The Titanium Cannulated Tibial Nail.
Expert Nailing System.

Technique Guide

SYNTHES®

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

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Image intensifier control

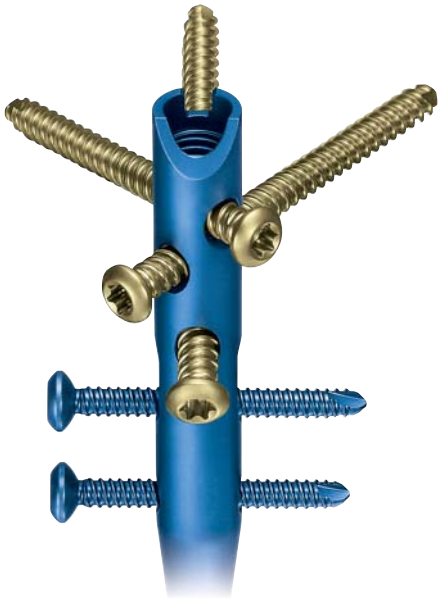
Titanium Cannulated Tibial Nail Expert System

Advanced solutions

Advanced proximal locking options

– Three innovative locking options, in combination with Dual Core Locking Screws, to increase the stability of the proximal fragment for proximal third fractures

– Two state-of-the-art mediolateral (ML) locking options enable primary compression or secondary controlled dynamization



Improved stability

End Caps

– Gold end caps securely lock the most proximal oblique locking screw to create a fixed-angle construct
– Gray end caps feature a lead-in design for easier end cap insertion
– End caps prevent ingrowth of tissue and facilitates nail extraction
– Self-retaining T40 StarDrive recess for easy pick up and insertion of end cap
– Cannulated
– 0 mm end caps sit flush with nail
– 5, 10 and 15 mm end caps extend nail height if nail is overinserted

Advanced nail design
- New anatomic bend for ease of nail insertion
- Titanium alloy* for improved mechanical and fatigue properties
- Cannulated nails (from 8 mm to 13 mm dia.) for reamed or unreamed techniques, enabling nail insertion over guide wire
- All Synthes 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)

Advanced distal locking options
- Distal oblique locking options to prevent soft tissue damage and increase stability of the distal fragment
- Two ML and one anteroposterior (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 enhance stability and ease of insertion
- Thread closer to screw head provides better bone purchase in the near cortex and improved stability
- Titanium alloy* for improved mechanical and fatigue properties
- Self-tapping blunt tip
- Self-retaining T25 StarDrive recess allows improved torque transmission and increased resistance to stripping relative to a hex recess and secure locking screw pick-up

Dual-Core Locking Screws:
- Indicated for the three proximal locking options of all tibial nails
- 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 diameter for 8 mm and 9 mm tibial nails, lengths: 18 mm–80 mm
- 5.0 mm diameter for 10 mm to 13 mm tibial nails, lengths: 26 mm–100 mm

* Titanium-6% aluminum-7% niobium alloy

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.

Anatomic reduction
The Tibial Nail–EX is designed to fit anatomically in the medullary canal, allowing indirection reduction.

Stable fixation
The intramedullary nail acts as an internal splint that controls but does not prevent micromovements of the fragments. It provides relative stability that leads to an indirect healing through callus formation.

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

Early mobilization
The Tibial Nail–EX provides secure fixation which permits controlled, early, active rehabilitation conducive to optimal recovery.

1 M.E. Müller, M. Allgöwer, R. Schneider, and H. Willenegger: *AO Manual of Internal Fixation,* 3rd Edition. Berlin: Springer-Verlag. 1991.

Indications

The Tibial Nail–EX is intended to stabilize fractures of the proximal and distal tibia and the tibial shaft, open and closed tibial shaft fractures, certain pre- and postisthmic fractures, and tibial malunions and nonunions.

Clinical 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 the two ML locking options of the Tibial Nail–EX. 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 dynamization 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, 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)

preoperative

postoperative

follow-up (3 weeks after surgery)

preoperative

postoperative

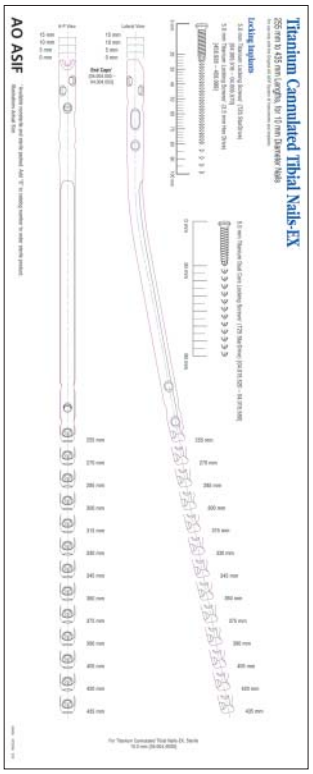
follow-up (3 weeks after surgery)

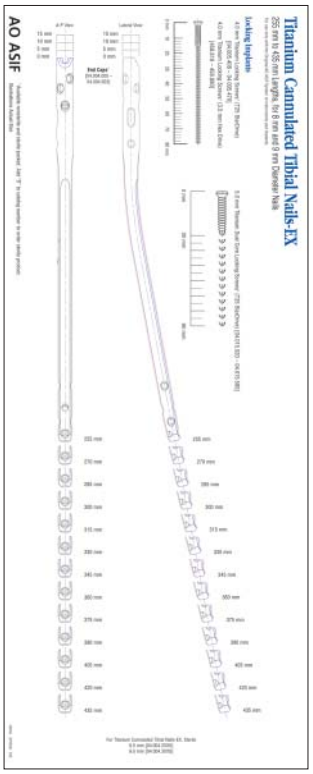
Preoperative Planning

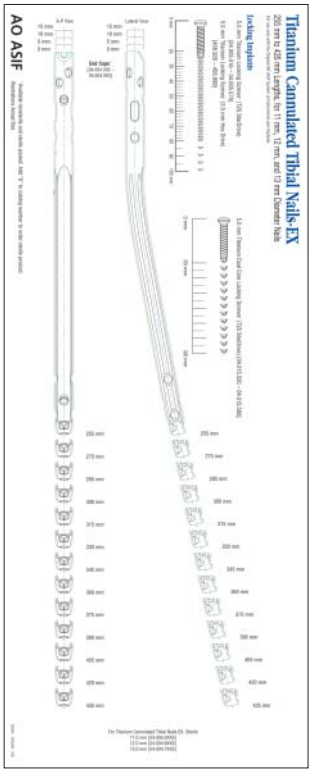
Use the AO ASIF Preoperative Planner Template for the Tibial Nail–EX to estimate nail diameter and nail length. To estimate nail diameter, place the template on the AP or lateral X-ray of the uninjured tibia and measure the diameter of the medullary canal at the narrowest part that will contain the nail.

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.

Note: Templates are available in two sizes: actual size and 115% magnification in which the image is enlarged 15% to correspond to typical radiographic magnification; however, variations in magnification levels are common.





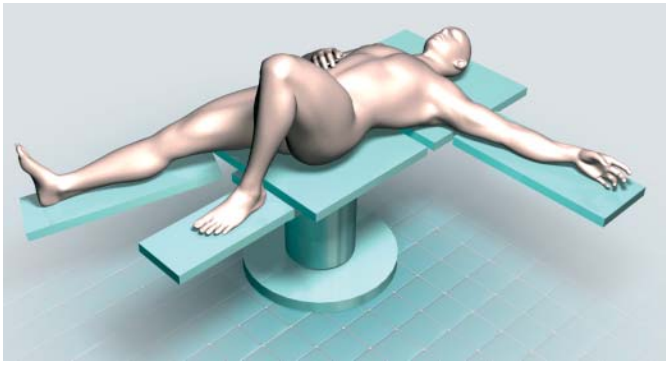


Opening the Tibia

1

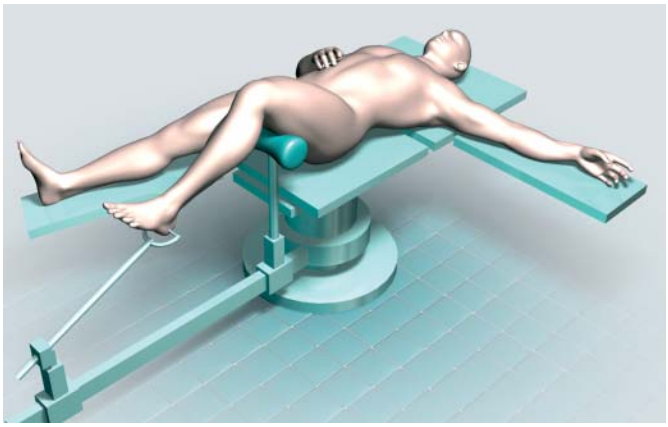
Position the patient

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 so that visualization 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 roll can be placed under the lower part of the thigh if it obstructs the view of the tibial plateau in the AP view.



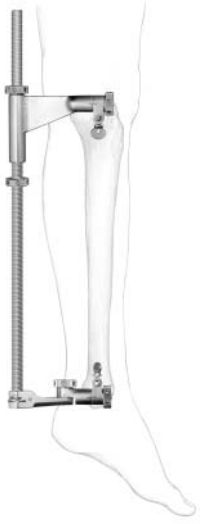
2

Reduce fracture

Instrument	
394.35	Large Distractor

Perform closed reduction manually by axial traction under image intensification. The use of the Large Distractor may be appropriate in certain circumstances.

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

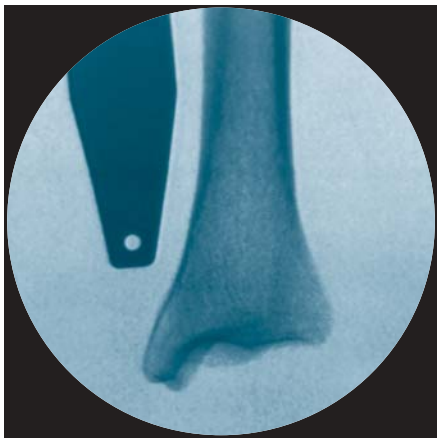


3
Confirm nail length and diameter

Instrument	
03.010.021	Radiographic Ruler for Titanium Cannulated Tibial Nails–EX

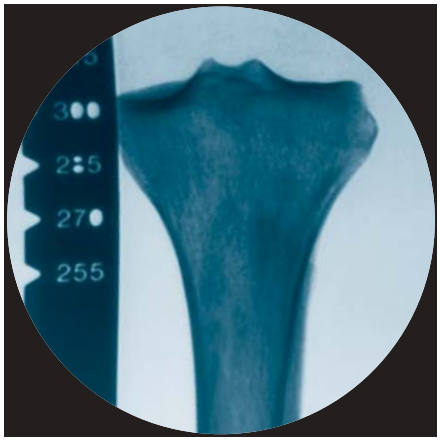
The required nail length must be determined after reduction of the lower leg fracture.

Position the C-arm for an AP view of the distal tibia. With long forceps, hold the Radiographic 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.

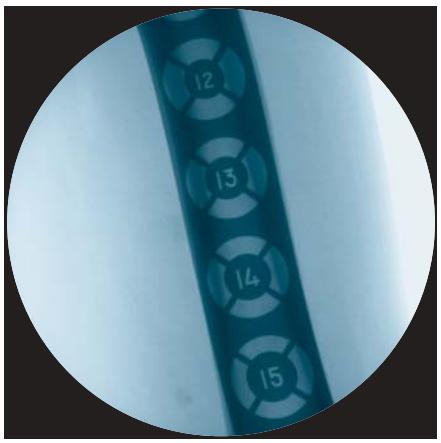


Move the C-arm to the proximal tibia, replace the distal end of the ruler at the skin mark, and take an AP image of the proximal tibia. Read nail length directly from the ruler image, selecting the measurement at or just below the level of the anterior edge of the tibial plateau.

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 Radiographic 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 dynamization 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.

Important: The ruler is not at the same level as the tibia. This affects the accuracy of the measurement, providing only an estimate of the canal diameter.

4
Approach

Make an incision in line with the central axis of the intra-medullary 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.

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

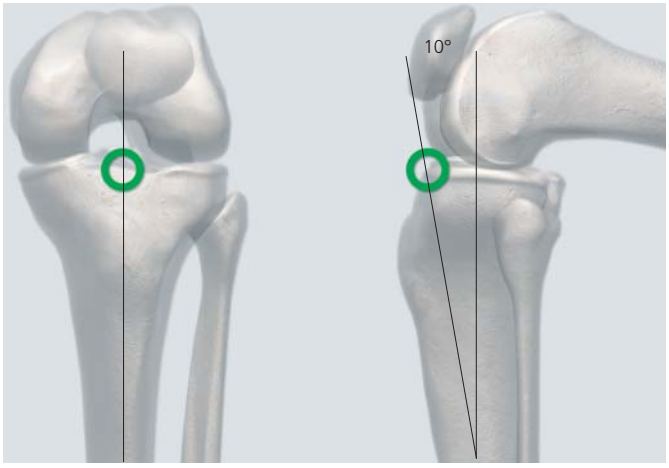
Prepare the entry site of the nail on the ventral edge of the tibial plateau.

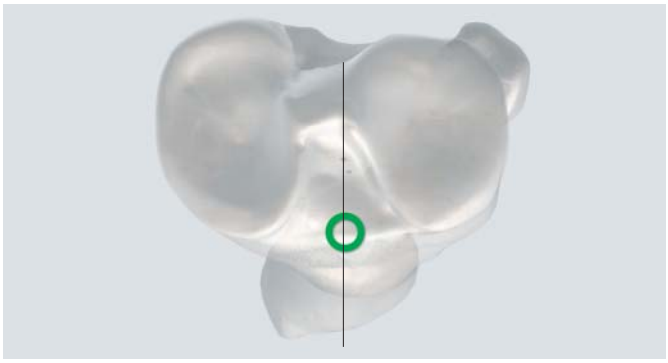
5
Determine entry point

- The entry point defines the optimal position of the 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

Instrument	
357.399	3.2 mm Guide Wire, 400 mm

Slightly punch mark the insertion point at a 10° angle to the shaft axis in the lateral view.

Hold a sterile nail on the side of the lower leg with its distal end parallel to the tibia shaft. The curved proximal nail end determines the angle of insertion for the Guide Wire.

- Insert the Guide Wire for approximately 8–10 cm and check the position under image intensification in the AP and lateral views.

7

Open medullary canal–drill bit

Instruments	
03.010.035	12.0 mm Protection Sleeve
03.010.036	12.0 mm Cannulated Drill Bit, large quick coupling, 190 mm
357.399	3.2 mm Guide Wire, 400 mm

Place the Protection Sleeve and the Drill Bit over the Guide Wire and down to the bone. Drill to a depth of approximately 8–10 cm. The Guide Wire and the Drill Bit should not touch the posterior cortex.

Remove the Guide Wire, Drill Bit and Protection Sleeve.

Note: Dispose of the Guide Wire. Do not reuse.

Alternative Instruments	
03.010.040	12.0 mm Cannulated Awl
357.399	3.2 mm Guide Wire, 400 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 approximately 8–10 cm.

The Awl should not touch the posterior cortex.

Remove the Guide Wire and Awl.

Note: Dispose of the Guide Wire. Do not reuse.

Reaming (optional technique)

8

Reaming medullary canal (optional)

Instruments	
03.010.024	Holding Device for Guide Wires and Reaming Rods
03.010.093	Reaming Rod Push Rod
150.060	Flexible Reamer Set for IM Nails
351.706S	2.5 mm Reaming Rod with ball tip, 950 mm, sterile
351.707S	2.5 mm Reaming Rod with ball tip and extension, 950 mm, sterile

If necessary, enlarge the tibial canal with the medullary reamer, to the desired diameter.

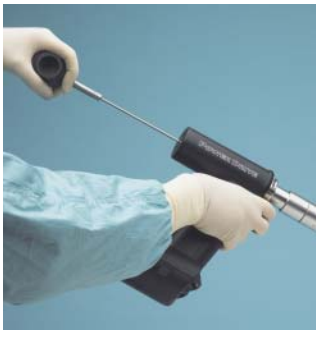
Check fracture reduction under the image intensification.

Inserting the reaming rod
Insert the Reaming Rod with ball tip into the medullary canal, using the holding device to the desired insertion depth.

Reaming
Starting with the 8.5 mm diameter reaming head, ream to a diameter of 0.50–1.0 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 nails in the cannulated Tibial Nail Expert System can be inserted over the Reaming Rod with ball tip. Reaming rod exchange is not required.

Option
Use the Reaming Rod Push Rod to help retain the reaming rod during reamer extraction.



Inserting the Nail

1
Assemble the insertion instruments

Instruments	
03.010.044	Cannulated Connecting Screw for Standard Insertion Handle
03.010.045	Standard Insertion Handle
03.010.092	Ball Hex Screwdriver, 8 mm

Orient the Insertion Handle anteriorly, and match the tang on the handle to the notch in the Tibial Nail–EX.

Place the Connecting Screw into the Insertion Handle and thread it into the proximal nail end, using the 8 mm Ball Hex Screwdriver.

Verify the nail is oriented properly on the insertion handle; secure the assembly with the 8 mm Ball Hex Screwdriver.

Alternative Instrument	
03.010.093	Reaming Rod Push Rod

Optionally, slide the Connecting Screw onto the Reaming Rod Push Rod. Slide the assembly through the Insertion Handle and match the tang of the handle to the notch of the nail. Tighten, using the hex on the Reaming Rod Push Rod.

Secure the assembly using the 8 mm Ball Hex Screwdriver.

2
Inserting the nail

Note: Hyperflex 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.

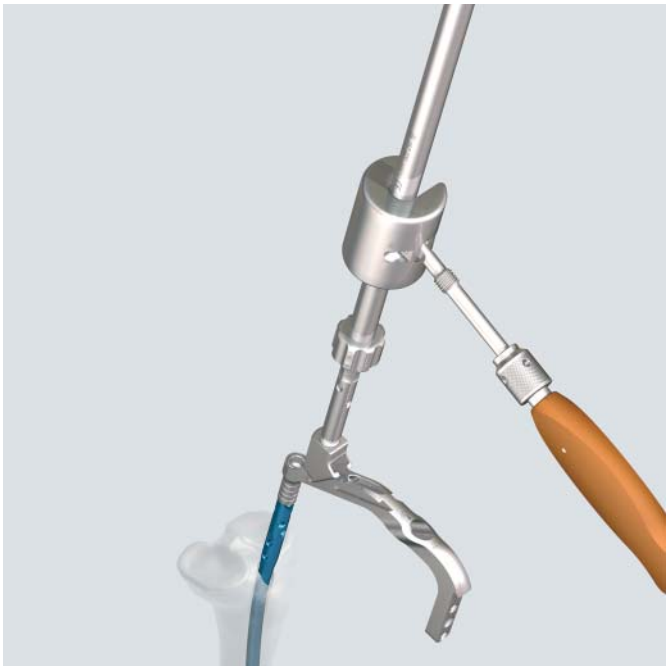
Monitor the nail passage across the fracture; control in two planes to avoid malalignment.

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 Tibial Nail has been completely inserted, otherwise the Aiming Arm may loosen during nail insertion.

Optional Instruments

03.010.047	Driving Cap
03.010.056	Slide/Fixed Hammer, 700 grams
321.17	4.5 mm Pin Wrench
321.20	11 mm Ratchet Wrench
357.22	Hammer Guide for Slide Hammer
357.398	Cannulated Shaft with 8 mm hex



If needed, use light, controlled hammer blows to seat the nail. Slide the Driving Cap into the grooves on the insertion handle and secure it, using the 11 mm Wrench. Lock the head of the Hammer in place by tightening the nut onto the threads located below the hammer head, using the 4.5 mm Pin Wrench. Strike the driving cap directly.

Optionally, the Hammer Guide can be threaded into the driving cap and the hammer can be used as a slide hammer. Loosen the nut 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 tibial nail or ream the medullary canal to a larger diameter.

Important: Confirm that the nail is securely connected to the insertion handle, especially after hammering, using either the 8 mm Ball Hex Screwdriver or the Cannulated Shaft with 8 mm hex.

3
Check proximal nail position

Instruments

03.010.052	Aiming Arm for Titanium Cannulated Tibial Nails–EX
357.399	3.2 mm Guide Wire, 400 mm

Attach the Aiming Arm and insert a 3.2 mm Guide Wire through the hole as shown in the illustration.

The tip of the Guide Wire indicates the exact proximal position of the Tibial Nail.

Remove the Driving Cap.

Remove 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 overinsertion of the nail or for correcting the nail location within the medullary canal.

If primary compression or secondary dynamization are planned, it is recommended to overinsert 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, using either the 8 mm Ball Hex Screwdriver or the Cannulated Shaft with 8 mm hex.

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 before 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.

Locking Holes

AP View

ML View

For use with Dual Core Locking Screws

For anterolateral or anteromedial locking (30° to the sagittal plane)

1
Distal locking

Instruments	
03.010.006	Cannulated Connecting Screw
03.010.017	Tibial Nail–EX Insertion Handle
511.30	Radiolucent Drive

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

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

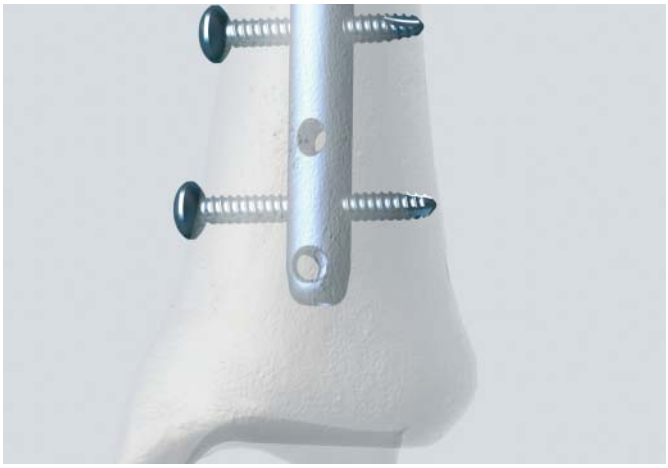
It is recommended to lock distally first, enabling the use of the backstroke technique** to prevent loss of reduction. Verify the nail has been inserted to the appropriate depth.

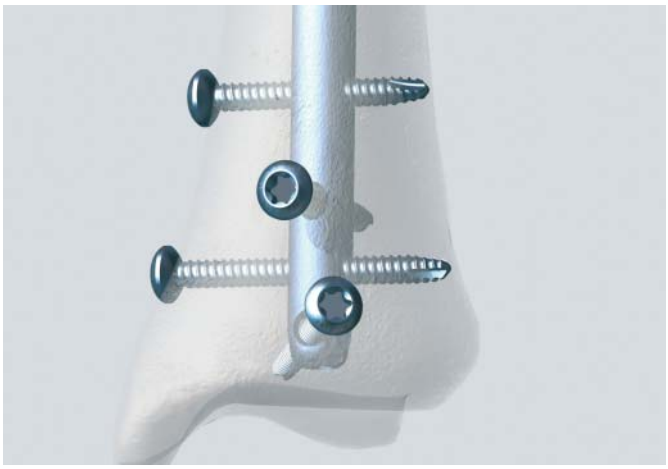
Locking of the Tibial Nail is usually performed from the medial side, if possible with the leg extended. This position helps counteract the forces exerted by the quadriceps muscle that would tend to deform the proximal fragment and also facilitates rotational control of the tibial axis before locking.

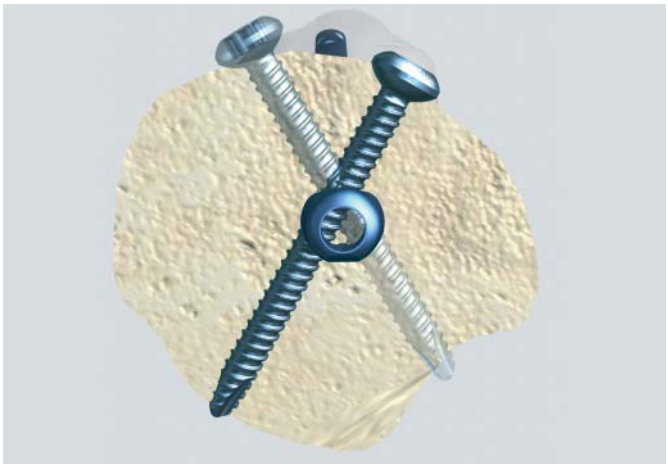
Note: When locking in extension use Tibial Nail–EX Insertion Handle and the corresponding connecting screw.

Distal locking with the Radiolucent Drive is described on pages 22 and 23.

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
** See page 26.

2

Align the image

- Check the reduction, correct alignment of the fragments, and leg length before locking the Expert Tibial 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	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.101	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive

- Using the Radiolucent Drive under image intensification, insert the tip of the appropriate drill bit through the incision and 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 resuming power to drill the far cortex.

Alternative Instruments	
03.010.103	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm
03.010.104	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm

Standard freehand locking technique can be performed without the Radiolucent Drive. Use the appropriate drill bit shown above.

5

Determine the length of the locking screw

Instruments	
03.010.100	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.101	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.103	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm
03.010.104	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm
03.010.106	Direct Measuring Device, for Locking Screws to 100 mm, for IM Nails

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.

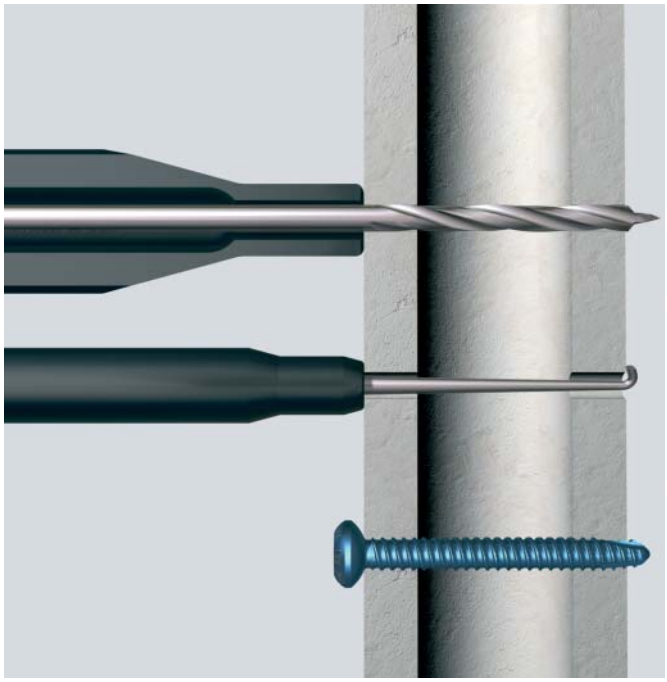
Note: Drill Bit location with respect to the far cortex is critical for measuring the appropriate Locking Screw length.

Alternative Instrument

03.010.072	Depth Gauge, for Locking Screws to 100 mm, for IM Nails

Measure the Locking Screw length using the Depth Gauge for Locking Screws. Ensure the outer sleeve is in contact with the bone and the hook grasps the far cortex.

Read the Locking Screw length directly from the Depth Gauge at the back of the outer sleeve.



6
Insert locking screw

Instruments

03.010.107	StarDrive Screwdriver, T25, self-retaining
03.010.112	Holding Sleeve with Locking Device

Insert the appropriate length Locking Screw using the T25 StarDrive Screwdriver and the Holding Sleeve with Locking Device, if needed.

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

Note: In the event of loss of reduction, the backstroke technique* can be used after insertion of the second distal Locking Screw. Alternatively, the Compression Device can be used, refer to page 31.

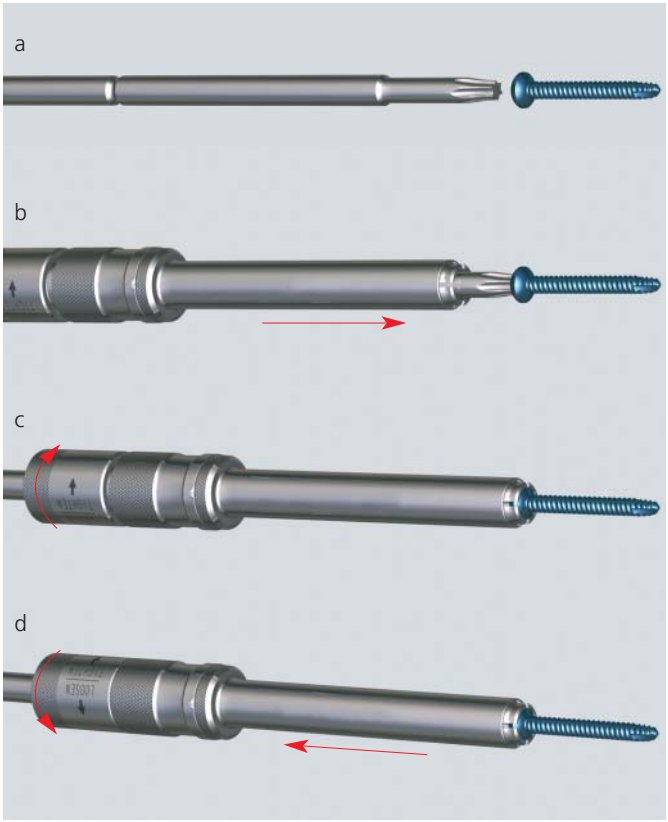
Use the Holding Sleeve as described below:

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 counterclockwise.

d Release the Holding Sleeve after insertion of the Locking Screw, by loosening it clockwise and pushing backwards.

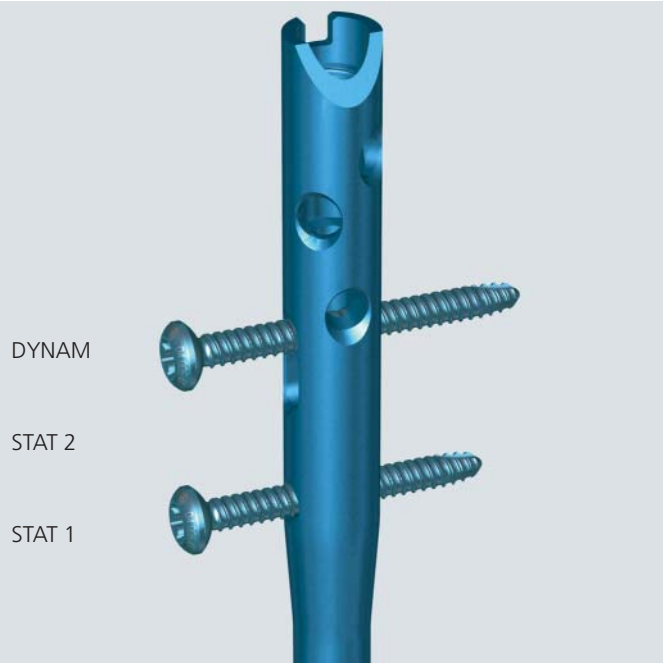


* Backstroke technique: with the hammer guide attached to the driving cap and insertion handle (see page 16) light, reverse hammer blows may be used to compress the fracture; monitor reduction radiographically.

1

Choose the appropriate 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 (blue)	4.0 mm (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 (green)	5.0 mm (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 dynamization of the bone fragments.

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

3 Static 1 (STAT 1) corresponding to most distal proximal locking hole.

2
Mount the aiming arm

Instrument	
03.010.052	Aiming Arm for the Titanium Cannulated Tibial Nails–EX

Confirm that the nail is securely connected to the Insertion Handle using the 8 mm Ball Hex. 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	12.0 mm/8.0 mm Protection Sleeve, 188 mm
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm (with blue and gold marking)
03.010.065	8.0 mm/4.2 mm Drill Sleeve, 200 mm (with green marking)
03.010.069	3.2 mm Trocar, 210 mm (with blue and gold marking)
03.010.070	4.2 mm Trocar, 210 mm (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 a stab incision and insert the Trocar to the bone. Remove the Trocar.

4

Drill and determine the locking screw length

Instruments	
03.010.060	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration (with blue and gold marking)
03.010.061	4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration (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 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 two parts: the outer sleeve and the measuring device with hook. Insert the measuring device into the Protection Sleeve. Make sure that the hook grasps far cortex and that the Protection Sleeve is on the bone.

Read the measurement from the back of the protection sleeve, which indicates the appropriate length Locking Screw.

5
Insert locking screw

Instrument	
03.010.107	StarDrive Screwdriver, T25, self-retaining

Insert the appropriate length Locking Screw through the Protection Sleeve using the T25 StarDrive 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 Dual Core Locking Screws can be added for proximal fractures and highly unstable fractures.

Refer to page 33 for details on proximal locking with the Dual Core Locking Screws.

Proximal Locking—Compression Locking Mode (optional)

1

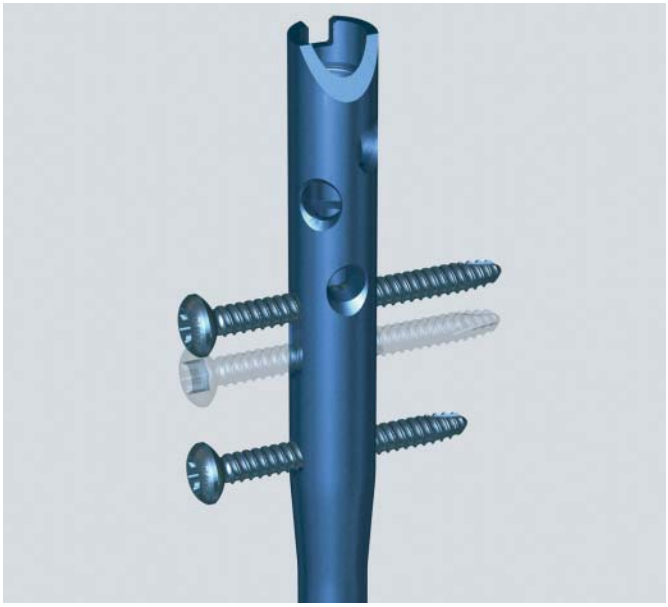
Compression locking mode (optional)

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

The Tibial Nail–EX allows a maximum compression of 7 mm. If more compression of the fracture gap is needed, the conventional backstroke technique is recommended (see page 26).

Note: Distal locking is required prior to Compression Locking, refer to page 21.

Insert one proximal Locking Screw in the dynamic locking hole (DYNAM). Refer to section Diaphyseal and Distal Segment Fractures on pages 27 to 30, for details on inserting this Locking Screw.



2

Insert compression device

Instruments

03.010.015	Compression Device for Titanium Cannulated Tibial Nails–EX, for use with (03.010.044) and (03.010.045)
03.010.092	Ball Hex Screwdriver, 8 mm

Confirm that the nail is securely connected to the Insertion Handle using the 8 mm Ball Hex Screwdriver.

Insert the Compression Device through the Connecting Screw and into the nail using the 8 mm Ball Hex Screwdriver.

The Compression Device will contact the dynamic Locking Screw.

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

2

Insert compression device continued

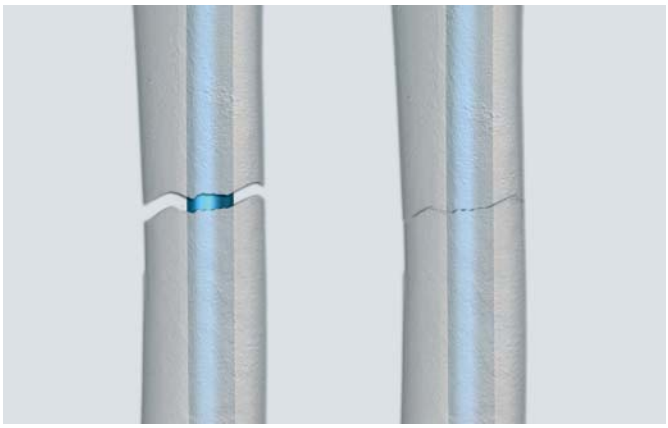
Important: Do not overtighten the Compression Device, it may deform the Locking Screw.

Note: Compression device cannot be used with Tibial Nail–EX Insertion Handle (03.010.017) and cannulated Connecting Screw (03.010.006). Compression can be accomplished using the backstroke technique (see page 26).

3

Monitor fracture

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



4

Insert static locking screw

Insert second proximal Locking Screw in the most distal hole of the proximal locking options (Static 1). Refer to section Diaphyseal and Distal Segment Fractures on pages 27 to 30.

Remove the Compression Device.

Additional oblique Dual Core Locking Screws can be inserted if required. Refer to section Proximal Segment Fractures on page 33.

1
Oblique proximal locking

Instruments	
03.010.006	Cannulated Connecting Screw
03.010.015	Compression Device
03.010.017	Tibial Nail–EX Insertion Handle
04.004.000– 04.004.003	Tibial Nail End Cap

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 Dual Core Locking Screws (gold) only in combination with the two oblique proximal locking holes (PROXIMAL OBLIQUE, DISTAL OBLIQUE) and A/P proximal locking hole for all nail diameters.

Use the 3.2 mm Drill Bit for the 5.0 mm Dual Core Locking Screws.

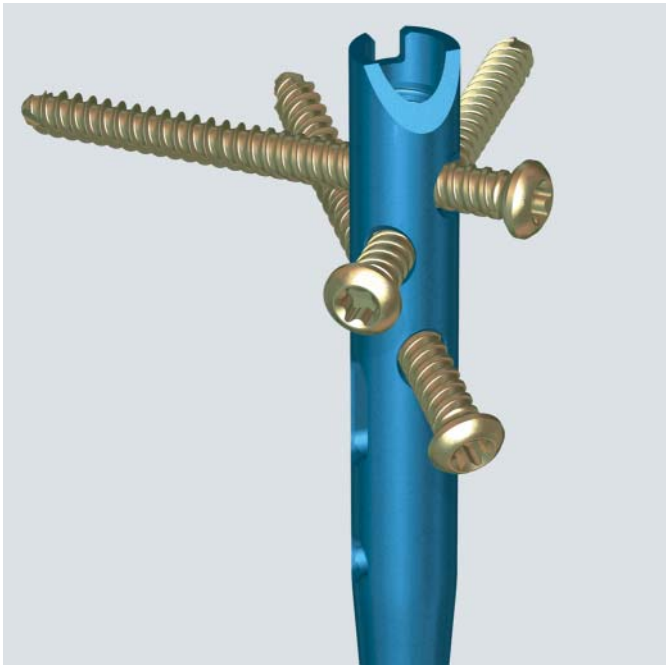
The Aiming Arm can target all three proximal oblique locking options:

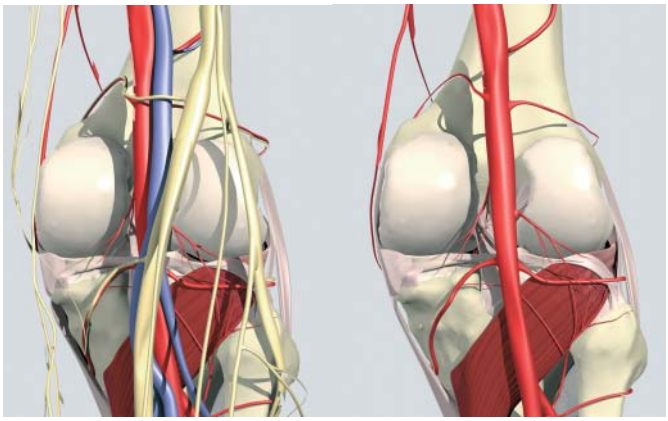
1 The oblique locking option (PROXIMAL OBLIQUE) corresponds to the most proximal locking position. Inserting a Tibial Nail End Cap with this Locking Screw will create a fixed-angle construct.

2 The oblique locking option (Distal Oblique) corresponds to the second proximal locking position.

3 The oblique locking option in anteroposterior 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.





1

Oblique proximal locking continued

Note: When locking with the leg in full extension it is recommended to use the Tibial Nail–EX Insertion Handle and Cannulated Connecting Screw to prevent impingement on the patella. These devices are not compatible with the Compression Device.

2

Mount the aiming arm

Instruments

03.010.052	Aiming Arm, for Titanium Cannulated Tibial Nail–EX
03.010.092	Ball Hex Screwdriver, 8 mm

Confirm that the nail is securely connected to the Insertion Handle using the 8 mm Ball Hex Screwdriver. 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.

3

Insert trocar combination

Instruments	
03.010.063	12.0 mm/8.0 mm Protection Sleeve, 188 mm
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm (with blue and gold marking)
03.010.069	3.2 mm Trocar, 210 mm (with blue and gold 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.

4

Drill and determine the length of the Dual Core Locking Screws

Instrument	
03.010.060	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration (with blue and gold marking)

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.

4

Drill and determine the length of the Dual Core Locking Screws continued

- 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 Dual Core Locking Screw will achieve better bone purchase than a shorter Dual Core 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 indicates the appropriate length of the Dual Core Locking Screw.

Remove the Drill Bit and the Drill Sleeve.

Important: To avoid perforation of the far cortex with the Dual Core Locking Screw, a Dual Core Locking Screw 5 mm shorter than the measured length is recommended.

5
Insert Dual Core Locking Screws

Instrument	
03.010.107	StarDrive Screwdriver, T25, self-retaining

Insert the appropriate 5.0 mm Dual Core Locking Screw through the Protection Sleeve, using the T25 Stardrive Screwdriver. Do not overtighten.

Verify locking screw length under image intensification.

Repeat this procedure for the second Dual Core Locking Screw.

5

Insert Dual Core Locking Screws continued

Option

Repeat the same steps as described above for the third proximal Dual Core Locking Screw in the AP direction.

The position of the Dual Core Locking Screw should be controlled under image intensification to ensure a correct position of the AP Dual Core Locking Screw.

End Cap Insertion

1

Insertion of the end cap

Instruments	
03.010.110	Cannulated StarDrive Screwdriver, T40
357.399	3.2 mm Guide Wire, 400 mm

All Titanium End Caps for the Tibial Nail–EX are available in extension lengths of 0 mm, 5 mm, 10 mm, and 15 mm. They prevent bone ingrowth into the nail and they extend the nail height if it is overinserted.

The gold end caps lock the proximal oblique screw providing a stable fixed angle construct.

The gray end caps have a lead-in design for easier end cap insertion. These are only used for standard transverse proximal locking. The two proximal oblique locking holes cannot be used in conjunction with the gray end caps.

The End Caps are cannulated for use over a guide wire, if necessary.

Remove the nail insertion instruments.

Optionally, 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 leg should be positioned in flexion to facilitate End Cap insertion.

1

Insertion of the end cap continued

Engage the End Cap with the Cannulated T40 StarDrive Screwdriver by exerting axial pressure. To prevent cross-threading, align the End Cap with the nail axis and turn the End Cap counterclockwise, 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 T40 StarDrive Screwdriver.

Note: The End Cap will engage the most proximal oblique locking screw to create a fixed-angle construct.

Implant Removal

1

Remove end cap and locking screws

Instruments	
03.010.107	StarDrive Screwdriver, T25, self-retaining
03.010.110	Cannulated StarDrive Screwdriver, T40, self-retaining
03.010.112	Cannulated Holding Sleeve, with Locking Device

Implant removal is an optional procedure.

Clear the StarDrive socket of the End Cap and the locking implants of any tissue ingrowth. Remove the End Cap with the T40 StarDrive Screwdriver.

Remove all Locking Screws except one of the proximal Locking Screws, using the T25 StarDrive Screwdriver and Holding Sleeve.

Note: Always remove the most proximal Dual Core Locking Screw in order to insert the Extraction Screw into the proximal end of the Tibial Nail–EX.

2
Attach Extraction Screw and Hammer Guide

Instruments	
03.010.107	StarDrive Screwdriver, T25, self-retaining
357.133	Extraction Screw
357.22	Hammer Guide

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

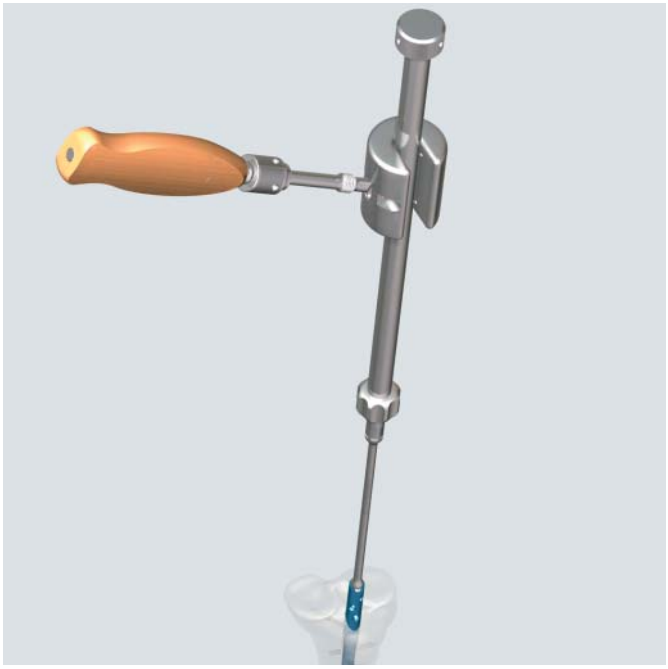
Attach the Hammer Guide to the Extraction Screw.

Remove the remaining Locking Screw with the T25 StarDrive Screwdriver.

3
Remove nail

Instrument	
03.010.056	Slide/Fixed Hammer, 700 grams

Extract the nail by applying gentle blows with the Hammer.



Implant Specifications

Titanium Cannulated Tibial Nails–EX
Universal design for the left or right tibia

Material:
Titanium-6% aluminum-7% niobium alloy

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 (blue) use 4.0 mm Titanium Locking Screws (blue)
– 10 mm–13 mm (green) use 5.0 mm Titanium Locking Screws (green)

Lengths:
255 mm–435 mm (15 mm increments)

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

Implants

Titanium Cannulated Tibial Nails–EX, sterile*

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

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

8 mm
9 mm

10 mm

11 mm
12 mm
13 mm

* Titanium-6% aluminum-7% niobium alloy

5.0 mm Titanium Dual Core Locking Screws,◊ with T25 StarDrive recess, for IM Nails (gold)

- Titanium alloy*
- 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
- Fully threaded
- Self-tapping, blunt tip

	Length (mm)
04.015.520	30
04.015.525	35
04.015.530	40
04.015.535	45
04.015.540	50
04.015.545	55
04.015.550	60
04.015.555	65
04.015.560	70
04.015.565	75
04.015.570	80
04.015.575	85
04.015.580	90

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.
* Titanium-6% aluminum-7% niobium alloy

4.0 mm Titanium Locking Screws◊, with T25 StarDrive recess, for IM Nails (blue)

– Titanium alloy*
– Lengths: 18 mm–80 mm (2 mm increments)
– 3.3 mm core diameter
– Fully threaded
– Self-tapping, blunt tip

	Length (mm)		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 nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.
* Titanium-6% aluminum-7% niobium alloy

5.0 mm Titanium Locking Screws◊, with T25 StarDrive recess, for IM Nails (light green)

– Titanium alloy*
– Lengths: 26 mm–80 mm (2 mm increments)
85 mm–100 mm (5 mm increments)
– 4.3 mm core diameter
– Fully threaded
– Self-tapping, blunt tip

	Length (mm)		Length (mm)
04.005.516	26	04.005.548	58
04.005.518	28	04.005.550	60
04.005.520	30	04.005.552	62
04.005.522	32	04.005.554	64
04.005.524	34	04.005.556	66
04.005.526	36	04.005.558	68
04.005.528	38	04.005.560	70
04.005.530	40	04.005.562	72
04.005.532	42	04.005.564	74
04.005.534	44	04.005.566	76
04.005.536	46	04.005.568	78
04.005.538	48	04.005.570	80
04.005.540	50	04.005.575	85
04.005.542	52	04.005.580	90
04.005.544	54	04.005.585	95
04.005.546	56	04.005.590	100

Titanium End Caps◊, with T40 StarDrive recess, for Titanium Tibial Nails–EX

– Titanium alloy*
– Protect nail threads from tissue ingrowth
– Cannulated
– T40 StarDrive recess

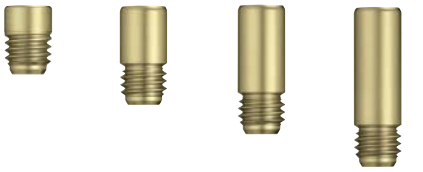
0 mm
– Sits flush with end of nail

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

Gold Titanium End Caps◊, with T40 StarDrive recess, for Titanium Tibial Nails–EX

– Securely lock the proximal oblique Dual Core Locking Screw

	Extension (mm)
04.004.000	0
04.004.001	5
04.004.002	10
04.004.003	15



0 mm 5 mm 10 mm 15 mm

Gray Titanium End Caps◊, with T40 StarDrive recess, for Titanium Tibial Nails–EX

– Lead-in design for easier end cap insertion
– Will block the two most proximal oblique locking holes

	Extension (mm)
04.004.008	0
04.004.009	5
04.004.010	10
04.004.011	15

0 mm 5 mm 10 mm 15 mm

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.
* Titanium-6% aluminum-7% niobium alloy

Instruments

03.010.015	Compression Device, for Titanium Cannulated Tibial Nails–EX	
03.010.021	Radiographic Ruler, for Titanium Cannulated Tibial Nails	
03.010.023	Radiographic Canal Width Estimator, for IM Nails	
03.010.035	12.0 mm Protection Sleeve	
03.010.036◊	12.0 mm Cannulated Drill Bit, large quick coupling, 190 mm	
03.010.040	12.0 mm Cannulated Awl	
03.010.044	Cannulated Connecting Screw, for Standard Insertion Handle	

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

03.010.045 Standard Insertion Handle

03.010.092 Ball Hex Screwdriver, 8 mm

03.010.047 Driving Cap with Handle Adapter

03.010.056 Slide/Fixed Hammer, 700 grams

03.010.106 Direct Measuring Device, for locking screws to 100 mm, for IM nails

03.010.107 StarDrive Screwdriver, T25, self-retaining

03.010.110 Cannulated StarDrive Screwdriver, T40, self-retaining

03.010.112	Holding Sleeve, with Locking Device	
03.010.052	Aiming Arm, for Titanium Cannulated Tibial Nails–EX	
03.010.060◊	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration	
03.010.061◊	4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration	
03.010.063	12.0 mm/8.0 mm Protection Sleeve, 188 mm	
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm	
03.010.065	8.0 mm/4.2 mm Drill Sleeve, 200 mm	

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

03.010.069	3.2 mm Trocar, 210 mm	
03.010.070	4.2 mm Trocar, 210 mm	
03.010.072	Depth Gauge, for locking screws to 100 mm, for IM nails	
03.010.093	Reaming Rod Push Rod, with ball handle	
03.010.103◊	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm	
03.010.104◊	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm	
03.010.024	Holding Device, for Guide Wires and Reaming Rods	

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

321.17	4.5 mm Pin Wrench, 120 mm	
321.20	Ratchet Wrench, 11 mm width across flats	
357.22	Hammer Guide, for Slide Hammer	
357.133	Extraction Screw, for Titanium Femoral and Tibial Nails	
357.398	Cannulated Shaft with 8 mm hex, 125 mm	
357.399	3.2 mm Guide Wire, 400 mm	

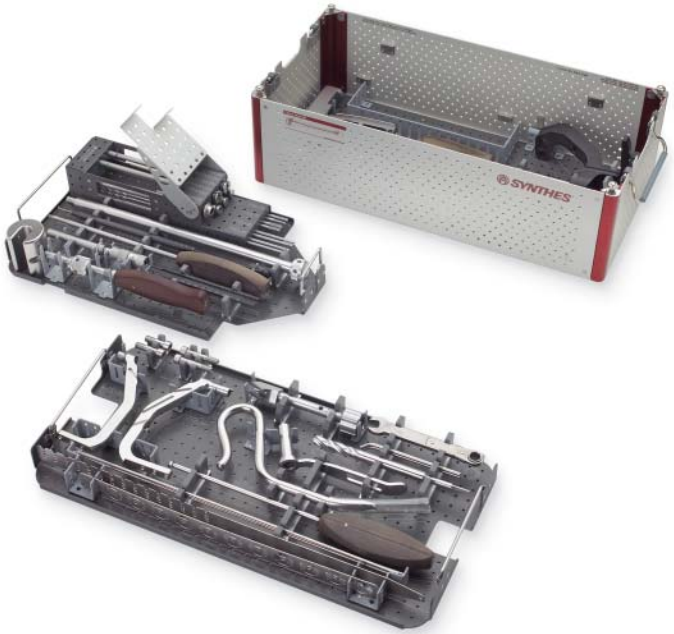
Tibial Nail–EX Instrument Set (01.004.303)

Graphic Case

69.004.300	Tibial Nail–EX Instrument Set Graphic Case

Instruments

03.010.015	Compression Device, for Titanium Cannulated Tibial Nails–EX
03.010.021	Radiographic Ruler, for Titanium Cannulated Tibial Nails
03.010.023	Radiographic Canal Width Estimator, for IM Nails
03.010.024	Holding Device for Guide Wires and Reaming Rods
03.010.035	12.0 mm Protection Sleeve
03.010.036◊	12.0 mm Cannulated Drill Bit, large quick coupling, 190 mm
03.010.040	12.0 mm Cannulated Awl
03.010.044	Cannulated Connecting Screw, for Standard Insertion Handle, 2 ea.
03.010.045	Standard Insertion Handle
03.010.047	Driving Cap with Handle Adapter
03.010.052	Aiming Arm, for Titanium Cannulated Tibial Nails–EX
03.010.056	Slide/Fixed Hammer, 700 Grams
03.010.060◊	3.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration, 2 ea.
03.010.061◊	4.2 mm Three-Fluted Drill Bit, quick coupling, 330 mm, 100 mm calibration, 2 ea.
03.010.063	12.0 mm/8.0 mm Protection Sleeve, 188 mm
03.010.064	8.0 mm/3.2 mm Drill Sleeve, 200 mm
03.010.065	8.0 mm/4.2 mm Drill Sleeve, 200 mm
03.010.069	3.2 mm Trocar, 210 mm
03.010.070	4.2 mm Trocar, 210 mm
03.010.072	Depth Gauge, for locking screws to 100 mm, for IM nails
03.010.092	Ball Hex Screwdriver, 8 mm
03.010.093	Reaming Rod Push Rod, with ball handle
03.010.092	Ball Hex Screwdriver, 8 mm
03.010.093	Reaming Rod Push Rod, with ball handle



Sterilization Parameters for Sets (01.004.300, 01.004.303 and 01.004.304)

These Synthes sets with all additionally available items, as marked in the cases, can be sterilized by the following parameters. For more information, please refer to graphic case package insert.

Method	Cycle	Temperature	Exposure Time
Steam	Prevacuum (Wrapped)	132°–135°C (270°–275°F)	8 Minutes
Steam	Gravity Displacement (Wrapped)	132°–135°C (270°–275°F)	22 Minutes

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

Instruments continued

03.010.103◊	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, 2 ea.
03.010.104◊	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, 2 ea.
03.010.106	Direct Measuring Device, for locking screws to 100 mm, for IM nails
03.010.107	StarDrive Screwdriver, T25, self-retaining
03.010.110	Cannulated StarDrive Screwdriver, T40, self-retaining
03.010.112	Holding Sleeve, with Locking Device
321.17	4.5 mm Pin Wrench, 120 mm, 2 ea.
321.20	Ratchet Wrench, 11 mm width across flats
357.133	Extraction Screw, for Titanium Femoral and Tibial Nails
357.22	Hammer Guide, for Slide Hammer
357.398	Cannulated Shaft with 8 mm hex, 125 mm
357.399	3.2 mm Guide Wire, 400 mm, 3 ea.

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

Tibial Nail–EX Implant Set (01.004.304)

Graphic Case

690.504 Locking Screw Rack for Tibial Nail–EX Implants

Implants

Gold Titanium End Caps, with T40 StarDrive recess, for Tibial Nails–EX◊, 2 ea.

	Extension (mm)
04.004.000	0
04.004.001	5
04.004.002	10
04.004.003	15

5.0 mm Titanium Dual Core Locking Screws, with T25 StarDrive recess, for IM Nails◊, 2 ea.

	Length (mm)		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		

4.0 mm Titanium Locking Screws, with T25 StarDrive recess, for IM Nails◊, 2 ea.

	Length (mm)		Length (mm)
04.005.416	26	04.005.444	54
04.005.418	28	04.005.446	56
04.005.420	30	04.005.448	58
04.005.422	32	04.005.450	60
04.005.424	34	04.005.452	62
04.005.426	36	04.005.454	64
04.005.428	38	04.005.456	66
04.005.430	40	04.005.458	68
04.005.432	42	04.005.460	70
04.005.434	44	04.005.462	72
04.005.436	46	04.005.464	74
04.005.438	48	04.005.466	76
04.005.440	50	04.005.468	78
04.005.442	52	04.005.470	80

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

Implants continued

5.0 mm Titanium Locking Screws, with T25 StarDrive recess, for IM Nails◊, 2 ea.

	Length (mm)		Length (mm)
04.005.516	26	04.005.544	54
04.005.518	28	04.005.546	56
04.005.520	30	04.005.548	58
04.005.522	32	04.005.550	60
04.005.524	34	04.005.552	62
04.005.526	36	04.005.554	64
04.005.528	38	04.005.556	66
04.005.530	40	04.005.558	68
04.005.532	42	04.005.560	70
04.005.534	44	04.005.562	72
04.005.536	46	04.005.564	74
04.005.538	48	04.005.566	76
04.005.540	50	04.005.568	78
04.005.542	52	04.005.570	80

319.97 Screw Forceps

Also Available

Gray Titanium End Caps, with T40 StarDrive recess, for Tibial Nails–EX◊, 2 ea.

	Extension (mm)
04.004.008	0
04.004.009	5
04.004.010	10
04.004.011	15

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

Tibial Nail–EX Instrument and Titanium Implant Set (01.004.300)

01.004.300 consists of:

01.004.303	Tibial Nail–EX Instrument Set
01.004.304	Tibial Nail–EX Implant Set

Also Available

Optional Instruments

03.010.006	Cannulated Connecting Screw, for Tibial Nail–EX Insertion Handle
03.010.017	Tibial Nail–EX Insertion Handle
03.010.100◊	3.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.101◊	4.2 mm Three-Fluted Drill Bit, quick coupling, 145 mm, for Radiolucent Drive
03.010.119	4.6 mm Cleaning Brush
03.010.120	4.6 mm Cleaning Stylet
03.010.121	Large Hexagonal Screwdriver, 3.5 mm width across flats
150.060	Flexible Reamer Set for IM Nails
314.119	StarDrive Screwdriver Shaft, T25, self-retaining, quick coupling, 165 mm
351.706S	2.5 mm Reaming Rod with ball tip, 950 mm, sterile
351.707S	2.5 mm Reaming Rod with ball tip and extension, 950 mm, sterile
357.408	Cleaning Stylet (3.2 mm)
357.409	Cleaning Brush (3.2 mm)
360.251	7.5 mm Intramedullary Reduction Tool, 460 mm
393.105	Small Universal Chuck with T-Handle
394.35	Large Distractor, complete
399.43	Hammer, 700 grams

Power Equipment

511.30	Radiolucent Drive Mark II
511.73	Jacobs Chuck with Key (large)
511.75	Quick Coupling for drill bits
511.761	Large Quick Coupling
511.785	Reduction Drive Unit
511.791	Quick Coupling for Kirschner wires
530.100	Power Drive
530.200	Battery, for Power Drive
530.280	Battery Casing, for Power Drive

◊ Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.

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