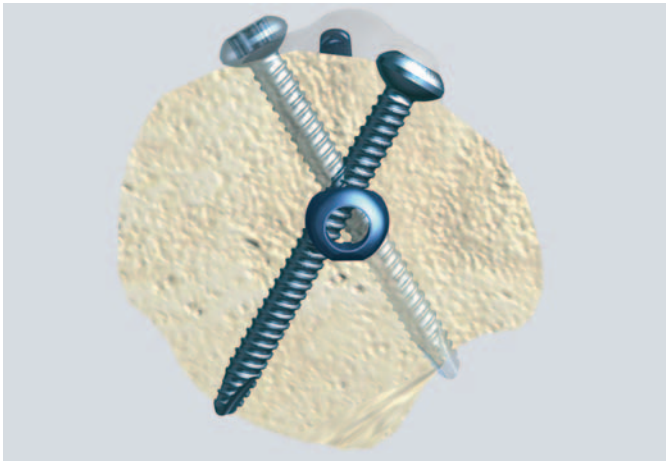
Locking of the tibial nail is usually performed from the medial side, if possible with the leg extended. This position helps counteract the forces exerted by the quadriceps muscle that would tend to deform the proximal fragment and also facilitates rotational control of the tibial axis before locking.

Distal locking with the Radiolucent Drive (511.300) is described below.

Note: The use of the most distal locking option is recommended for distal fractures. This locking option is oriented 30° from the Sagittal plane.







* For Radiolucent Drive

** Backstroke technique: with the hammer guide attached to the connector and insertion handle (see page 23), light reverse hammer blows may be used to compress the fracture; monitor reduction radiographically.

2
Align the image

- Check the reduction, correct alignment of the fragments and leg length before locking the nail.
- Align the C-arm with the hole in the nail closest to the fracture until a perfect circle is visible in the center of the screen. (distal ML hole shown in illustration).

3
Determine incision point

Place a scalpel blade on the skin over the center of the hole to mark the incision point and make a stab incision.

4
Drill

Instruments	
03.010.100	Drill Bit ∅ 3.2 mm, calibrated, lenght 145 mm, 3-flute, with Coupling for RDL
03.010.101	Drill Bit ∅ 4.2 mm, calibrated, lenght 145 mm, 3-flute, with Coupling for RDL

- Using the radiolucent drive, under image intensification, insert the tip of the appropriate drill bit through the incision down to the bone.
- Incline the drive so that the tip of the drill bit is centered over the locking hole. The drill bit should almost completely fill the circle of the locking hole. Hold the drill bit in this position and drill through both cortices.

Tip: For greater drill bit control, discontinue drill power after perforating the near cortex. Manually guide the drill bit through the nail before drilling the far cortex.

Alternative instruments

03.010.103	Drill Bit ∅ 3.2 mm, calibrated, length 145 mm, 3-flute, for Quick Coupling
03.010.104	Drill Bit ∅ 4.2 mm, calibrated, length 145 mm 3-flute, for Quick Coupling

Standard freehand locking technique can be performed without the radiolucent drive. Use the appropriate drill bit shown in the table above.

5

Determine the length of the locking screw

Instrument	
03.010.106	Direct Measuring Device for Drill Bits length 145 mm

Stop drilling immediately after both cortices and disassemble the drill bit from the Radiolucent Drive. Ensure the correct position of the drill bit beyond the far cortex. Place the direct measuring device onto the drill bit. Read the graduation of the measuring device at the end of the drill bit.

This corresponds to the appropriate locking screw length.

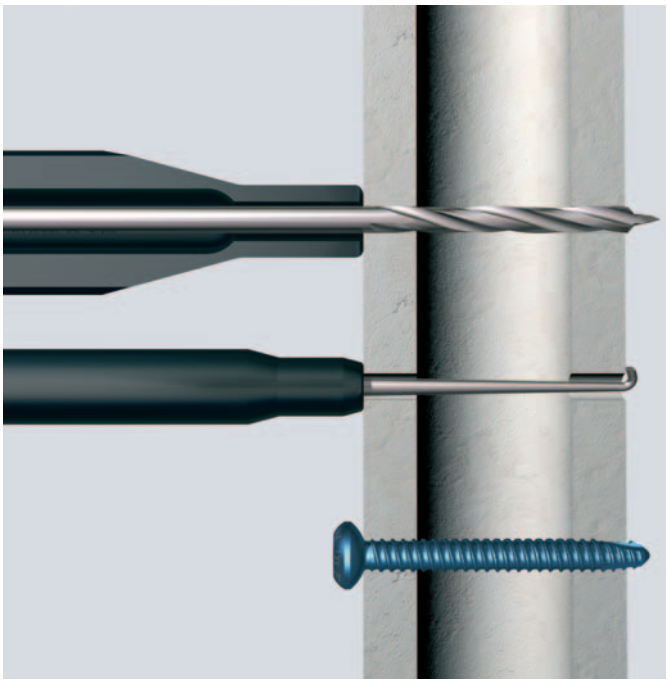
Alternative instrument

03.010.072	Depth Gauge for Locking Screws

Measure the screw length using the depth gauge. Ensure the outer sleeve is in contact with the bone and the hook grasps the far cortex.

Read the screw length directly from the measuring device at the back of the protection sleeve.

Note: Drill bit location with respect to the far cortex is critical for measuring the appropriate locking screw length.



6
Insert locking screw

Instruments	
03.010.107	Screwdriver Stardrive, T25, length 330 mm
03.010.112	Holding Sleeve, with Locking Device

Insert the appropriate length locking screw using the screwdriver Stardrive T25 and the holding sleeve, if needed.

Verify screw length under image intensification. If needed, a second locking screw may be inserted using the same technique.

Note: In the event of diastasis, the backstroke technique can be used after insertion of the second distal locking screw. Alternatively the compression screw can be used, please refer to step 26 (page 34).

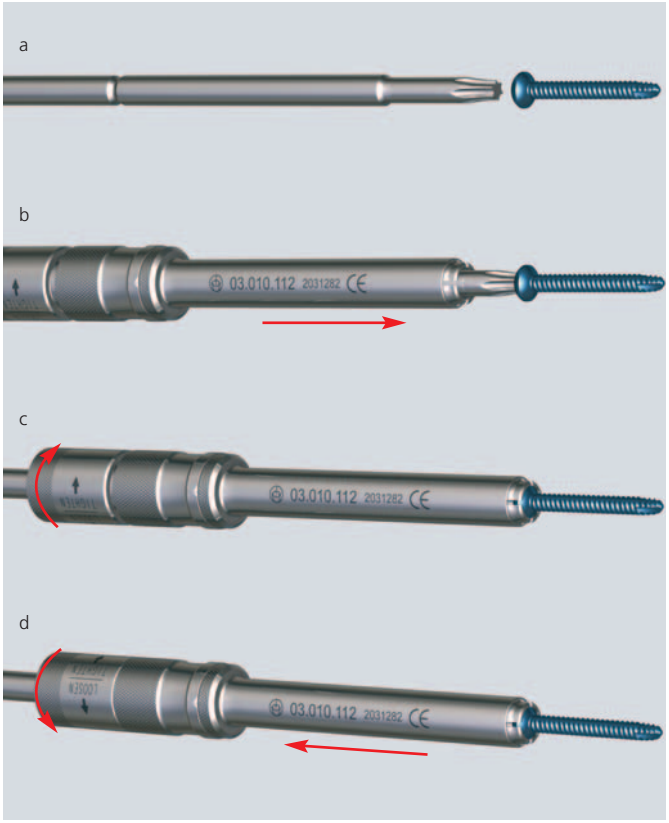
Use the holding sleeve as described below:

a Insert the holding sleeve onto the shaft of the screwdriver and place the tip of the screwdriver in the recess of the locking screw.

b Push the holding sleeve in the direction of the locking screw, the sleeve now holds the locking screw.

c Lock the holding sleeve by tightening it counter clockwise.

d Release the holding sleeve after insertion of the locking screw by loosening it clockwise and pushing backwards.



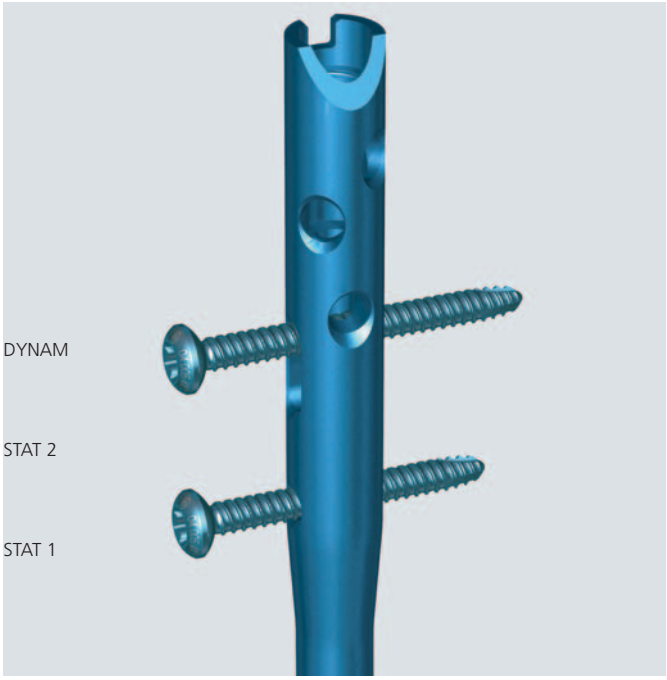
Proximal locking

Diaphyseal and distal segment fractures

1

Choose locking screws and instruments

Use the correct locking screw, drill sleeve, trocar and drill bit for the selected nail diameter as shown in the table.



Nail Diameter	Locking Screws	Protection Sleeve	Drill Sleeve	Trocar	Calibrated Drill Bit
8 mm and 9 mm (dark blue)	∅ 4.0 mm (dark blue)	12.0 mm / 8.0 mm 03.010.063	8.0 mm / 3.2 mm 03.010.064	∅ 3.2 mm 03.010.069	∅ 3.2 mm 03.010.060
10 mm – 13 mm (light green)	∅ 5.0 mm (light green)	12.0 mm / 8.0 mm 03.010.063	8.0 mm / 4.2 mm 03.010.065	∅ 4.2 mm 03.010.070	∅ 4.2 mm 03.010.061

Three proximal ML locking options can be targeted using the aiming arm:

1 The dynamic locking option (DYNAM) corresponds to the upper position of the proximal locking slot. This type of locking allows primary compression or secondary, controlled dynaminization of the bone fragments.

2 Static 2 (STAT 2) corresponds to the lower position of the proximal locking slot. This type of locking does not allow primary compression or secondary controlled dynaminization.

3 Static 1 (STAT 1) corresponds to most distal of the proximal locking holes.

2
Mount the aiming arm

Instrument	
03.010.018	Aiming Arm for Expert Tibial Nail

Confirm that the nail is securely connected to the insertion handle (use the blue and green marked guided holes). Mount the aiming arm to the insertion handle.

Note: Do not exert forces on the aiming arm, protection sleeve, drill sleeves and drill bits. These forces may prevent accurate targeting through the proximal locking holes and damage the drill bits.

3

Insert trocar combination

Instruments	
03.010.063	Protection Sleeve 12.0/8.0, length 188 mm
03.010.064	Drill Sleeve 8.0/3.2, for No. 03.010.063 (with blue and yellow marking)
03.010.065	Drill Sleeve 8.0/4.2, for No. 03.010.063 (with green marking)
03.010.069	Trocar ∅ 3.2 mm, for No. 03.010.063 (with blue and yellow marking)
03.010.070	Trocar ∅ 4.2 mm, for No. 03.010.063 (with green marking)

Insert the three-part trocar combination (protection sleeve, corresponding drill sleeve and trocar) through the desired ML hole in the aiming arm, make stab incision and insert the trocar to the bone. Remove the trocar.

4

Drill and determine the locking screw length

Instruments	
03.010.060	Drill Bit ∅ 3.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling (with blue and yellow marking)
03.010.061	Drill Bit ∅ 4.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling (with green marking)

Ensure that the drill sleeve is pressed firmly to the near cortex. Using the corresponding drill bit (3.2 mm for 4.0 mm locking screws or 4.2 mm for 5.0 mm locking screws), drill through both cortices until the tip of the drill bit penetrates the far cortex.

Confirm drill bit position.

Ensure that the drill sleeve is pressed firmly to the near cortex and read the measurement from the calibrated drill bit at the back of the drill sleeve. This measurement corresponds to the appropriate length of the locking screw. Remove the drill bit and the drill sleeve.

Alternative instrument

03.010.072	Depth Gauge for Locking Screws

After drilling both cortices, remove the drill bit and the drill sleeve.

Disassemble the depth gauge into 2 parts: the outer sleeve and the measuring device with hook. Insert the measuring device into the protection sleeve. Make sure that the hook grasps the far cortex and that the protection sleeve is on the bone.

Read the measurement from the back of the protection sleeve, which corresponds to the appropriate length of the locking screw.

5
Insert locking screw

Instrument	
03.010.107	Screwdriver Stardrive, T25, length 330 mm

Insert the appropriate locking screw through the protection sleeve using the Stardrive T25 screwdriver. Verify locking screw length under image intensification.

The tip of the locking screw should not project more than 1–2 mm beyond the far cortex.

Repeat the steps 3 to 5 for the second proximal ML locking Screw.

Option
Additional cancellous bone locking screws can be added for proximal fractures and highly unstable fractures.

Refer to steps 1 to 7 on pages 44 to 54 for details on proximal locking with the cancellous bone locking screws.

6

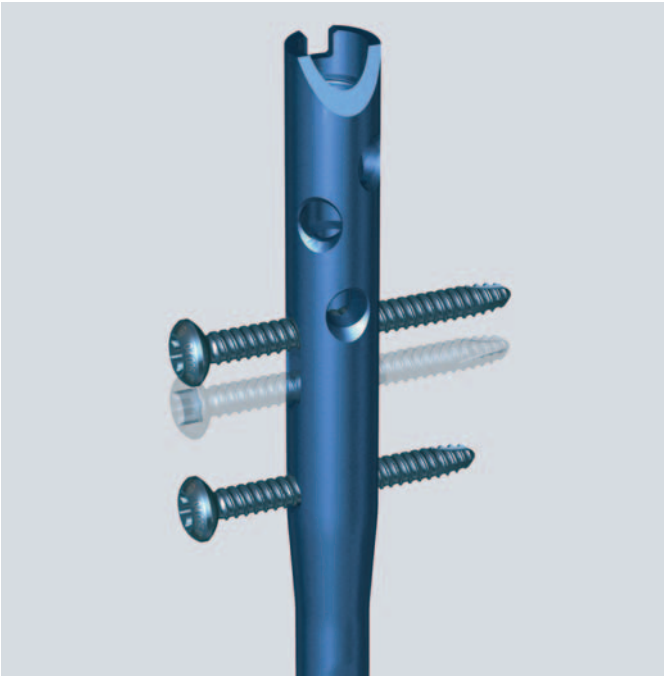
Compression locking mode (optional)

For situations where the fracture gap needs compression after nail insertion, diastasis, compression of the fracture gap can be accomplished without removing the insertion instruments.

The Expert Tibial Nail allows for a maximum compression of 7 mm. If more compression of the fracture gap is needed, the conventional backstroke technique is recommended.

Note: Distal locking is required prior to compression locking, refer to steps 1 to 6 on pages 28 to 34.

Insert one proximal locking screw in the dynamic locking hole (DYNAM), refer to steps 1 to 5 on pages 35 to 40 for details on inserting this locking screw.



7
Insert compression screw

Instruments	
03.010.015	Compression Screw for Tibial Nail, for No. 03.010.044
03.010.092	Screwdriver, hexagonal with spherical head 8.0 mm

Confirm that the nail is securely connected to the insertion handle.

Insert the compression screw through the connecting screw and into the nail using the screwdriver.

The compression screw will contact the dynamic locking screw.

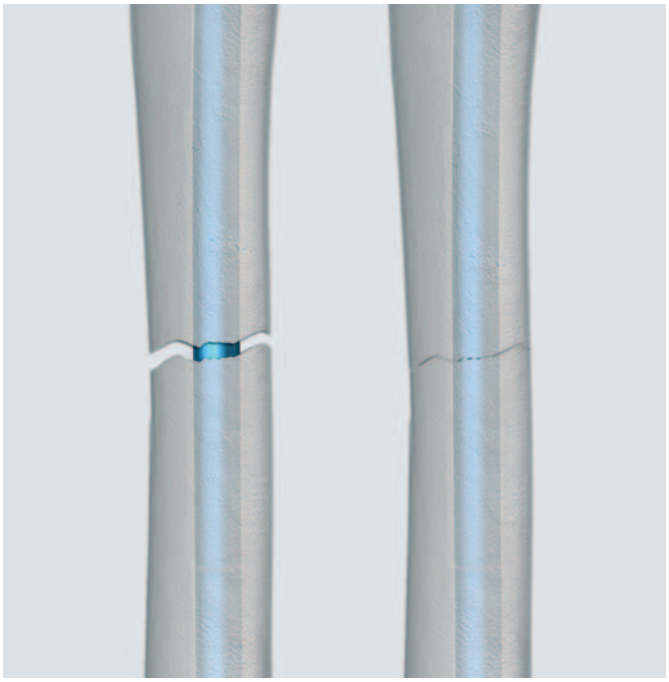
Advance the compression screw until the fracture gap is reduced. Monitor reduction under image intensification. Each revolution of the compression screw corresponds to a compression of 1 mm (maximum 7 mm).

Important: Do not overtighten the compression screw, it may deform the locking screw.

8

Monitor fracture

- Control the fracture gap before, during and after the compression procedure.



9

Insert static locking screw

Insert second proximal locking screw in the most distal hole of the proximal locking options (Static 1), refer to steps 1 to 5 on pages 35 to 40.

Remove the compression screw.

Additional oblique cancellous bone locking screws can be inserted if required, refer to steps 1 to 7 on pages 44 to 54.

Proximal segment fractures

1

Oblique proximal locking

Proximal locking can be performed with the leg in full extension. This neutralizes the deforming forces on proximal fragments caused by the quadriceps mechanism and relieves the pressure on the soft tissue usually associated with tibial nail insertion instruments. This position also facilitates assessment of rotational alignment prior to locking.

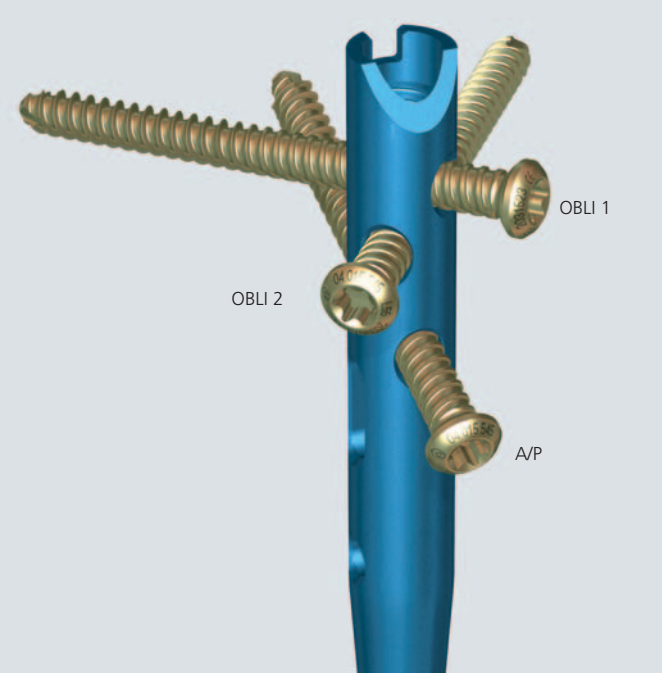
Use the cancellous bone locking screws (gold) only in combination with the two oblique proximal locking holes (OBLI 1, OBLI 2) and A/P proximal locking hole for all nail diameters.

Use the ∅ 3.2 mm drill bit (03.010.060 with blue and yellow markings) for the cancellous bone locking screws (gold).

The aiming arm can target all three proximal oblique locking options:
1. The oblique locking option (OBLI1) corresponds to the most proximal locking position. Inserting an end cap (04.004.000–04.004.003) with this locking screw will create a fixed angle construct .

2. The oblique locking option (OBLI2) corresponds to the second proximal locking position. Inserting an end cap (04.004.004) with this locking screw will create a fixed angle construct (OBLI 1 must be kept empty).

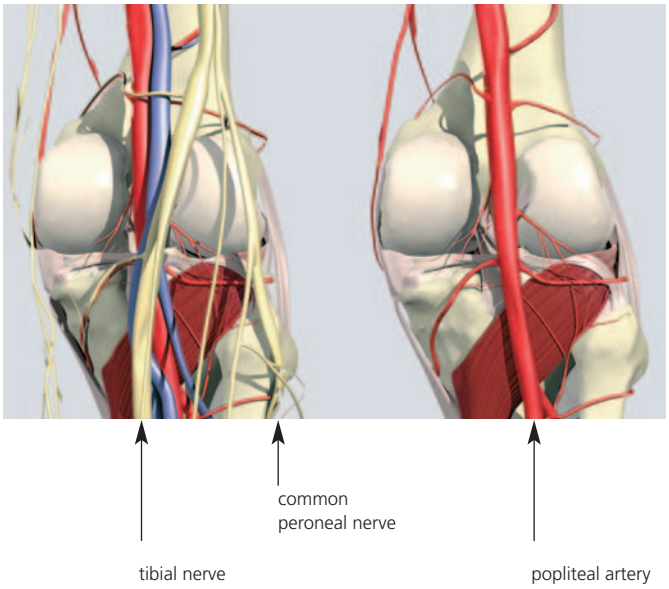
3. The oblique locking option in antero-posterior direction (A/P) corresponds to the third proximal locking position.



Important: Drilling for the oblique proximal locking requires special attention.

To avoid lesion of the popliteal artery, the tibial nerve and the common peroneal nerve as well as damage to the proximal tibiofibular joint, drilling must be stopped immediately before penetrating the far cortex.

In case of C-type fractures of the tibial head, the articulation surface of the proximal tibia should be restored before inserting the nail. The most recommended procedure is the use of two cannulated screws parallel to and below the tibia plateau surface.



2

C-type fractures of the tibial head (optional)

Insert two cannulated screws under image intensification according to standard technique. These cannulated screws must not interfere with the nail and must not damage the tibial plateau.

Cannulated screws
Using TAN screws is strongly recommended. The following cannulated screws can be considered:
– Cannulated Screws 6.5 mm, TAN, dark blue (408.401–408.482)
– Cannulated Screws 7.0 mm, TAN, light blue (408.151–408.223)
– Cannulated Screws 7.3 mm, TAN, gold (408.830–409.950)

Insert Expert Tibial Nail, please refer to steps 1 to 4 on pages 20 to 25.

3

Mount the aiming arm

Instrument	
03.010.018	Aiming Arm for Expert Tibial Nail

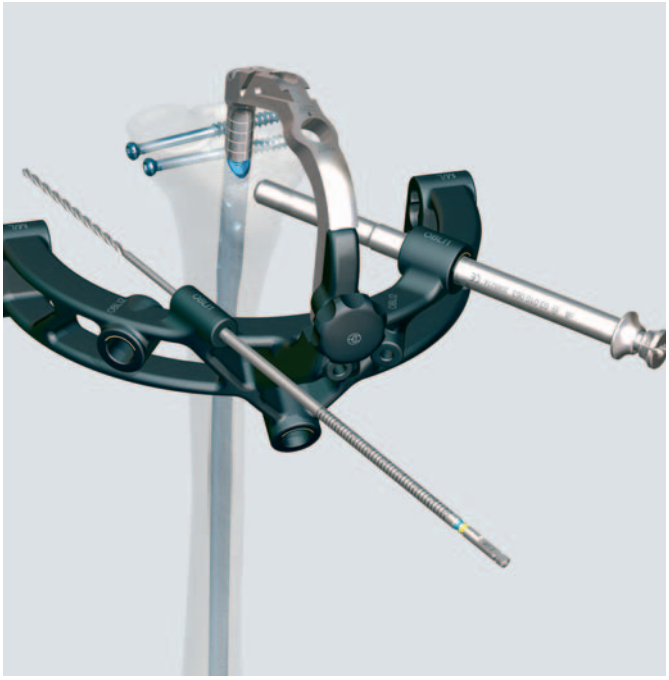
Confirm that the nail is securely connected to the insertion handle. Mount the aiming arm to the insertion handle as shown in the illustration.

Note: Do not exert forces on the aiming arm, protection sleeve, drill sleeves and drill bits. These forces may prevent accurate targeting through the proximal locking holes and damage the drill bits.

4

Check proximal nail position (optional)

Instruments	
03.010.018	Aiming Arm for Expert Tibial Nail (use the yellow marked guide holes)
03.010.063	Protection Sleeve 12.0/8.0, length 188 mm
03.010.064	Drill Sleeve 8.0/3.2, for No. 03.010.063 (with blue and yellow marking)
03.010.060	Drill Bit ∅ 3.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling (with blue and yellow marking)



Insert the protection sleeve and the drill sleeve through the oblique guide hole (OBLI 1) of the aiming arm.

Insert one drill bit through the corresponding guide hole of the aiming arm as illustrated. Do not drill.

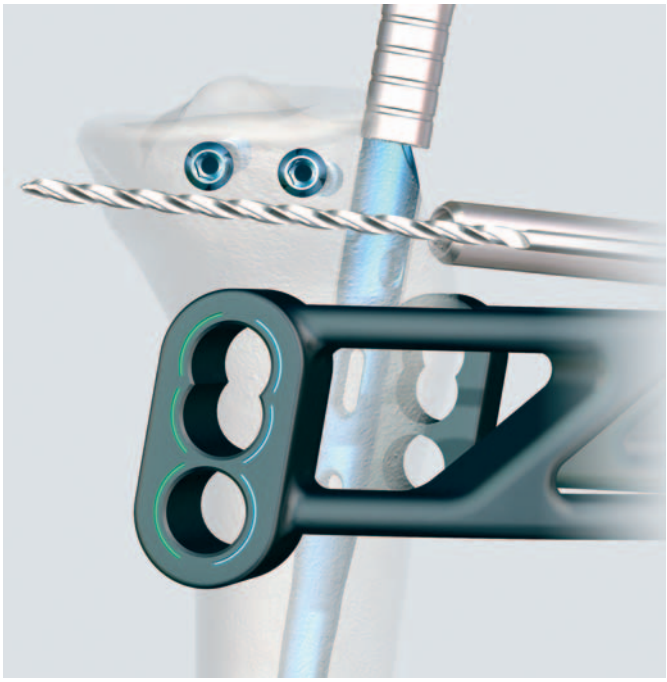
- Position the image intensifier in lateral view and adjust until the drill bit and the protection sleeve are perfectly aligned.

The view obtained when the drill bit and the protection sleeve are perfectly aligned is exactly perpendicular to the plane formed by the nail and the insertion handle and, therefore, almost parallel to the knee joint.

The drill bit shows the exact position of the first proximal cancellous bone locking screw.

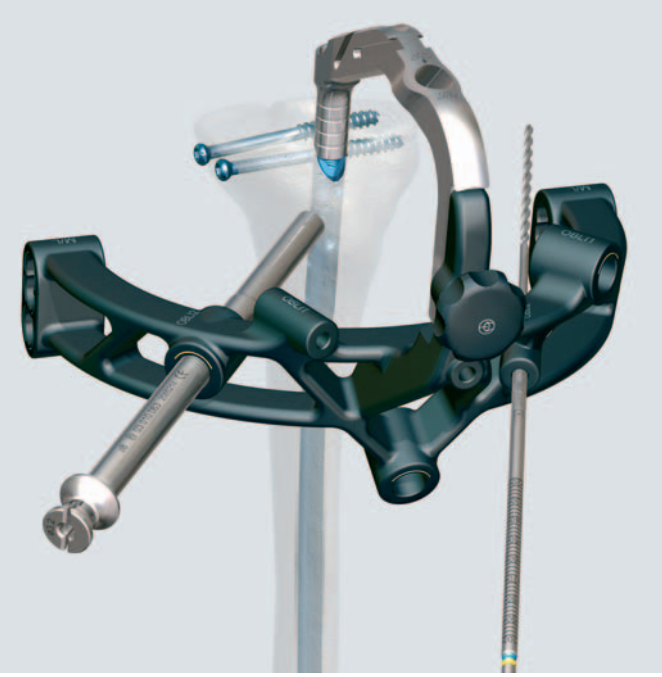
If necessary, insert the nail more distally.

Note:
- It is important that the cannulated screws and the cancellous bone locking screws do not interfere, and that the cancellous bone locking screws do not damage the surface of the tibia plateau.
- Depending on the anatomy of the patient's proximal tibia and on the specific situation, the second proximal oblique locking option can be chosen instead of the first locking option.



Alternative

The position of the second oblique locking option can be checked similarly to the technique described above by using the oblique guide hole (OBLI 2) of the aiming arm and corresponding guide hole for the drill bit.



5

Insert trocar combination

Instruments	
03.010.063	Protection Sleeve 12.0/8.0, length 188 mm
03.010.064	Drill Sleeve 8.0/3.2, for No. 03.010.063 (with blue and yellow marking)
03.010.069	Trocar ∅ 3.2 mm, for No. 03.010.063 (with blue and yellow marking)

Insert the three part trocar combination (protection sleeve, corresponding drill sleeve and trocar) through the desired hole for oblique locking options in the aiming arm, make a stab incision and insert the trocar to the bone. Remove the trocar.

6

Drill and determine the length of the cancellous bone locking screw

Instrument	
03.010.060	Drill Bit ∅ 3.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling (with yellow and blue markings)

Ensure that the drill sleeve is pressed firmly to the near cortex.

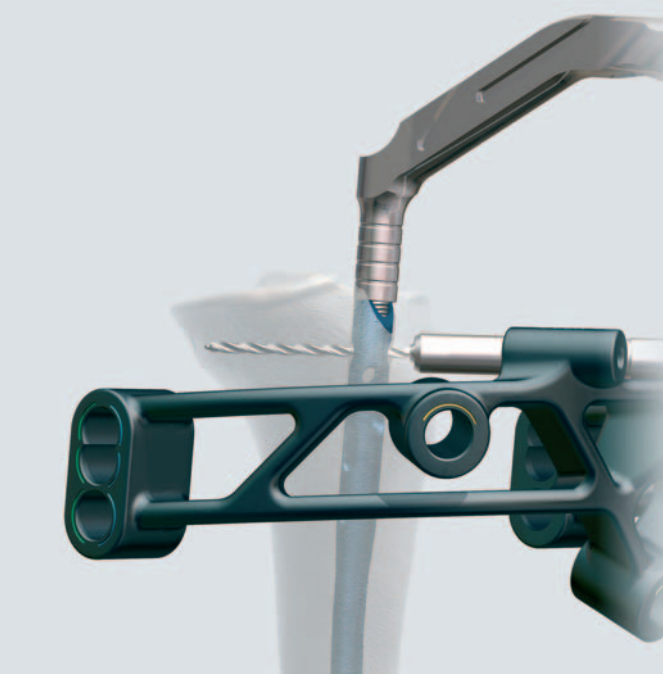
Insert the calibrated drill bit and start drilling the near cortex.

Stop drilling immediately after penetrating the near cortex. DO NOT penetrate the far cortex.

- Monitor the position of the drill bit with image intensification. This can be done by orienting the image intensifier perpendicular to the drill bit.
- Drill to the desired depth. A long cancellous bone locking screw will achieve better bone purchase than a shorter cancellous bone locking screw.

Important: Do not perforate the far cortex with the drill bit. Do not damage the tibial plateau.

- Confirm drill bit position after drilling.



Ensure that the drill sleeve is pressed firmly to the bone and read the measurement from the calibrated drill bit at the back of the drill sleeve.

This measurement corresponds to the appropriate length of the cancellous bone locking screw.

Remove the drill bit and the drill sleeve.

Important: To avoid perforation of the far cortex with the cancellous bone locking screw, it is recommended to choose a cancellous bone locking screw 5 mm shorter than the measured length.

7

Insert cancellous bone locking screw

Instrument	
03.010.107	Screwdriver Stardrive, T25, length 330 mm

Insert the appropriate cancellous bone locking screw through the protection sleeve using the screwdriver, do not over tighten.

- Verify screw length under image intensification.

Repeat this procedure for the second cancellous bone locking screw.

Option

Repeat the same steps as described above for the third proximal cancellous bone locking screw in the AP direction.

The position of the cancellous bone locking screw should be controlled under image intensification to ensure a correct position of the AP cancellous bone locking screw.

Insert the end cap

1
Insertion of the end cap

Instruments	
03.010.110	Screwdriver Stardrive, T40, cannulated, length 300 mm
357.399	Guide Wire ∅ 3.2 mm

The end caps for the Expert Tibial Nails are available in extension lengths of 0 mm (04.004.000 and 04.004.004), 5 mm (04.004.001), 10 mm (04.004.002), and 15 mm (04.004.003). They fulfill three functions: they prevent bone ingrowth into the nail; they extend the nail height if it is overinserted; and they lock the proximal oblique screw or the distal oblique locking screw, providing a stable, fixed-angle construct.

The end caps are cannulated for use over a guide wire if necessary.

Remove the nail insertion instruments.

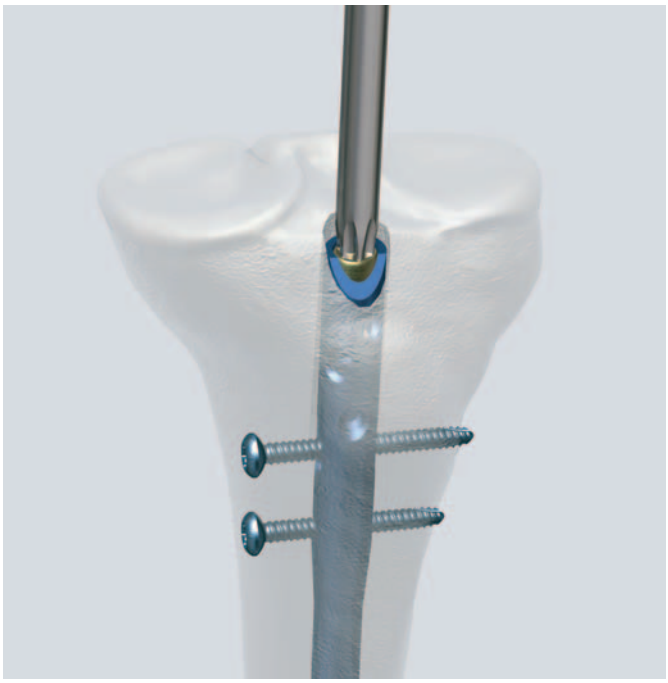
To aid in end cap insertion, remove the connecting screw only. The insertion handle can remain to help align the end cap to the top of the nail. The end cap fits through the barrel of the insertion handle.

Note: The patient's leg should be positioned in flexion to facilitate end cap insertion.

Engage the end cap with the screwdriver by exerting axial pressure. To prevent cross threading, align the end cap with the nail axis and turn the end cap counter clockwise until the thread of the end cap aligns with that of the nail.

Turn the end cap clockwise to thread the end cap into the nail.

Remove the guide wire and screwdriver.



Weight-bearing

When deciding on weight-bearing, fracture pattern, fracture location, conditions of soft tissues and quality of bone stock should be taken into account.

Partial weight bearing (sole contact or 15 kg) is the basic form of loading the fractured leg. Complete non-weight-bearing should be avoided.

Increase in load is determined according to fracture pattern and location, conditions of soft tissues and quality of bone as well as absence or presence of load induced pain.

Implant removal

1

Remove end cap and locking screws

Instruments	
03.010.110	Screwdriver Stardrive, T40, cannulated, length 300 mm
03.010.107	Screwdriver Stardrive, T25, length 330 mm
03.010.112	Holding Sleeve, with Locking Device

Implant removal is an optional procedure.

Clear the Stardrive socket of the end cap and the locking from any tissue ingrowth. Remove the end cap with the screwdriver Stardrive T40.

Remove all locking screws except one of the proximal locking screws using the screwdriver Stardrive T25 and the holding sleeve.

Note: Always remove the most proximal cancellous bone locking screw in order to insert the extraction screw into the proximal end of the nail.

2

Attach extraction screw and hammer guide

Instruments	
03.010.000	Extraction Screw
357.220	Hammer Guide
03.010.107	Screwdriver Stardrive, T25, length 330 mm

Before removing the final locking screw, screw the extraction screw into the nail and tighten it to prevent rotation or displacement of the nail posteriorly below the tibial plateau.

Attach the hammer guide to the extraction screw. Remove the remaining locking screw with the screwdriver.

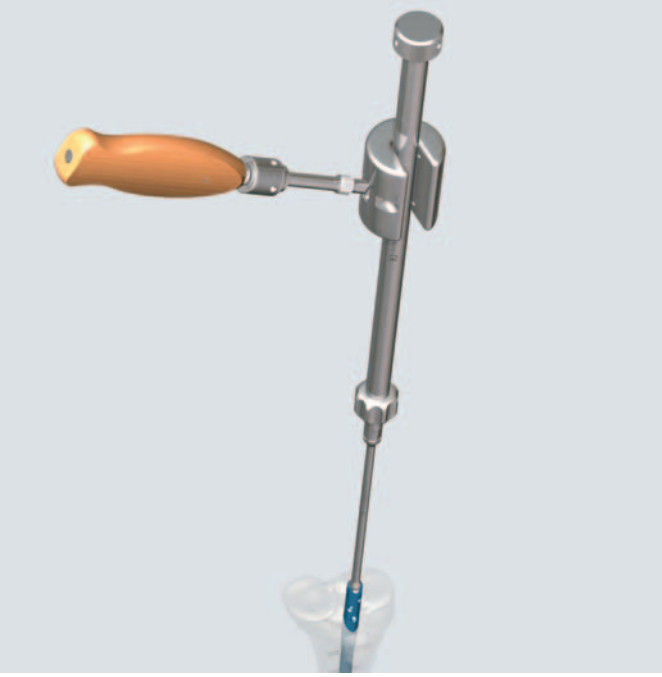
3
Remove nail

Instrument	
03.010.056	Combined Hammer, 700g

Extract the nail by applying gentle blows with the Hammer.

Alternative instrument	
03.010.001	Extraction Screw for 516.100 Air Pulse For extraction of intramedullary femoral and tibial nails

Before removing the final locking screw, screw the extraction screw into the nail and tighten it to prevent rotation or displacement of the nail posteriorly below the tibial plateau. Remove the remaining locking screw. Attach Air Pulse to the extraction screw and extract the Expert Tibial Nail.



Implant specifications

Expert Tibial Nail
Universal design for the left and right tibia

Material:
Titanium-6% aluminum-7% niobium alloy (TAN)

Diameters:
– 8 mm – 13 mm (1 mm increments)
– 8 mm – 10 mm nails have a proximal diameter of 11 mm
– 11 mm – 13 mm nails have a proximal diameter consistent with the shaft diameter

Colors:
– 8 mm and 9 mm (dark blue) use ∅ 4.0 mm locking screws (dark blue)
– 10 mm – 13 mm (light green) use ∅ 5.0 mm locking screws (light green)

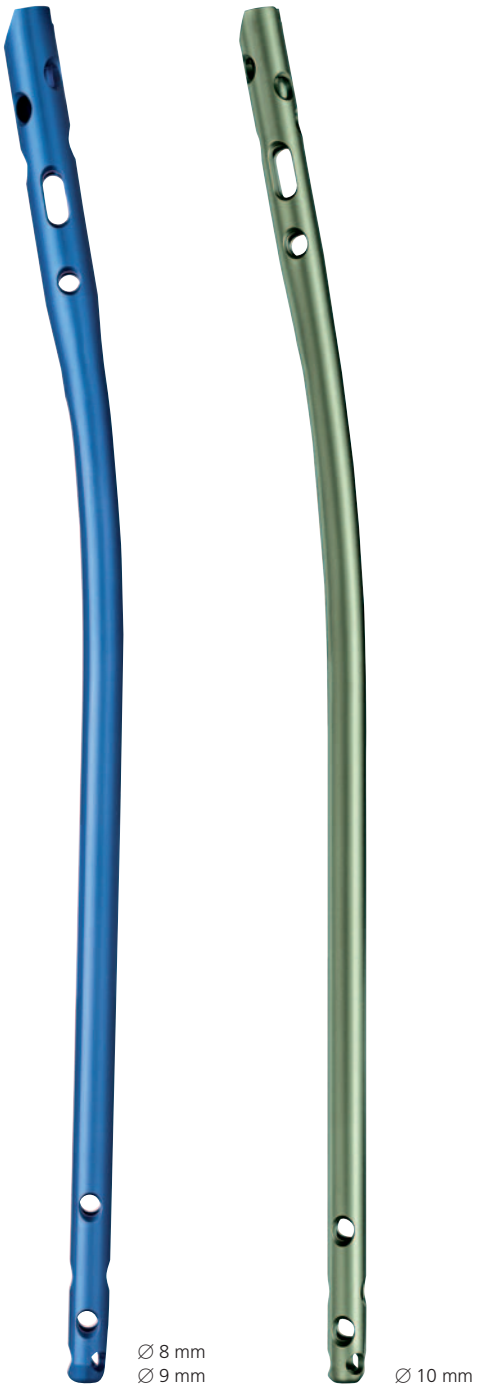
Lengths:
– 255 mm – 465 mm (15 mm increments)

Cross section:
– 8 mm – 10 mm nails are round
– 11 mm – 13 mm nails are fluted

Implants

Expert Tibial Nails, cannulated*

Length mm	∅ 8 mm dark blue	∅ 9 mm dark blue	∅ 10 mm light green
255	04.004.231	04.004.331	04.004.431
270	04.004.234	04.004.334	04.004.434
285	04.004.237	04.004.337	04.004.437
300	04.004.240	04.004.340	04.004.440
315	04.004.243	04.004.343	04.004.443
330	04.004.246	04.004.346	04.004.446
345	04.004.249	04.004.349	04.004.449
360	04.004.252	04.004.352	04.004.452
375	04.004.255	04.004.355	04.004.455
390	04.004.258	04.004.358	04.004.458
405	04.004.261	04.004.361	04.004.461
420	04.004.264	04.004.364	04.004.464
435	04.004.267	04.004.367	04.004.467
450	04.004.270	04.004.370	04.004.470
465	04.004.273	04.004.373	04.004.473



* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

Length mm	∅ 11 mm light green	∅ 12 mm light green	∅ 13 mm light green
255	04.004.531	04.004.631	04.004.731
270	04.004.534	04.004.634	04.004.734
285	04.004.537	04.004.637	04.004.737
300	04.004.540	04.004.640	04.004.740
315	04.004.543	04.004.643	04.004.743
330	04.004.546	04.004.646	04.004.746
345	04.004.549	04.004.649	04.004.749
360	04.004.552	04.004.652	04.004.752
375	04.004.555	04.004.655	04.004.755
390	04.004.558	04.004.658	04.004.758
405	04.004.561	04.004.661	04.004.761
420	04.004.564	04.004.664	04.004.764
435	04.004.567	04.004.667	04.004.767
450	04.004.570	04.004.670	04.004.770
465	04.004.573	04.004.673	04.004.773

∅ 11 mm
∅ 12 mm
∅ 13 mm

* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

Expert Tibial Nails, solid

Length mm	∅ 8 mm dark blue	∅ 9 mm dark blue	∅ 10 mm light green
255	04.024.231	04.024.331	04.024.431
270	04.024.234	04.024.334	04.024.434
285	04.024.237	04.024.337	04.024.437
300	04.024.240	04.024.340	04.024.440
315	04.024.243	04.024.343	04.024.443
330	04.024.246	04.024.346	04.024.446
345	04.024.249	04.024.349	04.024.449
360	04.024.252	04.024.352	04.024.452
375	04.024.255	04.024.355	04.024.455
390	04.024.258	04.024.358	04.024.458
405	04.024.261	04.024.361	04.024.461
420	04.024.264	04.024.364	04.024.464
435	04.024.267	04.024.367	04.024.467
450	04.024.270	04.024.370	04.024.470
465	04.024.273	04.024.373	04.024.473

Locking Screws for Expert Tibial Nail

Cancellous Bone Locking Screws 5.0 mm (gold)*

- Drill 3.2 mm
- Titanium-6% aluminium-7% niobium alloy (TAN)
- Lengths: 30 mm – 90 mm (5 mm increments)
- Used for proximal locking in the metaphysis (through the 3 most proximal holes)
- Dual core: smaller core (3.4 mm) for better purchase in cancellous bone, larger core (4.3 mm) to withstand load-bearing from the nail
- Stardrive T25 recess
- Fully threaded
- Self-tapping, blunt tip

Article No.	Length mm	Article No.	Length mm
04.015.520	30	04.015.555	65
04.015.525	35	04.015.560	70
04.015.530	40	04.015.565	75
04.015.535	45	04.015.570	80
04.015.540	50	04.015.575	85
04.015.545	55	04.015.580	90
04.015.550	60		

* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

Locking Screws 4.0 mm (dark blue)*

– Drill 3.2 mm
– Titanium-6% aluminium-7% niobium alloy (TAN)
– Lengths: 18 mm – 80 mm (2 mm increments)
– 3.3 mm core diameter
– Stardrive T25 recess
– Fully threaded
– Self-tapping, blunt tip

Article No.	Length mm	Article No.	Length mm
04.005.408	18	04.005.440	50
04.005.410	20	04.005.442	52
04.005.412	22	04.005.444	54
04.005.414	24	04.005.446	56
04.005.416	26	04.005.448	58
04.005.418	28	04.005.450	60
04.005.420	30	04.005.452	62
04.005.422	32	04.005.454	64
04.005.424	34	04.005.456	66
04.005.426	36	04.005.458	68
04.005.428	38	04.005.460	70
04.005.430	40	04.005.462	72
04.005.432	42	04.005.464	74
04.005.434	44	04.005.466	76
04.005.436	46	04.005.468	78
04.005.438	48	04.005.470	80

* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

Locking Screws 5.0 mm (light green)*

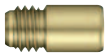
– Drill 4.2 mm
– Titanium-6% aluminium-7% niobium alloy (TAN)
– Lengths: 26 mm – 80 mm (2 mm increments)
  85 mm–100 mm (5 mm increments)
– 4.3 mm core diameter
– Stardrive T25 recess
– Fully threaded
– Self-tapping, blunt tip

Article No.	Length mm
04.005.516	26
04.005.518	28
04.005.520	30
04.005.522	32
04.005.524	34
04.005.526	36
04.005.528	38
04.005.530	40
04.005.532	42
04.005.534	44
04.005.536	46
04.005.538	48
04.005.540	50
04.005.542	52
04.005.544	54
04.005.546	56

Article No.	Length mm
04.005.548	58
04.005.550	60
04.005.552	62
04.005.554	64
04.005.556	66
04.005.558	68
04.005.560	70
04.005.562	72
04.005.564	74
04.005.566	76
04.005.568	78
04.005.570	80
04.005.575	85
04.005.580	90
04.005.585	95
04.005.590	100

* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

End Caps for Expert Tibial Nails, (gold)*
– Titanium-6% aluminium-7% niobium alloy (TAN)
– Protect nail threads from tissue ingrowth
– Cannulated
– Stardrive T40 recess
– Securely lock the most proximal oblique cancellous bone locking screw



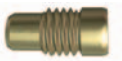
0 mm
– Sits flush with end of nail

5 mm, 10 mm and 15 mm extensions
– Extend nail height if nail is overinserted

Article No.	Extension (in mm)
04.004.000	0
04.004.001	5
04.004.002	10
04.004.003	15

Securely locks the second proximal oblique cancellous bone locking screw.

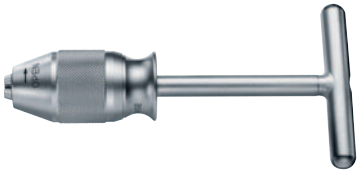
Article No.	Extension (in mm)
04.004.004	0



* Available non-sterile or sterile packed. Add "S" to the catalogue number to order sterile products.

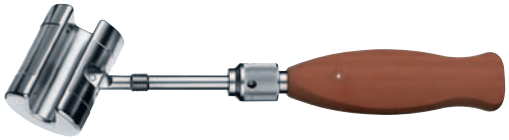
Instruments

Standard instrumentation

03.010.021	Radiographic Ruler for Tibial Nail, length 450 mm	
357.399	Guide Wire ∅ 3.2 mm	
393.100	Universal Chuck with T-Handle	
03.010.008	Cutter for Tibial Nails, ∅ 12.0 mm, length 350 mm	
03.010.035	Protection Sleeve 14.0/12.0	
03.010.044	Connecting Screw, for Tibial and Femoral Nails	

03.010.045	Insertion Handle, for Tibial and Femoral Nails	
03.010.092	Screwdriver, hexagonal with spherical head ∅ 8.0 mm	
03.010.047	Connector, length 141 mm, for Aiming Arm	
321.160	Combination Wrench ∅ 11 mm	
321.170	Pin Wrench ∅ 4.5 mm	
357.220	Hammer Guide, for No. 357.250 (*)	

(*) Also suitable for No. 03.010.056

03.010.056	Combined Hammer, 700 g, can be mounted	
357.398	Shaft, hexagonal, ∅ 8.0 mm, cannulated, short, length 125 mm	
03.010.100	Drill Bit ∅ 3.2 mm, length 145 mm, 3-flute, with Coupling for RDL	
03.010.101	Drill Bit ∅ 4.2 mm, length 145 mm, 3-flute, with Coupling for RDL	
03.010.106	Direct Measuring Device for Drill Bits of length 145 mm, for Nos. 03.010.100–105	
03.010.107	Screwdriver Stardrive, T25, length 330 mm	
03.010.112	Holding Sleeve, with Locking Device, for No. 03.010.107	

03.010.018	Aiming Arm for Tibial Nail	
03.010.063	Protection Sleeve 12.0/8.0, length 188 mm	
03.010.064	Drill Sleeve 8.0/3.2, for No. 03.010.063	
03.010.065	Drill Sleeve 8.0/4.2, for No. 03.010.063	
03.010.069	Trocar ∅ 3.2 mm	
03.010.070	Trocar ∅ 4.2 mm	

03.010.060	Drill Bit ∅ 3.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling	
03.010.061	Drill Bit ∅ 4.2 mm, calibrated, length 340 mm, 3-flute, for Quick Coupling	
03.010.072	Depth Gauge for Locking Screws 18 to 110 mm, for No. 03.010.063	
03.010.015	Compression Screw for Tibial Nail, for No. 03.010.044	
03.010.110	Screwdriver Stardrive, T40, cannulated, length 300 mm	
03.010.000	Extraction Screw for Tibial and Femoral Nails	

Radiolucent Instrumentation (Alternative)

03.010.013	Insertion Handle for Tibial Nail, radiolucent, short	
03.010.095	Connecting Screw, cannulated, short, for Tibial Nail	
03.010.004	Compression Screw for Tibial Nail	
03.010.011	Insertion Handle for Tibial Nail, radiolucent, long	
03.010.014	Connecting Screw for Tibial Nail, long, for No. 03.010.011	
03.010.007	Compression Screw for Tibial Nail, for No. 03.010.014	

03.010.010	Aiming Arm for Tibial Nail, radiolucent	
357.117	Hammer Guide for DFN, for No. 357.026 (*)	
03.010.124	Combined Hammer 500 g, can be mounted	

Optional Instruments

189.060	SynReam Intramedullary Reaming System	
03.010.093	Rod Pusher for Reaming Rod with Hexagonal Screwdriver ∅ 8.0 mm	

(*) Also suitable for Expert Tibial Nail for No. 03.010.124

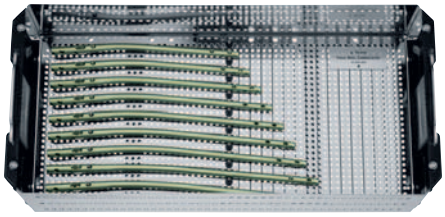
03.010.036	Drill Bit ∅ 12.0 mm, cannulated, length 300 mm, for No. 532.015	
03.010.040	Awl ∅ 12.0 mm, cannulated	
03.010.103	Drill Bit ∅ 3.2 mm, length 145 mm, 3-flute, for Quick Coupling	
03.010.104	Drill Bit ∅ 4.2 mm, length 145 mm, 3-flute, for Quick Coupling	
03.010.009	Protection Sleeve 12.0/8.0, length 128 mm	
03.010.073	Drill Sleeve 8.0/3.2, for No. 03.010.009	
03.010.074	Drill Sleeve 8.0/4.2, for No. 03.010.009	

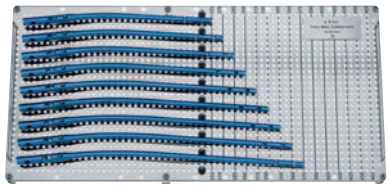
03.010.098	Trocar ∅ 3.2 mm, for No. 03.010.073	
03.010.099	Trocar ∅ 4.2 mm, for No. 03.010.074	
03.010.122	Drill Bit ∅ 3.2 mm, calibrated, length 270 mm, 3-flute, for Quick Coupling	
03.010.123	Drill Bit ∅ 4.2 mm, calibrated, length 270 mm, 3-flute, for Quick Coupling	
03.010.019	Depth Gauge for Locking Screws, measuring range up to 110 mm, for No. 03.010.009	
03.010.001	Extraction Screw for Tibial and Femoral Nails, for No. 516.100	

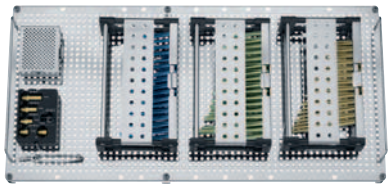
Note: Do not use standard instruments together with alternative instruments before contacting your Synthes representative.

VarioCase

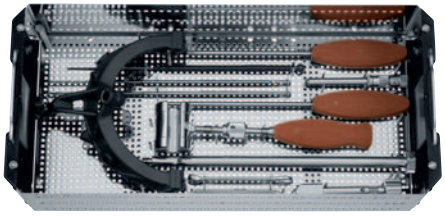
68.004.001	Vario Case for Expert Tibial Nails (Titanium Alloy), incl. Locking Screws and End Caps, without Lid, without Contents

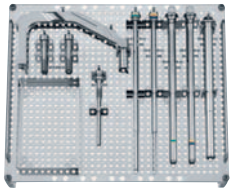


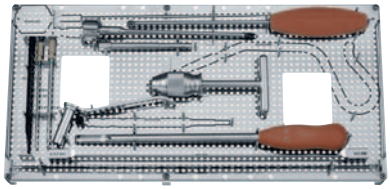




68.004.002 Vario Case for Standard Instruments for Expert Tibial Nail, without Lid, without Contents







68.004.003 Vario Case for Radiolucent Instruments for Expert Tibial Nail, without Lid, without Contents (not shown here)

Power Tools

511.300	Radiolucent Drive Mark II
511.730	Jacobs Chuck with Key (large)
511.750	Quick Coupling, for drill bits
511.761	Large Quick Coupling
511.785	Reduction Drive Unit
511.790	Quick Coupling, for Kirschner wires
530.010	Power Drive, complete
530.100	Power Drive
530.200	Battery, for Power Drive
530.280	Battery Casing, for Power Drive

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