Operative technique

ESTREMO
CITIEFFE NAILING SYSTEM

Intramedullary nailing system

Tibial nail - Suprapatellar approach
Femoral nail - Retrograde approach

citieffe®
Essential moves in Trauma

Surgeons must always decide on the best approach to follow according to their clinical judgement and the patient's needs. Citieffe does not dispense medical advice and recommends that surgeons be trained in the use of any particular product before using it in surgery. The information presented is intended to demonstrate the extent of Citieffe product offerings.

Before use a surgeon must always consult the package insert, product label and/or instructions for use. Products may not be available in all markets because product availability is subject to the regulatory and/or medical practices in individual markets.

Please contact your Citieffe representative if you have questions about the availability of Citeffe products in your area.

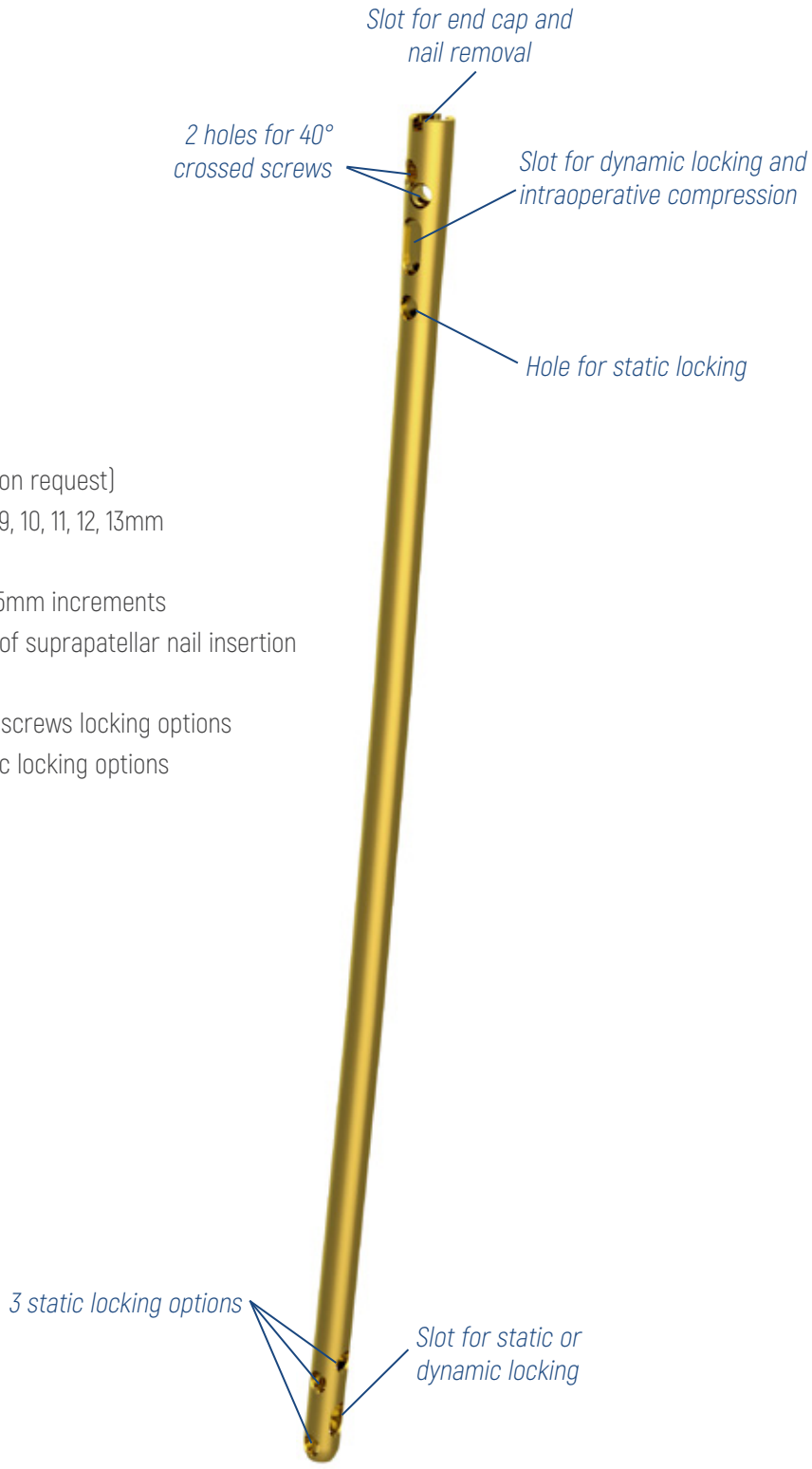
CONTENTS

PRODUCT DESCRIPTION

TITANIUM STERILE

ESTREMO citieffe nailing system

Intramedullary nailing system with a unique design allowing both an easier tibial suprapatellar approach with semi-extended knee and a retrograde femur approach.



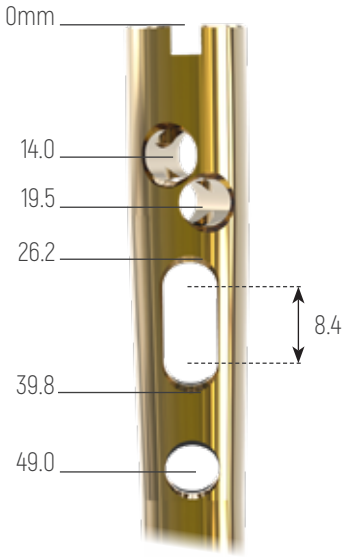
- Titanium alloy ASTM F136
- Solid nail diameter: 8mm (on request)
- Cannulated nail diameter: 9, 10, 11, 12, 13mm
- Available lengths:
  from 260 to 470mm with 15mm increments
- Anatomical bend for ease of suprapatellar nail insertion
- ø5.2mm screw sizes
- Different multi-directional screws locking options
- Multiple static and dynamic locking options

Image shows the cannulated nail

Proximal holes

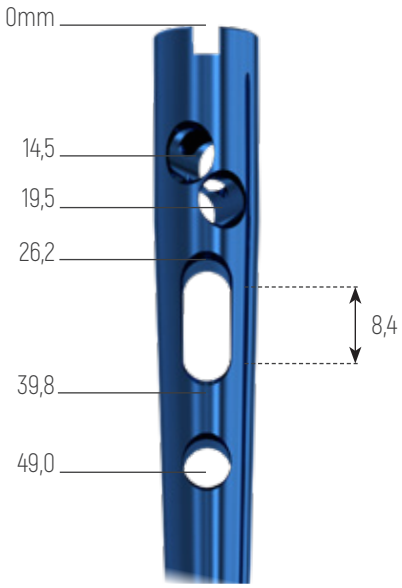
CANNULATED NAILS

ø9mm-ø13mm



SOLID NAILS

ø8mm



Compression range

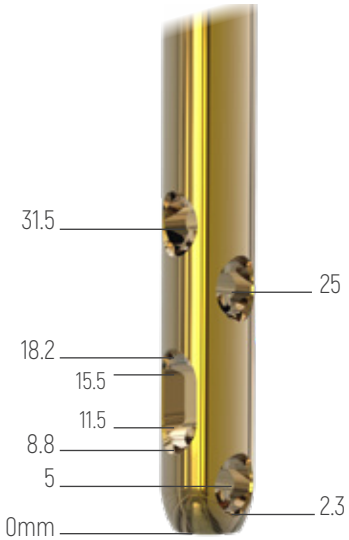
Total slot length	13.6mm
Screw diameter (-)	5.2mm
Maximum movement of screw	8.4mm

Note:
Micrometrical compression can't be performed on the solid nail ø8mm

Distal holes

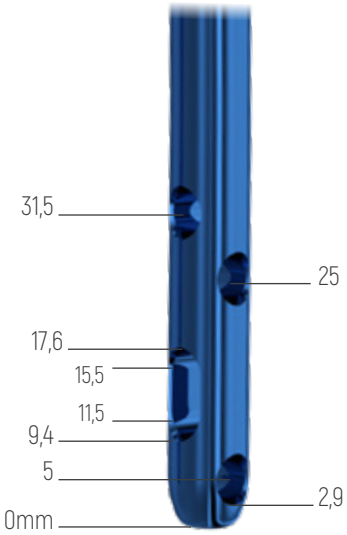
CANNULATED NAILS

ø9mm-ø13mm



SOLID NAILS

ø8mm



ESTREMO citieffe nailing system: screws and end caps

Both screws and end caps have a built-in threaded retention system.
All screws and end caps use the same 5mm hexagon screwdriver.

Cortical screw ø5.2mm

- Titanium alloy
- Self-tapping
- Proximal part of the screw built up for enhanced stability
- Self retaining threaded head
- Available lengths:
  - from 22.5mm to 55mm with 2.5mm increments;
  - from 55mm to 110mm with 5mm increments.

Cortical screw characteristics:

A Increased core diameter

B Proximal part of the screw built up for enhanced stability

Cortical screw ø4mm

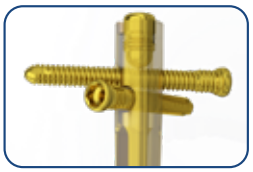
- Titanium alloy
- Self-tapping
- Proximal part of the screw built up for enhanced stability
- Self retaining threaded head
- Available lengths:
  from 25 to 40mm with 5mm increments

NOTE:
Used only in the distal holes of the solid nail ø8mm

ESTREMO end cap

- Titanium alloy
- Available sizes:
  - Standard
  - 5mm
  - 10mm
- To prevent bone in-growth
- To increase nail height

ESTREMO locking end cap



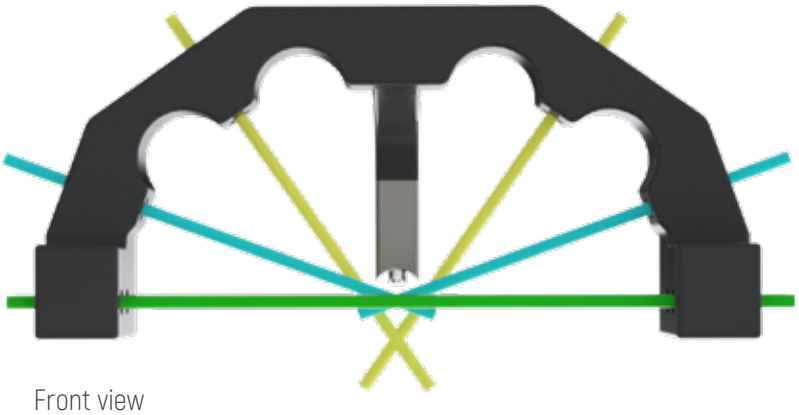
- Titanium alloy
- Available sizes:
  - Standard
  - 5mm
  - 10mm
- To prevent bone in-growth
- To increase nail height
- To lock crossed screws (with 40° angle)

PARALLEL SCREWS, marked green on the targeting guide
Insertion of parallel screws

CROSSED SCREW, marked blue on the targeting guide
Insertion of the crossed screws at 40°.

OUT-NAIL SCREWS, marked yellow on the targeting guide
Insertion of out-nail screws.

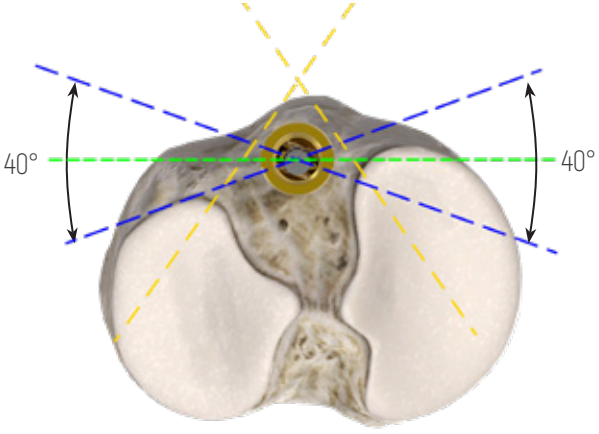
NOTE:
Rondò cannulated screws are available to be used in the out-nail holes for a correct bone fragments compression.



Front view

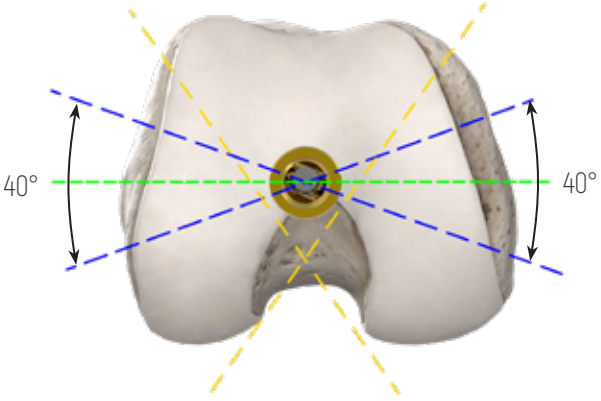
Side view

Tibial nail - Suprapatellar approach



- Parallel screws
- 40° crossed screws
- Out-nail screws

Femoral nail - Retrograde approach



- Parallel screws
- 40° crossed screws
- Out-nail screws

INDICATIONS

Tibia

The Estremo citieffe nailing system is indicated for tibial fracture fixation, which may include the following:

- diaphyseal tibial fractures
- corrective osteotomies
- pseudoarthrosis
- non-unions and mal-unions

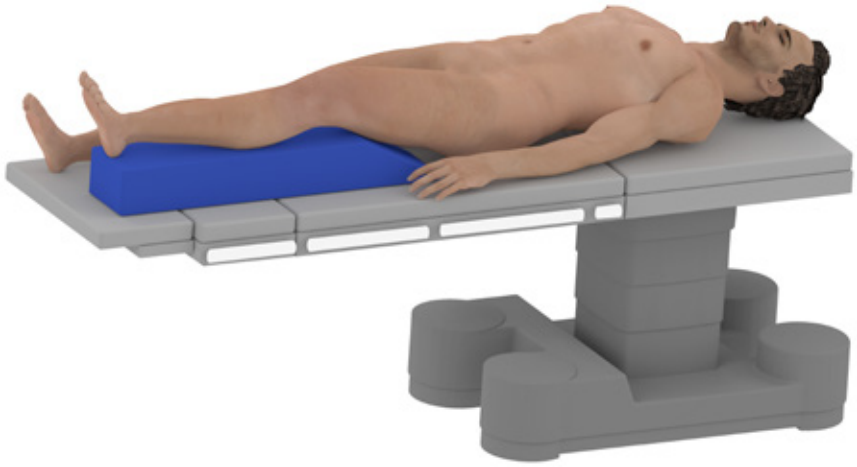
Femur

The Estremo citieffe nailing system is indicated for femoral fracture fixation, which may include the following:

- diaphyseal femoral fractures
- supra-condylar femoral fractures
- corrective osteotomies
- pseudoarthrosis
- non-unions and mal-unions

TS Tibial nail - Suprapatellar approach - Semiextended knee

Patient positioning

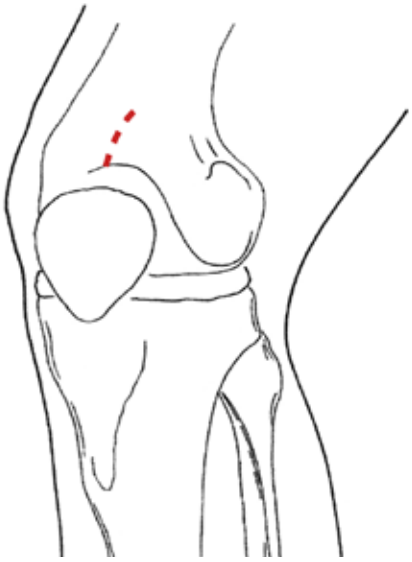


Place the patient in a supine decubitus position on the radiolucent operating table. The knee must be kept flexed by 15° - 20°.

NOTE: in order to maintain the correct knee flexion it is recommended to use a foam rubber support or surgical drapes, in order to relax the quadriceps muscle and avoid the risk of deformity in procurvatum.

Reduce the fracture and proceed to synthesis.

Incision and entry point



To perform proper nail placement make a 2-4 cm suprarotuleal longitudinal cutaneous incision.

Make a longitudinal incision of the quadriceps tendon; in particularly this incision is through the medial one-third of the quadriceps tendon.
At the end perform a detachment of the joint capsule.

NOTE:
Alternatively a 1.5cm transverse cutaneous incision can be made above the supra-lateral angle of the patella.
The incision is in line with the skin lines and minimizes the development of large retracting scars typical of infrapatellar incisions.

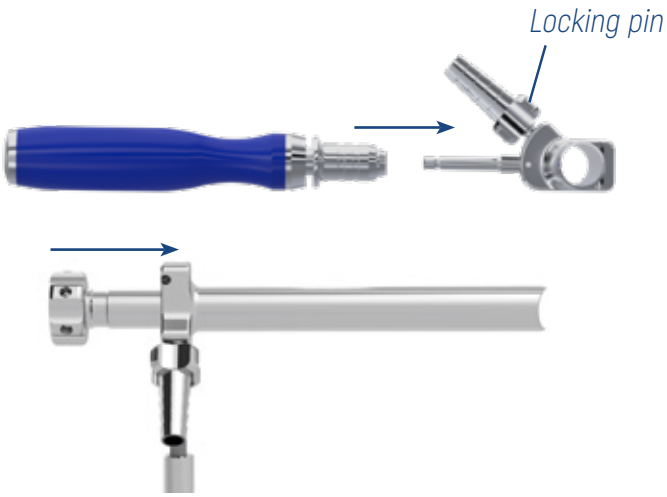
Proximal tibia
antero-posterior projection

Proximal tibia
medio-lateral projection

Under X-Ray control check the entry point. The entry point is medially to the lateral tibial spine in the AP projection and adjacent to the joint surface in the ML projection.

All power tools mentioned in surgical technique must be used with a low speed drill.

Preparation for K. wire insertion



Attach the handle with AO coupling to the tissue protection sleeve with AO joint. Insert the Multihole trocar inside the tissue protection sleeve and lock it by turning the locking pin clockwise.

Position the tissue protection sleeve with the trocar through the incision into the knee joint, posterior to the patella.

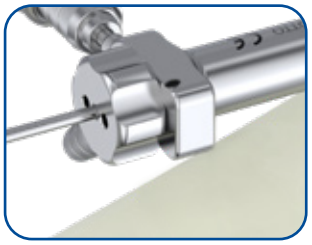
⚠ ***To direct the trocar towards the "safe zone" on the tibial plateau and use the trochlear groove as a guide, the patella can be medially subluxed.***

NOTE:
It is possible to connect a surgical aspirator to the locking pin.

NOTE:
Alternatively to standard tissue protection sleeve and its multihole trocar (DT030024 + DT030026) it is possible to use a tissue protection sleeve and its multihole trocar specifically designed for suprapatellar approach (DT030023 + DT030028) which are OPTIONAL instruments.

K. wire insertion

While keeping the trocar in contact with the cortex, insert the K. wire trocar tip ø3x350mm into the central hole by drilling the cortex to a depth of about 30mm (at or passed the tibial tubercle).



1st K. wire (Central hole)

INSTRUMENTS REQUIRED

DT030971
Cannulated "D20" handle with AO coupling

DT030024
Tissue protection sleeve with AO joint

DT030026
Multihole trocar

66987
K. wire trocar tip ø3x350mm STERILE

K. wire insertion

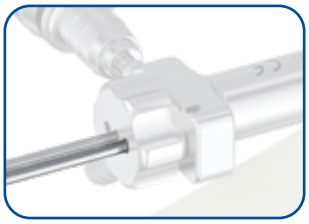
Under X-Ray control, check the positioning of the K. wire.
If the K. wire is positioned in line with the intramedullary canal, continue drilling.
At the end of the drilling, unscrew the locking pin and remove the trocar.

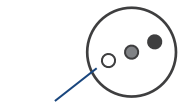
Left tibia
AP projection

Left tibia
ML projection

Courtesy of Massimo "Max" Morandi, MD, FACS, USA

Possible adjustments to the K. wire positioning





2nd K. wire

If the positioning of the K. wire is not correct, unscrew the locking pin and rotate the Multihole trocar to position a second K. wire, while keeping the first K. wire in place.

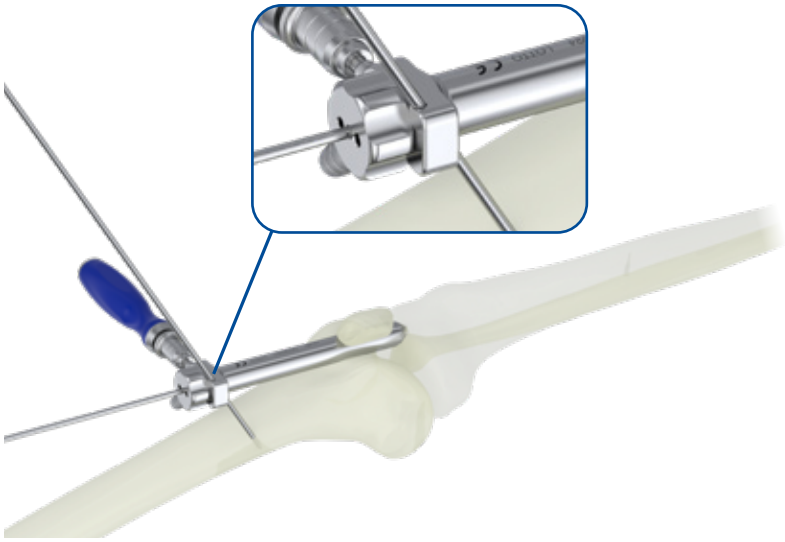
Insert a second K. wire for a depth of approximately 30mm or reaching similar depth of the first one.
If the second K. wire is aligned with the intramedullary canal, tighten the locking pin and continue drilling.

After correctly positioning the second K. wire, remove the first one.

INSTRUMENTS REQUIRED

66987
K. wire trocar tip ø3x350mm STERILE

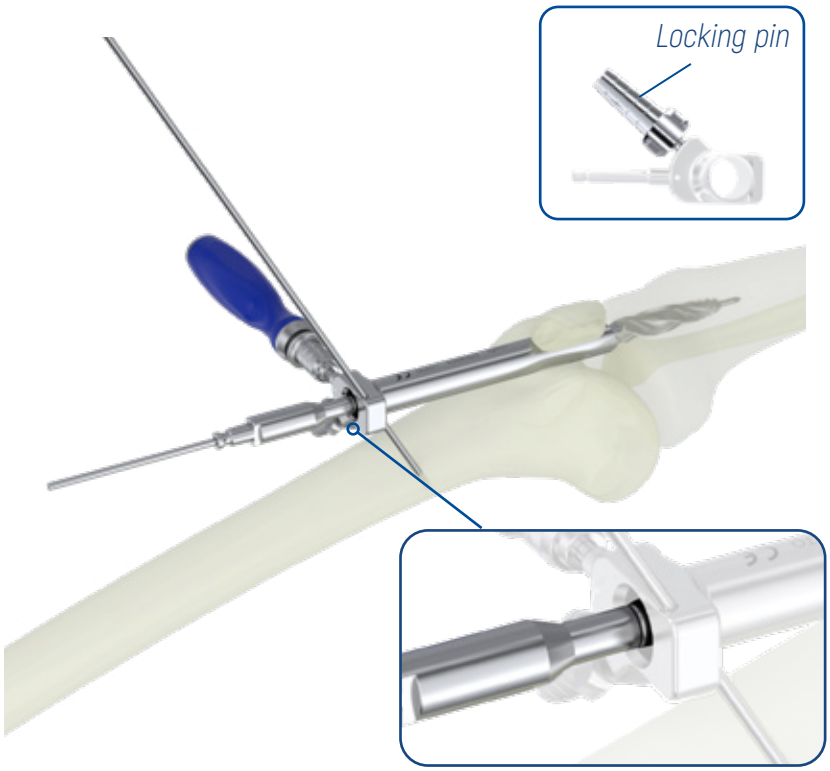
Tissue protection sleeve stabilization (optional)



Insert a K. wire trocar tip ø3x350mm through the stabilization hole on the tissue protection sleeve to anchor it to the femur.

⚠ ***The tissue protection sleeve and the stabilization K. wire should be removed only at the end of the surgical operation.***

Medullary canal preparation



Unscrew the locking pin and remove the trocar.

NOTE:
It is possible to connect a surgical aspirator to the locking pin.

Insert the Cannulated reamer, ø12.5mm (Hudson) through the wire and the tissue protection sleeve to drill the proximal tibia to a depth of approximately 70mm which corresponds to when the reference notch on the reamer reaches the edge of the tissue protection sleeve.

Remove the cannulated reamer.
Remove the K. wire.

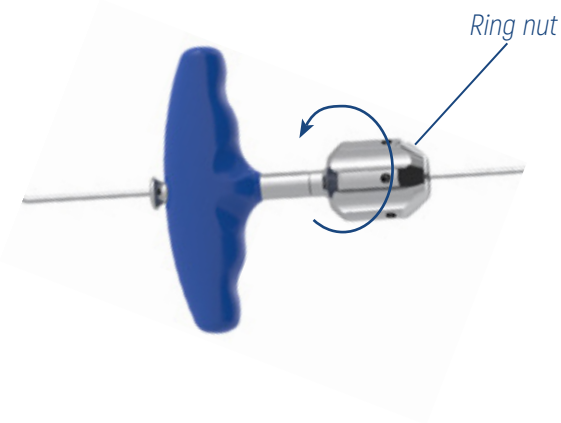
Reference notch (on the reamer)

INSTRUMENTS REQUIRED

66987
K. wire trocar tip ø3x350mm STERILE

DT03010H
Cannulated reamer, ø12.5mm (Hudson)

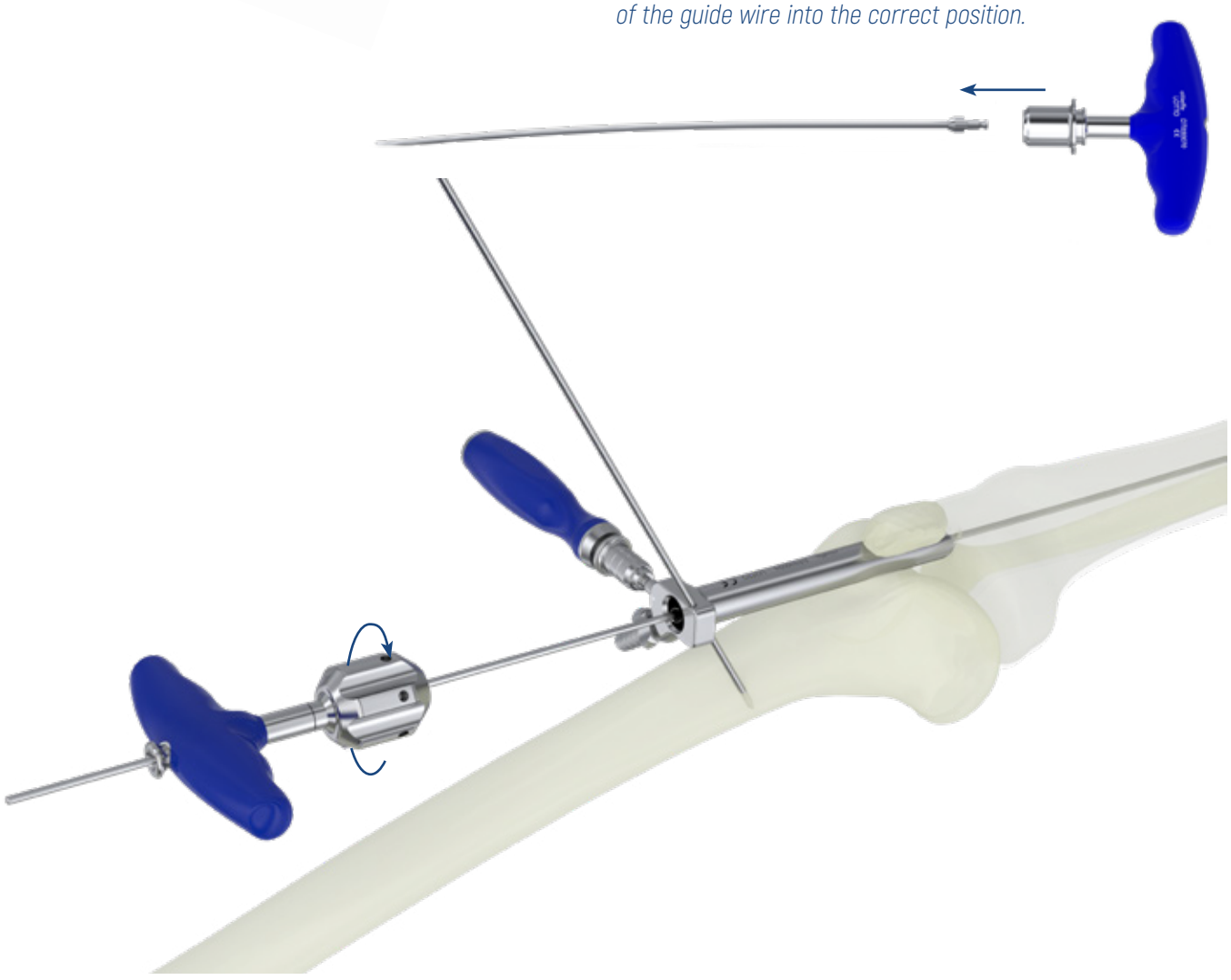
Guide wire insertion



Insert the Guide wire with olive ø2.5x800mm into the Chuck for ø2.5-3mm wire and turn the ring nut anticlockwise to lock the wire in place.

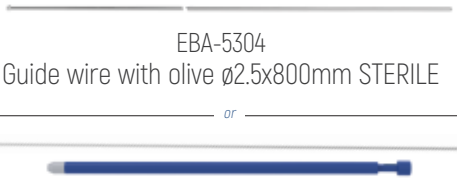
Introduce the wire into the intramedullary canal to the desired depth.
Remove the chuck by turning the ring nut clockwise to lock the wire in place.

NOTE:
If necessary, use the Fracture alignment guide wire exchange tool (Hudson) to facilitate fracture reduction and the insertion of the guide wire into the correct position.



INSTRUMENTS REQUIRED

EBA-5345
Chuck for ø2.5-3mm wire



EBA-5304
Guide wire with olive ø2.5x800mm STERILE

or

EBA-5233
Nails ruler Kit with guide wire with olive ø2.5x800mm STERILE

DT030016
Fracture align. guide wire exchange tool, Hudson

DT030070
Cannulated T-handle with Hudson coupling

Nail length measurement and medullary canal reaming

Insert the Nails ruler onto the Guide wire with olive bringing it in contact with the cortex.

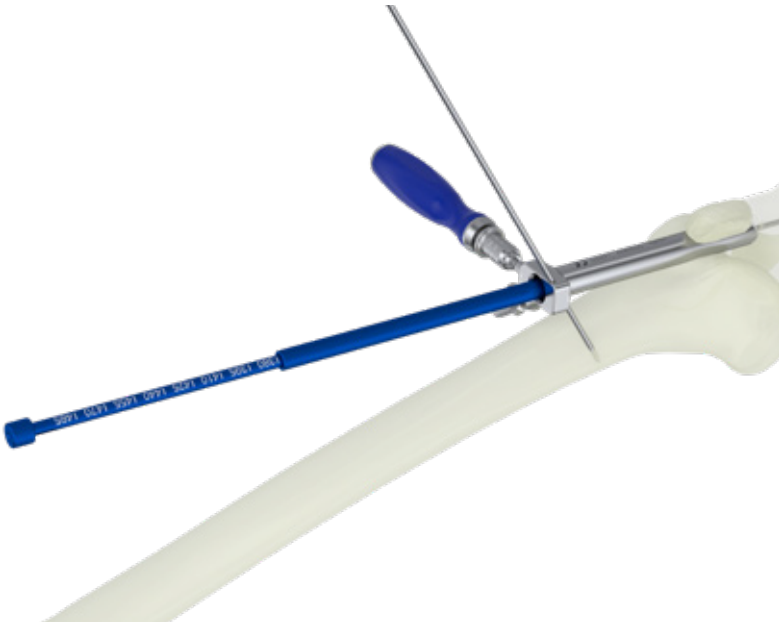
1) *2)*

The images refers to the 395mm nail length

1) Make sure that the end of the Guide wire is in contact with the end of the nails ruler (the wire must be visible through the slot).

2) Read the length of the nail directly on the nails ruler marker.

⚠ ***For intermediate readings, it is advisable to use the shorter nail.***



Ream the canal progressively using 0.5mm increments. It is suggested to ream 1.5mm greater than the nail selected to implant.

NOTE:
If necessary, it is possible to use the adapter GH5040 (Hudson-Hudson) or GH5041 (Zih-Zih).

INSTRUMENTS REQUIRED

DT030032
Nails ruler, wire 800mm

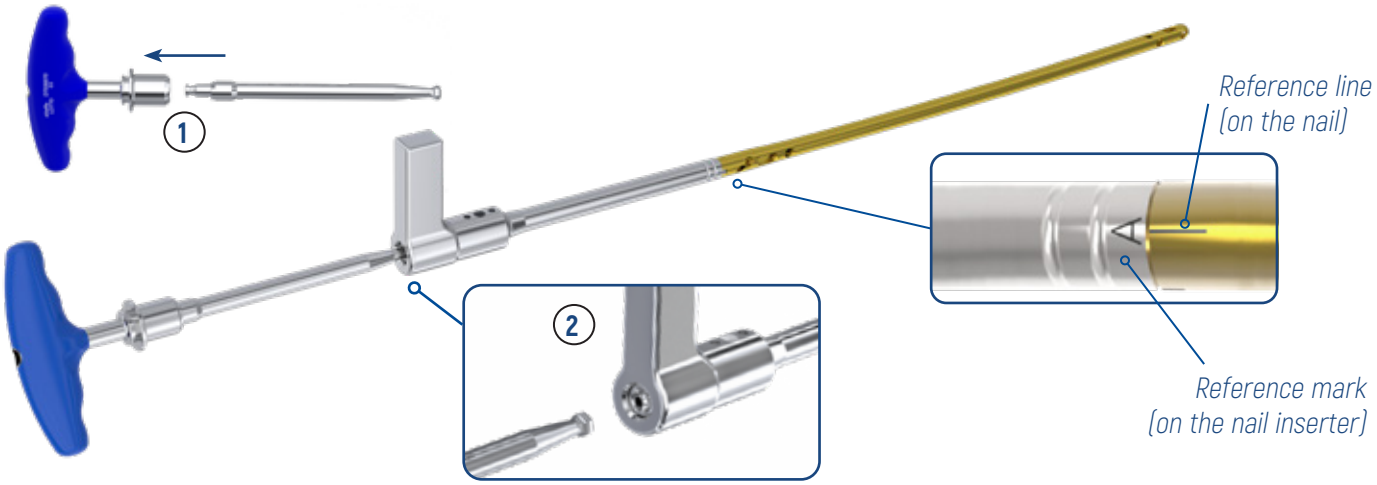
or

EBA-5233
Nails ruler Kit with guide wire with olive ø2.5x800mm
STERILE

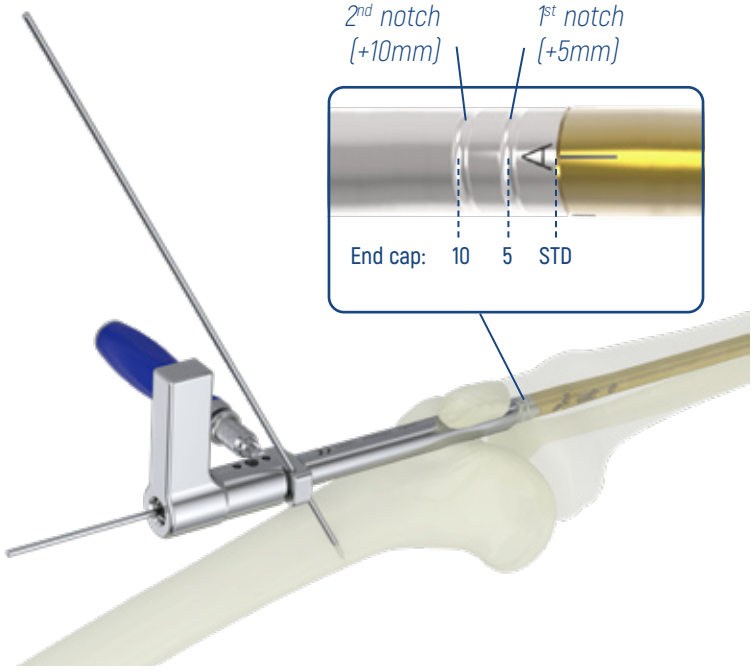
Nail-inserter assembly

The connection between nail inserter and nail is the same for both left and right tibias.

Attach the chosen nail onto the nail inserter, aligning the reference line on the nail with the "A" mark on the nail inserter.
Connect the T-handle with Hudson coupling with the Wrench, 8mm, Hudson coupling. Hereinafter referred to as T-wrench. (1)
Tighten the connection screw with the T-wrench. (2)



Nail insertion



Insert the Estremo nail on the guide wire by hand and advance it inside the medullary canal through the tissue protection sleeve.

If necessary, tap on the handle of the inserter with the Slotted hammer until reaching one of the two reference notches, which correspond to the other two sizes of end caps besides the standard one.

Once the nail has passed the fracture line, remove the Guide wire with olive ø2.5x800mm and check the final position of the nail with both AP and ML projections.

INSTRUMENTS REQUIRED

Nail inserter
(ESTREMO guide DT030008)

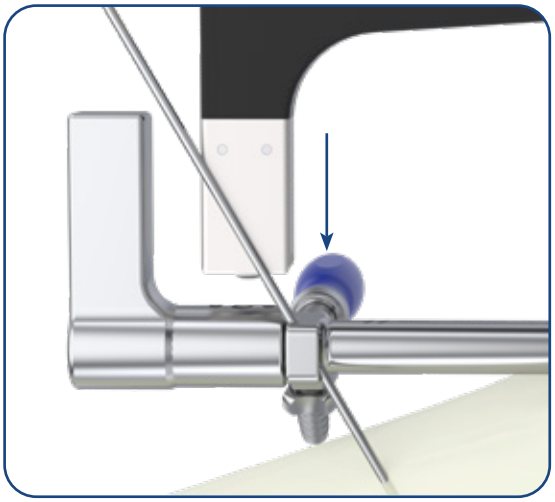
DT030070
Cannulated T-handle with Hudson coupling

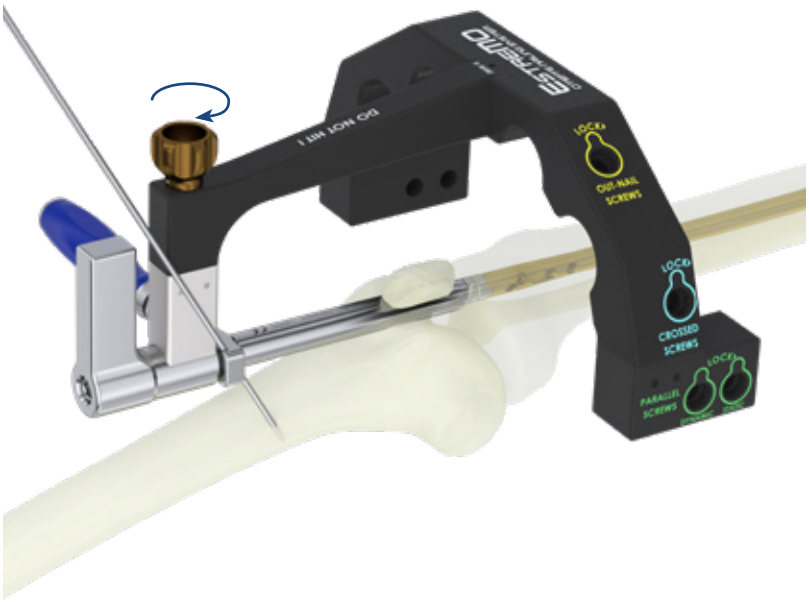
DT030045
Wrench, 8mm Hudson coupling, short

DT030080
Slotted hammer

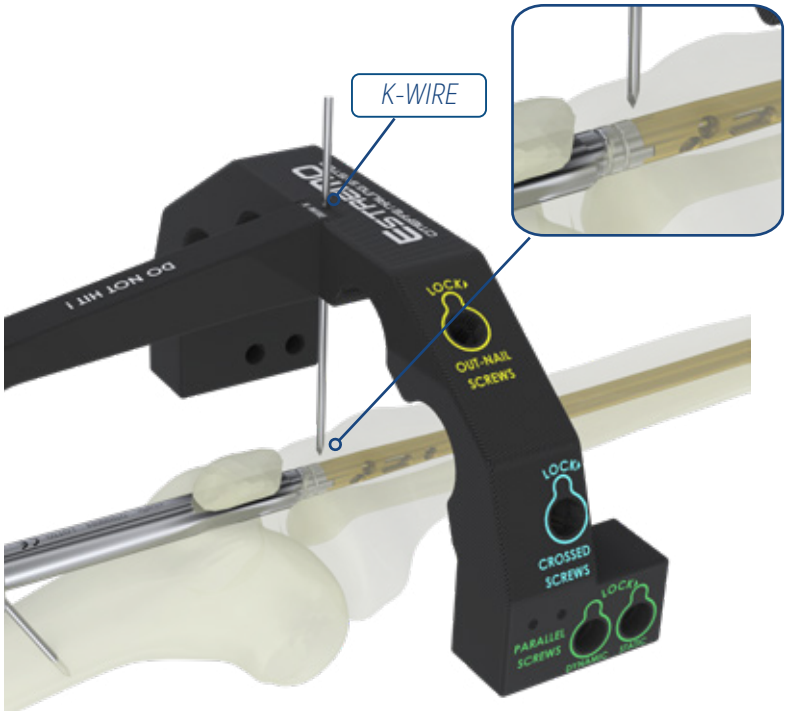
Targeting device assembly

Connect the Estremo carbon fiber guide to the inserter and screw the gold knob firmly.





Nail depth monitoring



It is possible to verify the correct nail depth introducing a K. wire through the hole of the targeting device, marked *K-WIRE*.

The tip of the K. wire indicates the proximal end of the nail.

Use the image intensifier to check the nail depth.

NOTE:
If compression with the Compression device is to be performed, the nail will shift proximally up to 8.4mm (refer to page 5 for details).

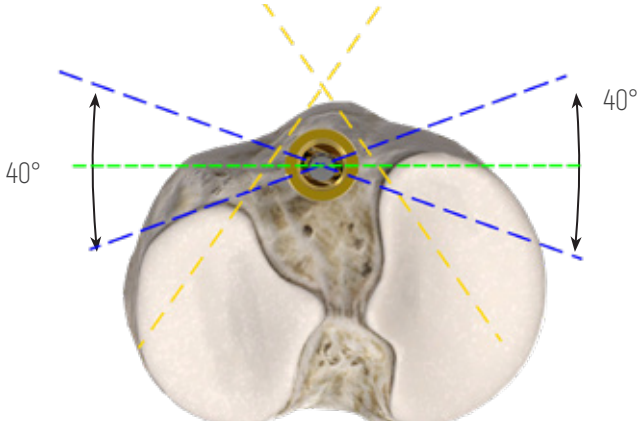
Remove the K. wire.

INSTRUMENTS REQUIRED

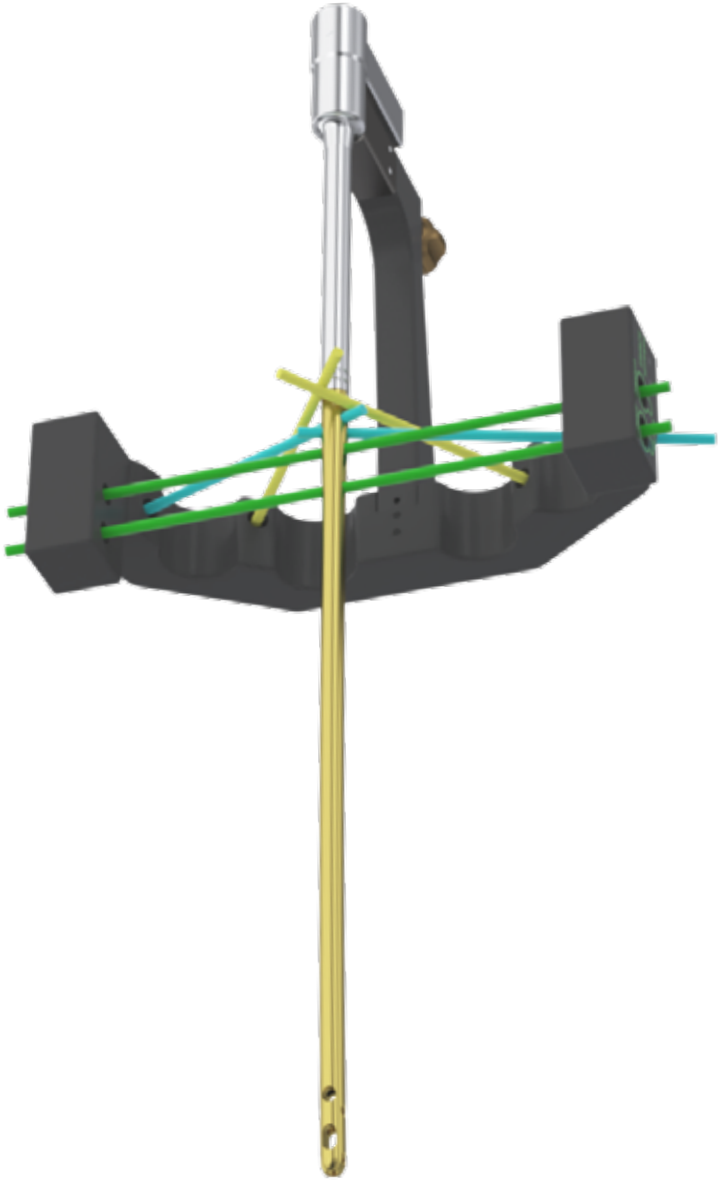
DT030008
ESTREMO guide

66987
K. wire trocar tip ø3x350mm STERILE

Proximal guided locking options



Parallel screws
40° crossed screws
Out-nail screws



Depending on the fracture the proximal locking can be performed with the following options:

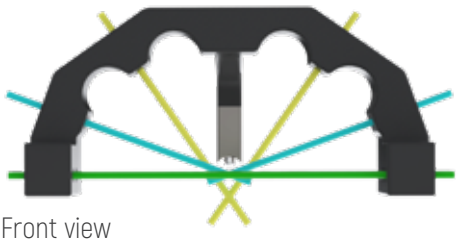
- two parallel screws with ML access;
- two screws crossed at 40°.

An additional locking option can be performed by inserting two out-nail screws.

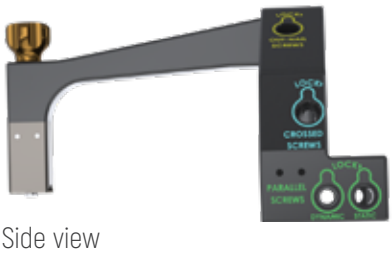
Compression with the Compression device can only be performed starting from the dynamic hole (parallel screws).
For more detail about the compression view page 24.

Compression with the Compression device can't be performed on the solid nail.

NOTE:
The locking with crossed screws is the most proximal locking option. In order to obtain optimal angular stability it is suggested to insert the Estremo locking end cap.



Front view



Side view

PARALLEL SCREWS, marked green on the targeting guide
Insertion of parallel screws with ML access.

CROSSED SCREWS, marked blue on the targeting guide
Insertion of the crossed screws at 40°.

OUT-NAIL, marked yellow on the targeting guide
Insertion of out-nail screws.

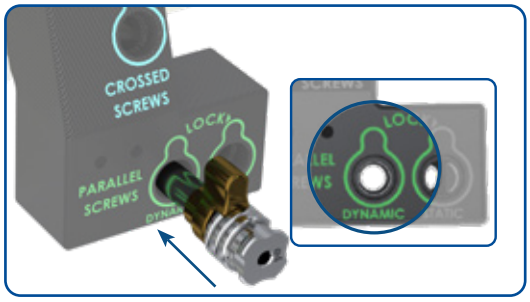
NOTE:
Rondò cannulated screws are available to be used in the out-nail holes for a correct bone fragments compression.

Proximal, Distal locking and Compression steps

Proximal Guided locking: Dynamic Screw

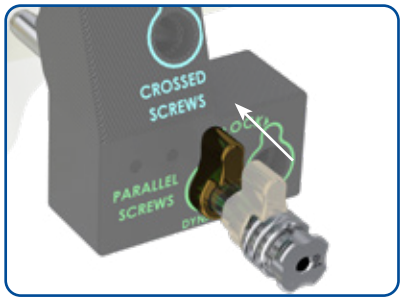
Dynamic proximal screw preparation

1) Insert and screw the Trocar for drill bit, ø4mm into the Cannula.

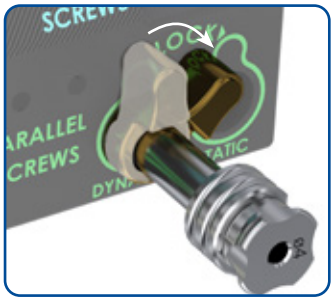


2) Introduce them into the hole marked DYNAMIC until they are in contact with the cortical bone.

⚠ *The gold lever must be facing upwards and aligned with the marking.*



3) Push the cannula lever down on the cannula until reaching the seat of the centering guide.



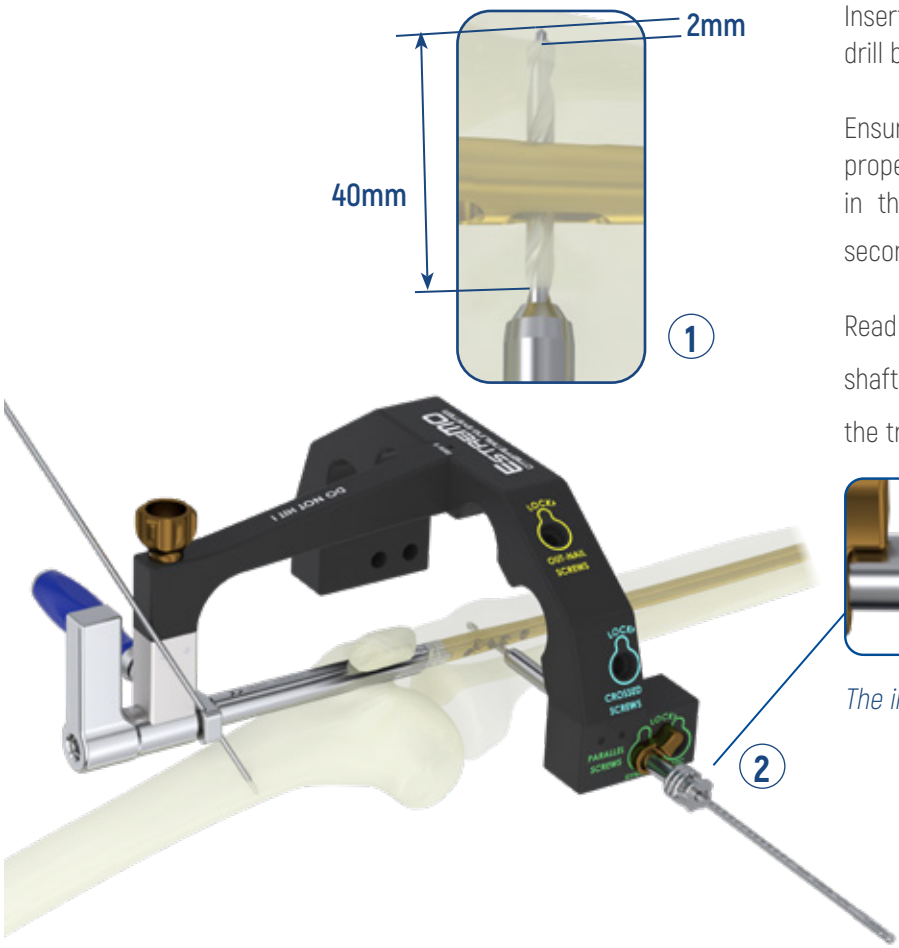
4) Rotate the lever clockwise, following the directions of the marking (Lock>), to anchor the cannula to the guide.

INSTRUMENTS REQUIRED

DT030020
Cannula

DT030027
Trocar for drill bit, ø4mm

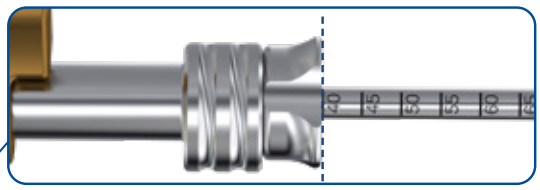
Dynamic proximal screw preparation and measurement



Insert the Graduated Drill bit, ø4x350mm and drill both cortices.

Ensure the tip of graduated drill bit is in the proper position prior to measuring as it shows in the image: the tip must go beyond the second cortex of at least 2mm (1).

Read the length of the screw directly on the shaft of the graduated drill bit at the edge of the trocar (2).

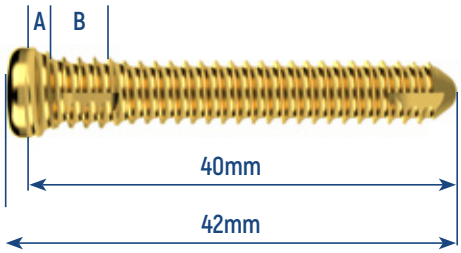


The image refers to the 40mm screw size

Remove the graduated drill bit and the trocar.

⚠ ***When in-between sizes, always select the longer size.***

Cortical screw characteristics:



A Approximately 2mm length with increased core diameter

B Increased resistance will be felt during screw insertion due to proximal screw self-tapping build up (0.5mm) for enhanced stability (approximately 4mm length)

Example: code DT352040 (Cortical screw ø5.2mm L.40mm)

INSTRUMENTS REQUIRED

DT03013A
Graduated drill bit, ø4x350mm STERILE

Dynamic proximal screw insertion

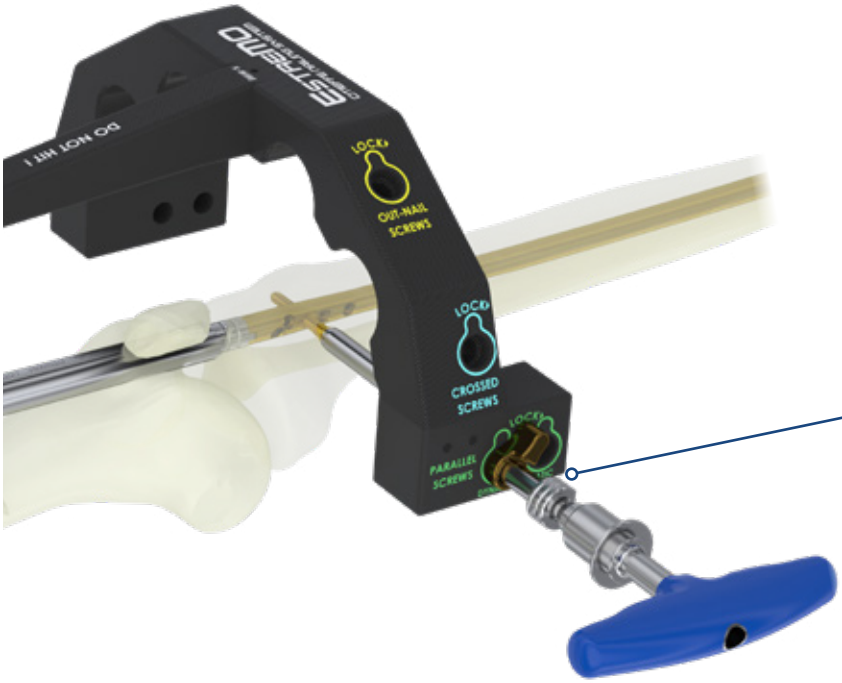
Select the correct cortical screw ø5.2mm.

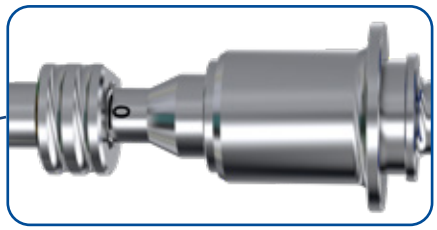
1) 

1) Position the screw on the Screwdriver, 5mm Hudson coupling, and assembly it manually rotating the pin clockwise.

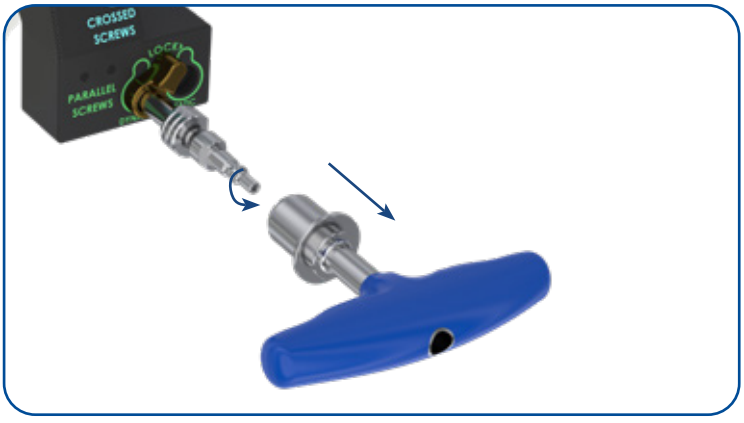
2) 

2) Connect the Cannulated T-handle on the screwdriver.

3) 



3) Insert the screwdriver into the cannula and screw in until the "0" mark on the screwdriver reaches the edge of the cannula.

4) 

4) Remove the cannulated T-Handle and loosen the pin of the screwdriver manually or with the Allen wrench, 2.5mm and remove the screwdriver.

INSTRUMENTS REQUIRED

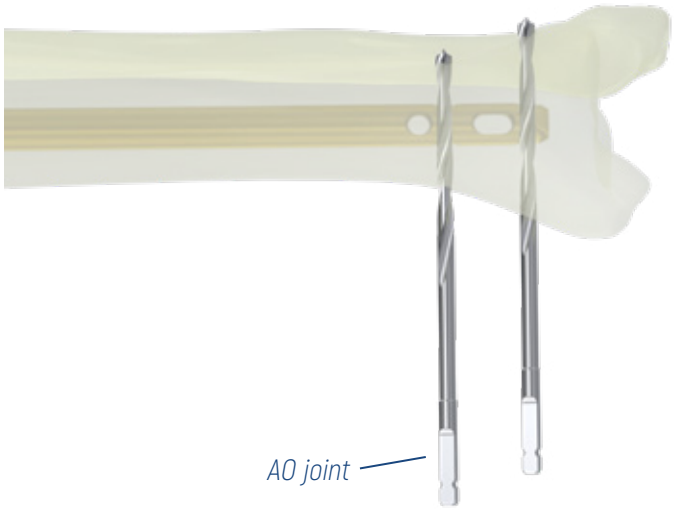
DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

970025
Allen wrench, 2.5mm

Distal locking (Free-Hand Technique)

Preparation of distal locking



Under X-Ray control, check the reduction, correct the alignment of the fragments and the length of the limb before performing distal locking with the free-hand technique.

Drill bi-cortical using the Drill bit, ø4x110mm or ø4x195mm.

Under X-Ray control, make sure the drill bit passes through the nail holes both on AP and ML axis.

NOTE:
It is suggested to start with the most distal hole.

If you use a solid nail ø8mm, the bone screws to be used for this locking are ø4mm and the drill bit to be used is ø3.2x195mm (SF1324).

INSTRUMENTS REQUIRED

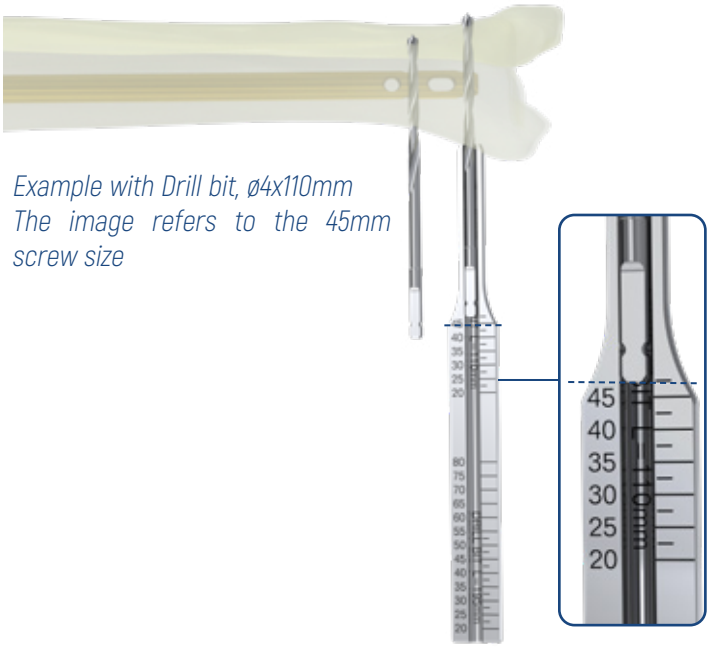
DT03016A
Drill bit, ø4x195mm STERILE

DT03019A
Drill bit, ø4x110mm STERILE

Distal screw length measurement options

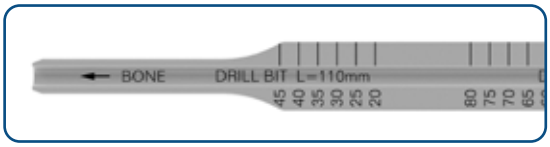
To measure the length of the cortical screws it's possible to use either the screw ruler (A) or the Screws depth gauge (B)

A) Screws ruler



Example with Drill bit, ø4x110mm
The image refers to the 45mm screw size

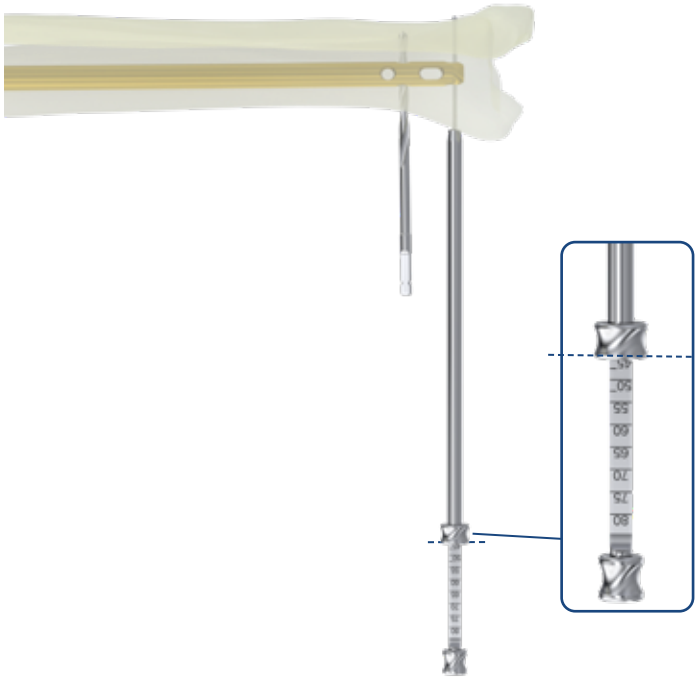
A) Insert the Screws ruler (with the marking "BONE" facing upwards) on the drill bit until touching the cortex. The end of the drill bit on the screws ruler shows the length of the screw to be used.



Remove the drill bit.

⚠ *Make sure to read the graduated scale based on the drill bit that is used. (110mm)*

B) Screws depth gauge



B) If you use the Screws depth gauge, remove the drill bit. Insert the gauge into the hole making sure that the external sleeve comes into contact with the bone and the tip hooks the second cortex. Read the length of the screw directly on the depth gauge scale.

⚠ *When in-between sizes, always select the longer.*

INSTRUMENTS REQUIRED

DT030030
Screws ruler (use BONE side)

DT030061
Screws depth gauge

First distal screw insertion

Select the correct cortical screw ø5.2mm and remove the drill bit.

1

1) Position the screw on the screwdriver, 5mm Hudson coupling, and assembly it manually rotating the pin clockwise.

2)

2) Connect the Cannulated T-Handle on the screwdriver.

3)

3) Insert the first distal screw.

4)

4) Remove the cannulated T-Handle and loosen the pin of the screwdriver manually or with the Allen wrench, 2.5mm and remove the screwdriver.

INSTRUMENTS REQUIRED

DT030047
Screwdriver, 5mm
Hudson coupling short

DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

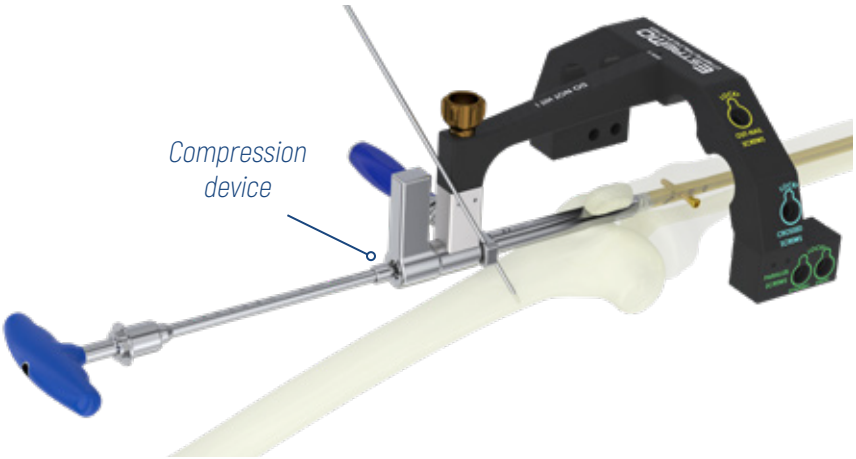
970025
Allen wrench, 2.5mm

Second distal screw insertion

Repeat the same steps for the selection (Page 22) of the cortical screw 5.2mm and second distal screw insertion (Page 23).

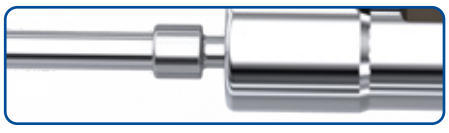
Fracture Compression (optional)

Compression device Insertion

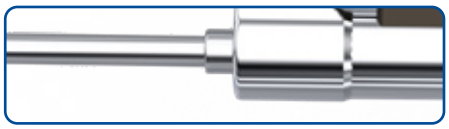


Fracture line compression can be performed only when the nail is locked proximally with the screw inserted in the DYNAMIC hole and there is at least one distal screw used.

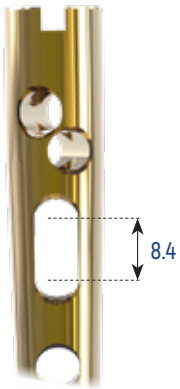
Fit the Compression device into the Screwdriver, 5mm Hudson coupling and introduce it into the nail inserter. Turn the screwdriver clockwise, using the X-Ray to check compression progress.



Pre-compression



Post-compression



NOTE:
During compression, the nail will shift proximally up to a maximum of 8.4mm.

⚠ ***Compression with the Compression device can't be performed on the solid nail.***

INSTRUMENTS REQUIRED

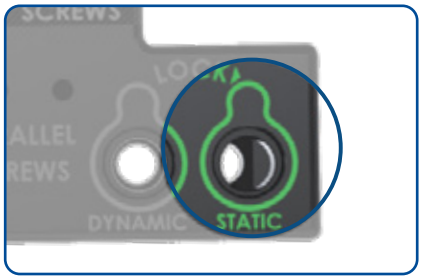
DT030052
Compression device

DT030070
Cannulated T-handle with Hudson coupling

DT030046
Screwdriver, 5mm Hudson coupling

Fracture Compression (optional)

Compression device removal

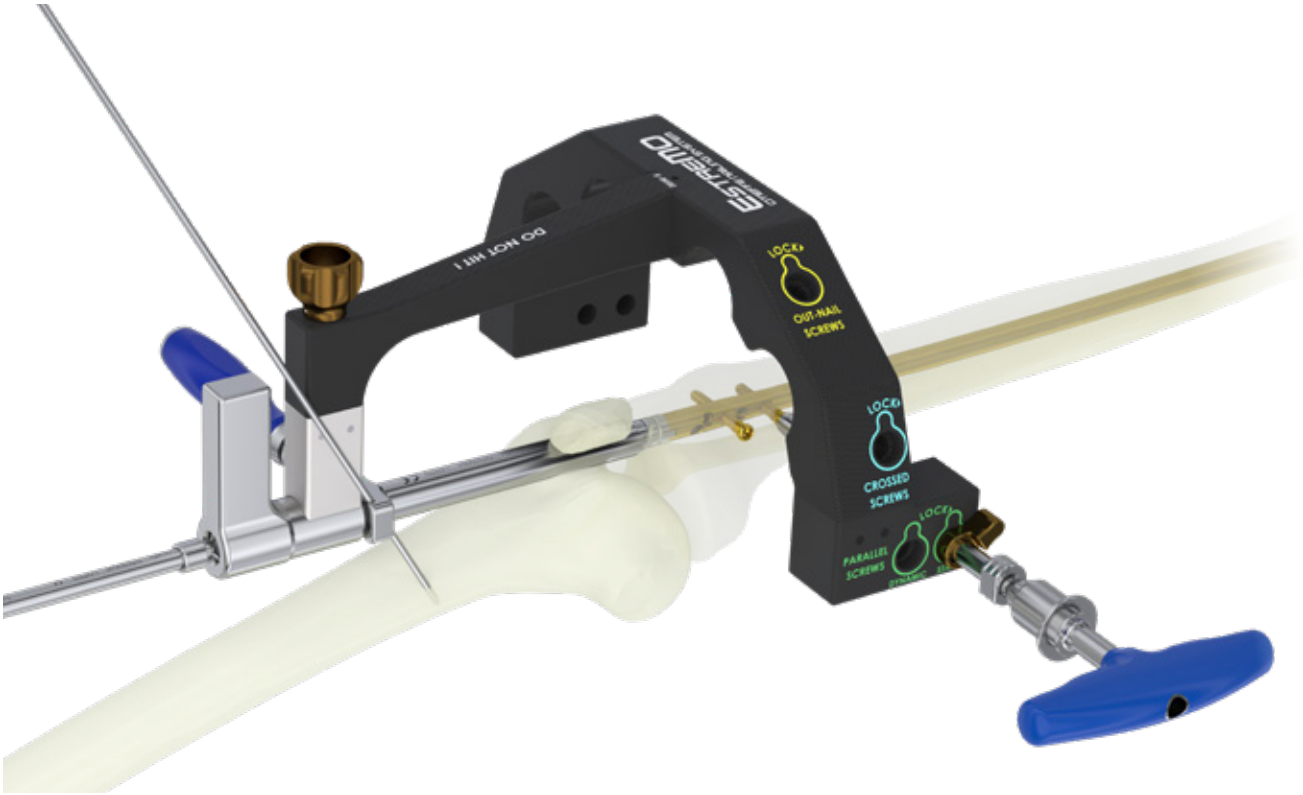


Insert the static proximal screw into the hole marked STATIC while maintaining the compression obtained. Follow the steps on pages 18 to 20.

Remove the compression device.

NOTE:
During compression, the nail will shift proximally up to a maximum of 8.4mm.

Compression with the Compression device can't be performed on the solid nail.



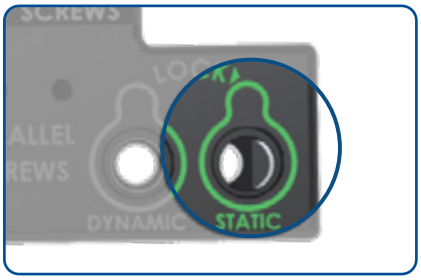
INSTRUMENTS REQUIRED

DT030052
Compression device

DT030070
Cannulated T-handle with Hudson coupling

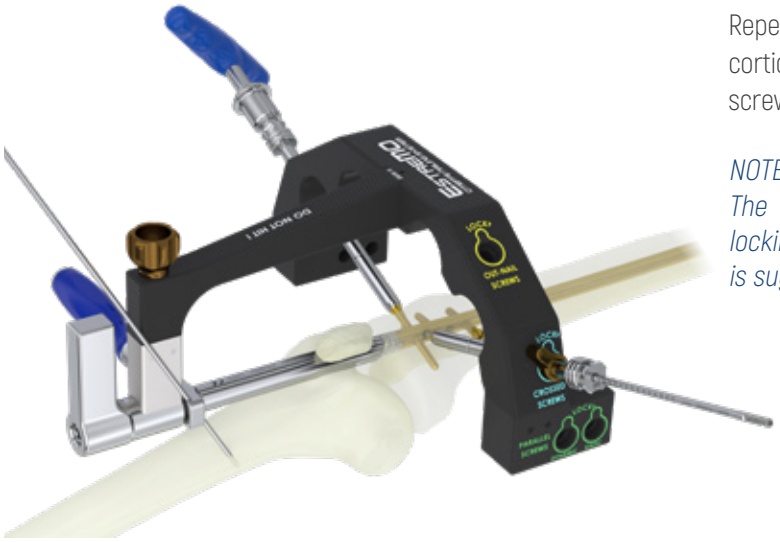
DT030046
Screwdriver, 5mm Hudson coupling

Proximal Guided locking: Static Screw



Repeat steps shown on page 18 using the hole marked STATIC.
Select the correct cortical screw ø5.2mm. (Page 19)
Repeat the same steps as done for the dynamic proximal screw insertion. (Page 20)

Proximal Guided locking: Crossed screw



To insert the crossed screws, repeat the same steps on page 18 using the holes marked CROSSED SCREWS.
Repeat the same steps for the selection of the correct cortical screw ø5.2mm (as shown on page 19) and for the screw insertion (as shown on page 20).

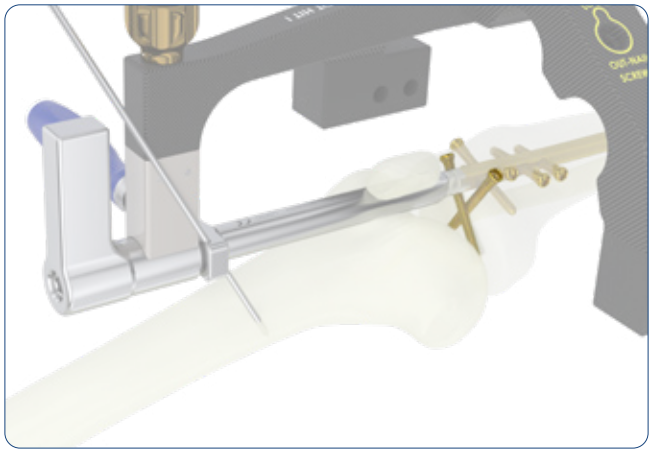
NOTE:
The locking with crossed screws is the most proximal locking option. In order to obtain optimal angular stability it is suggested to insert the Estremo locking end cap.

Proximal Guided locking: Out-nail screw

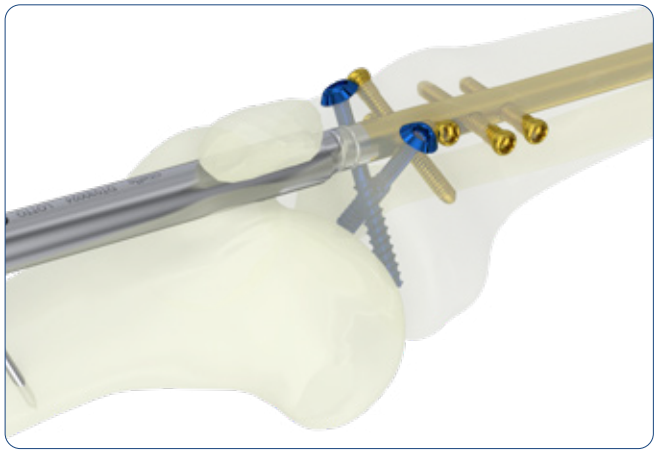
To insert out-nail screws, repeat the same steps on page 18 using the holes marked OUT-NAIL. For more details about the insertion follow the steps "Addendum: out-nail screw insertion" on page 52.

It is possible to choose between two options:

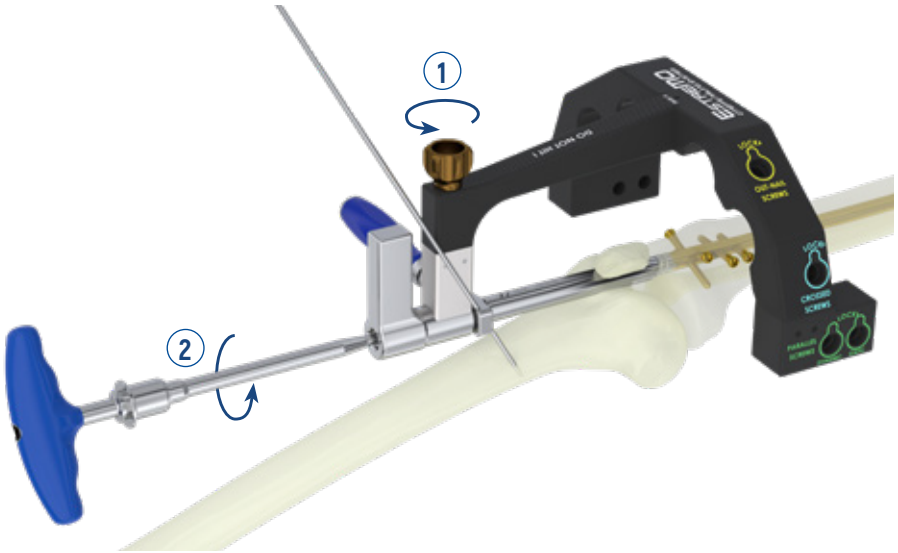
A) Cortical screws ø5.2mm (Page 52)



B) Rondò cannulated screws ø6.5mm (Page 54)



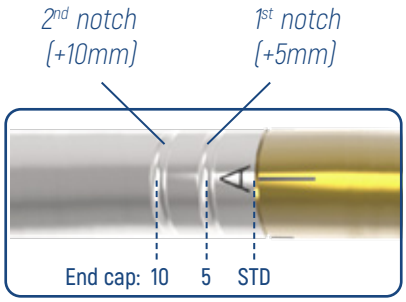
Targeting device removal



Remove the targeting device by loosening the golden knob (1).

Remove the nail inserter by using the T-wrench. (2).

NOTE:
Before removing guide take note of reference notch on the nail inserter to aid in Estremo end cap selection.



INSTRUMENTS REQUIRED

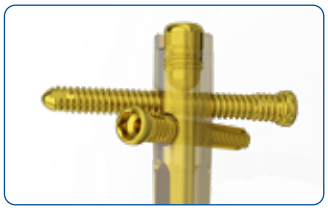
DT030070
Cannulated T-handle with Hudson coupling

DT030045
Wrench, 8mm Hudson coupling, short

End cap insertion

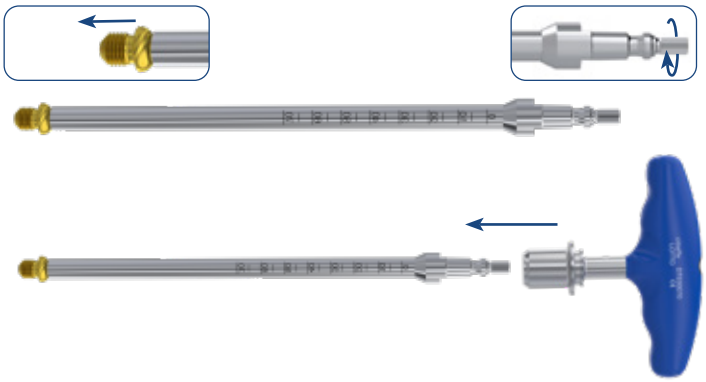
Select the correct end cap size.

If you have used crossed screws, in order to obtain optimal angular stability, it is suggested to use the Estremo locking end cap.



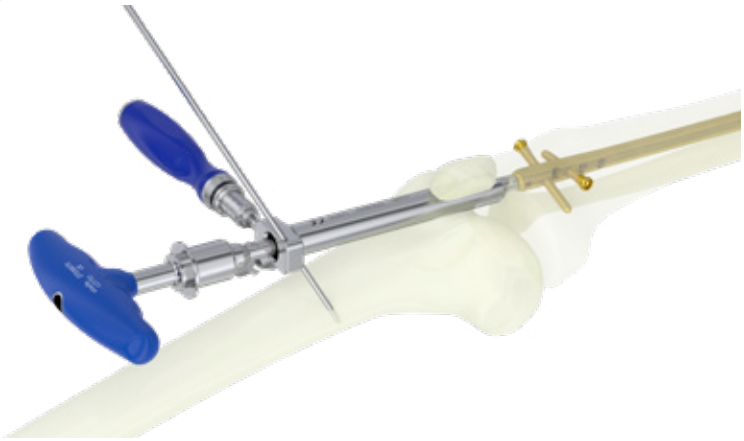
Locking end cap correct placement

1)



1) Position the end cap on the Screwdriver, 5mm Hudson coupling, and assembly it rotating manually the pin clockwise. Connect cannulated T-Handle on the screwdriver.

2)



2) Insert the end cap

Remove the T-handle , unscrew the pin manually or with the Allen wrench, 2.5mm and remove the screwdriver.

Remove the stabilization K. wire from the femur and Remove the tissue protection sleeve.

Suture the incision using the most suitable technique.

INSTRUMENTS REQUIRED

DT030070
Cannulated T-handle with
Hudson coupling

DT030046
Screwdriver, 5mm
Hudson coupling

970025
Allen wrench, 2.5mm

Finalized implant

FR

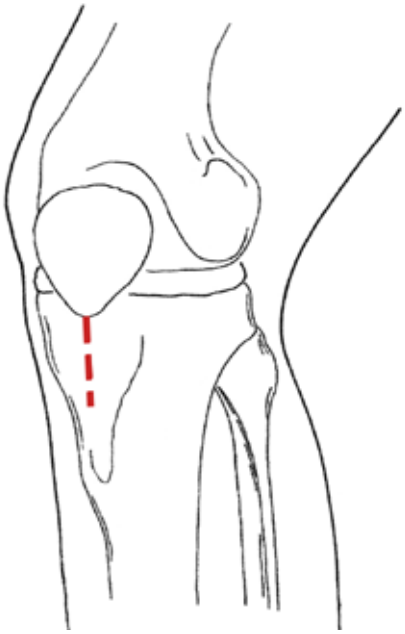
Femoral nail - Retrograde approach

Patient positioning

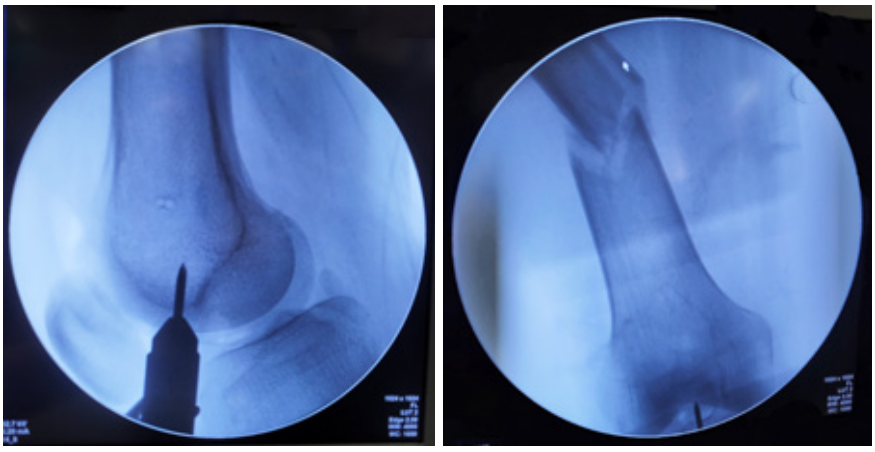
Position the patient in a supine position on the radiolucent operating table, flexing the knee of the limb to be treated by about 70° - 90°.

Reduce the fracture and proceed to synthesis.

Incision and entry point



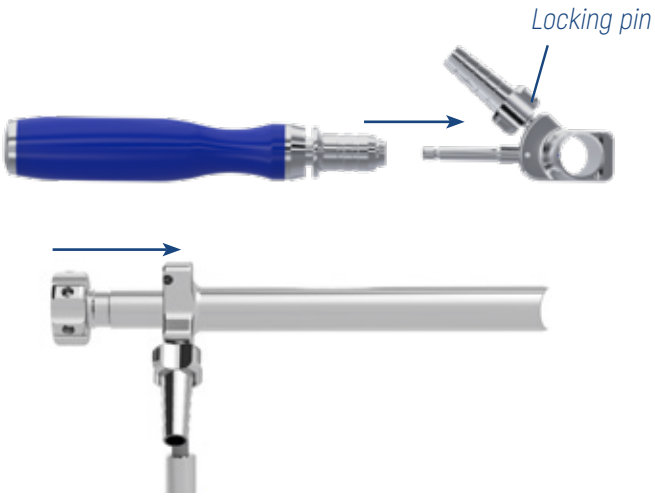
A 2cm skin incision is made longitudinally just distal to the inferior patellar pole, over the midline of the patellar tendon.



The nail entry point is in line with the medullary canal, when viewed with an AP projection and anterior to Blumensaat's line when viewed with a ML projection.

All power tools mentioned in surgical technique must be used with a low speed drill.

Preparation for K. wire insertion

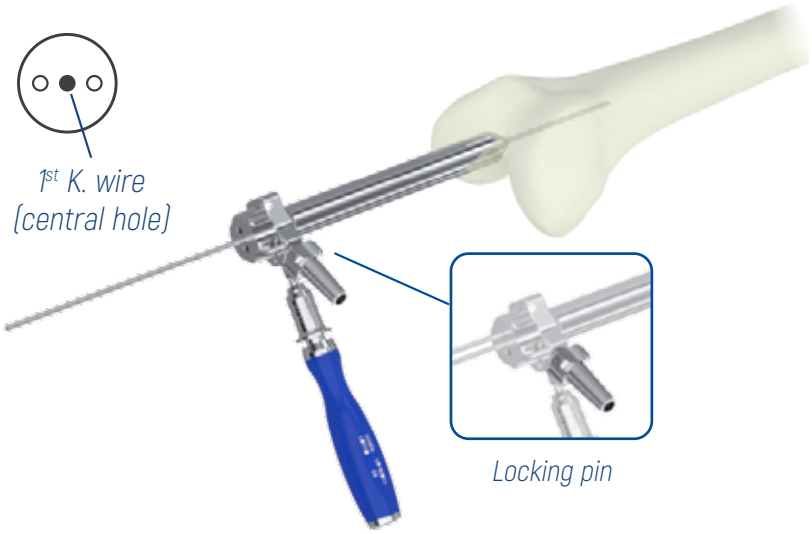


Attach the handle with AO coupling to the tissue protection sleeve with AO joint. Insert the Multihole trocar inside the tissue protection sleeve and lock it by turning the locking pin clockwise.

Position the tissue protection sleeve, with the trocar already inserted in it, in the middle of the intercondylar notch, anterior to the Blumensaat line identified using the image intensifier with a ML projection.

NOTE:
It is possible to connect a surgical aspirator to the locking pin.

K. wire insertion



While keeping the trocar in contact with the cortex, insert the K. wire trocar tip, ø3x350mm into the central hole to a depth of about 30mm.

Under X-Ray control check the position of the K. Wire.

INSTRUMENTS REQUIRED

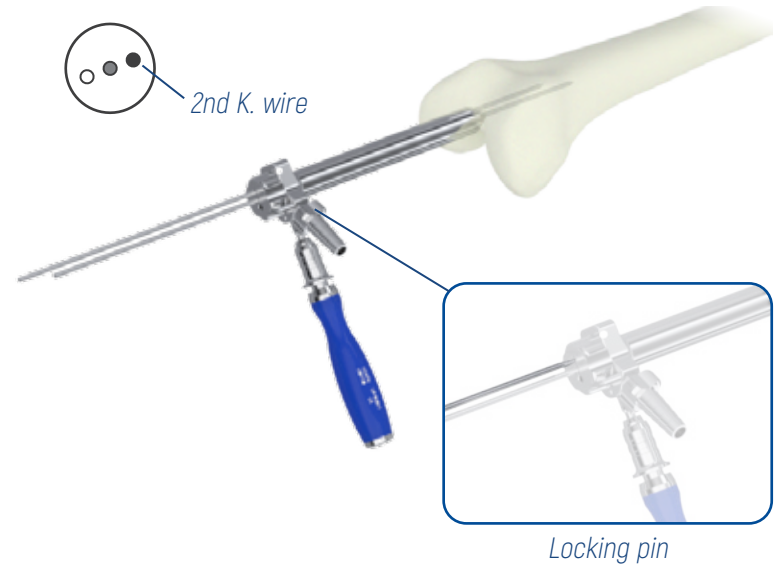
DT030971
Cannulated handle with AO coupling

DT030024
Tissue protection sleeve with AO joint

DT030026
Multihole trocar

66987
K. wire trocar tip ø3x350mm STERILE

Possible adjustments to the K. wire positioning



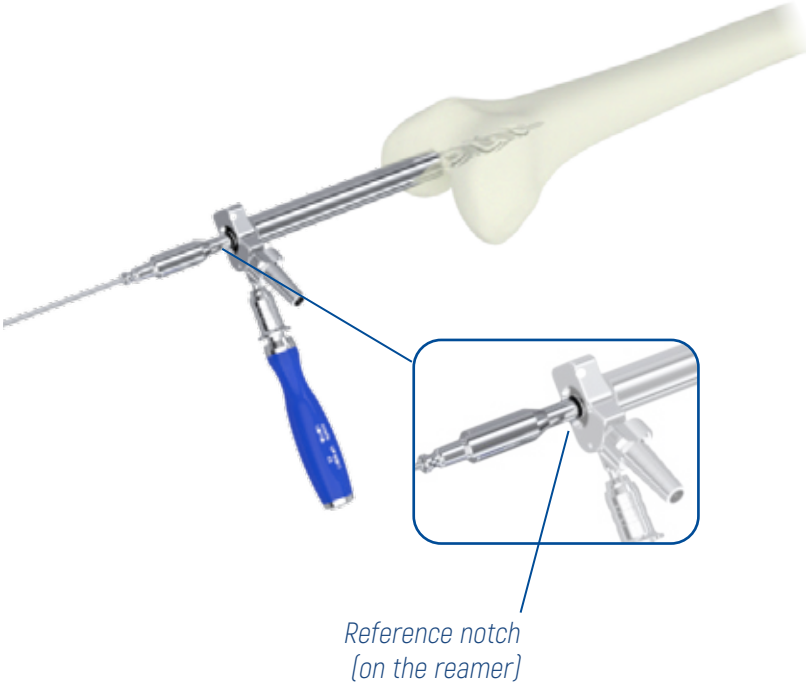
If the positioning of the K. wire is not correct, unscrew the locking pin and rotate the Multihole trocar to position a second K. wire, while keeping the first K. wire in place.

Insert a second K. wire for a depth of approximately 30mm. If the second K. wire is aligned with the intramedullary canal, tighten the locking pin and continue drilling.

After correctly positioning the second K. wire, remove the first one, unscrew the locking pin and remove the trocar.

Note:
It is also possible to connect surgical aspirator to the locking pin.

Medullary canal preparation



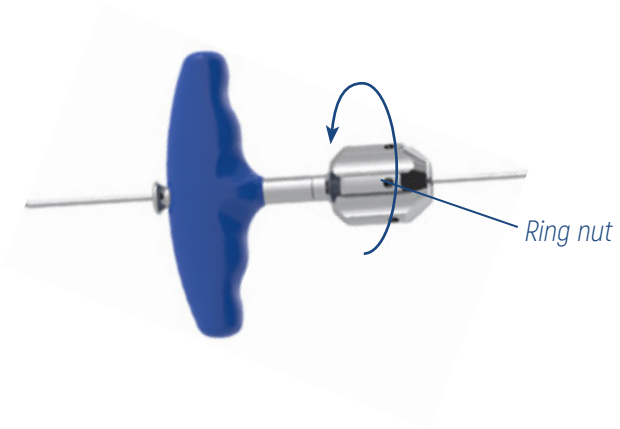
Insert the Cannulated reamer, ø12.5mm (Hudson) through the wire and the tissue protection sleeve to drill the distal femur to a depth of approximately 70mm which corresponds to when the reference notch on the reamer reaches the edge of the tissue protection sleeve.

Remove the cannulated reamer.
Remove the K. wire.

INSTRUMENTS REQUIRED

DT03010H
Cannulated reamer, ø12.5mm (Hudson)

Guide wire insertion



Insert the Guide wire with olive ø2.5x800mm into the Chuck for ø2.5-3mm wire and turn the ring nut anticlockwise to lock the wire in place.

Introduce the wire into the intramedullary canal to the desired depth.
Remove the chuck by turning the ring nut clockwise to lock the wire in place.

NOTE:
If necessary, use the Fracture alignment guide wire exchange tool (Hudson) to facilitate fracture reduction and the insertion of the guide wire into the correct position.

INSTRUMENTS REQUIRED

EBA-5304
Guide wire with olive ø2.5x800mm STERILE

or

EBA-5233
Nails ruler Kit with guide wire with olive ø2.5x800mm STERILE

EBA-5345
Chuck for ø2.5-3mm wire

DT030016
Fracture align. guide wire exchange tool, Hudson

DT030070
Cannulated T-handle with Hudson coupling

Nail length measurement and medullary canal reaming

1) *2)*

The image refers to the 395mm nail length

Insert the Nails ruler onto the Guide wire with olive bringing it in contact with the cortex.

1) Make sure that the end of the Guide wire is aligned with the end of the nails ruler (the wire must be visible through the slot).

2) Read the length of the nail directly on the nails ruler marker.

⚠ ***For intermediate readings, it is advisable to use the shorter nail.***

Ream the canal progressively using 0.5mm increments. It is suggested to ream 1.5mm greater than the nail selected to implant.

NOTE:
If necessary, it is possible to use the adapter GH5040 (Hudson-Hudson) or GH5041 (Zih-Zih).

INSTRUMENTS REQUIRED

DT030032
Nails ruler, wire 800mm

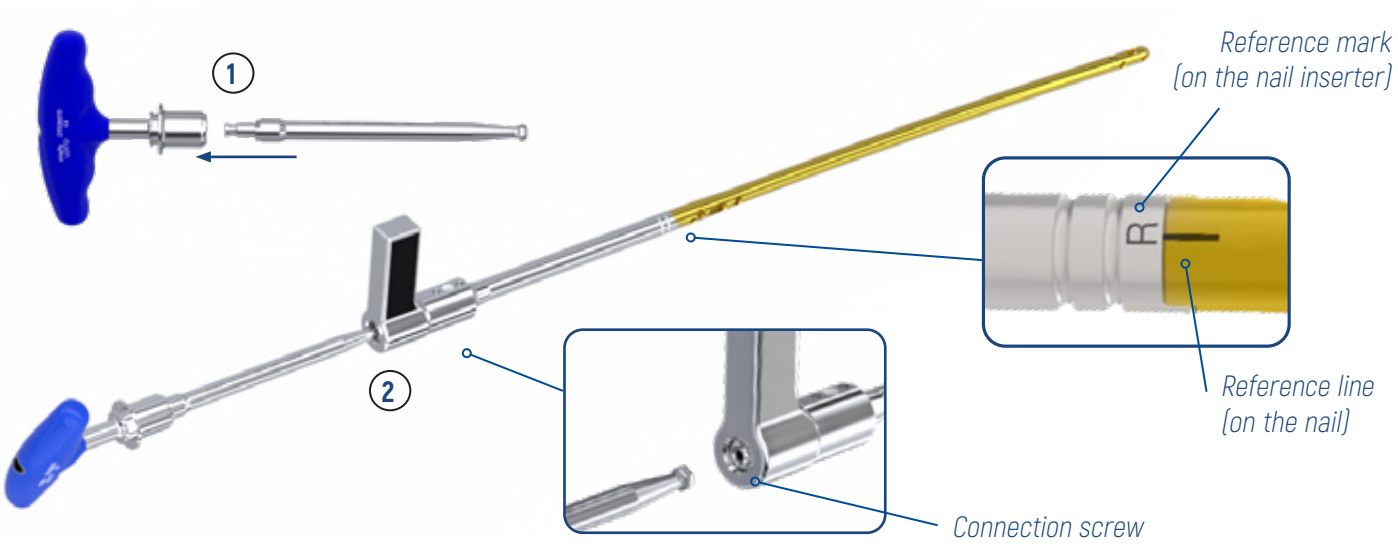
or

EBA-5233
Nails ruler Kit with guide wire with olive ø2.5x800mm STERILE

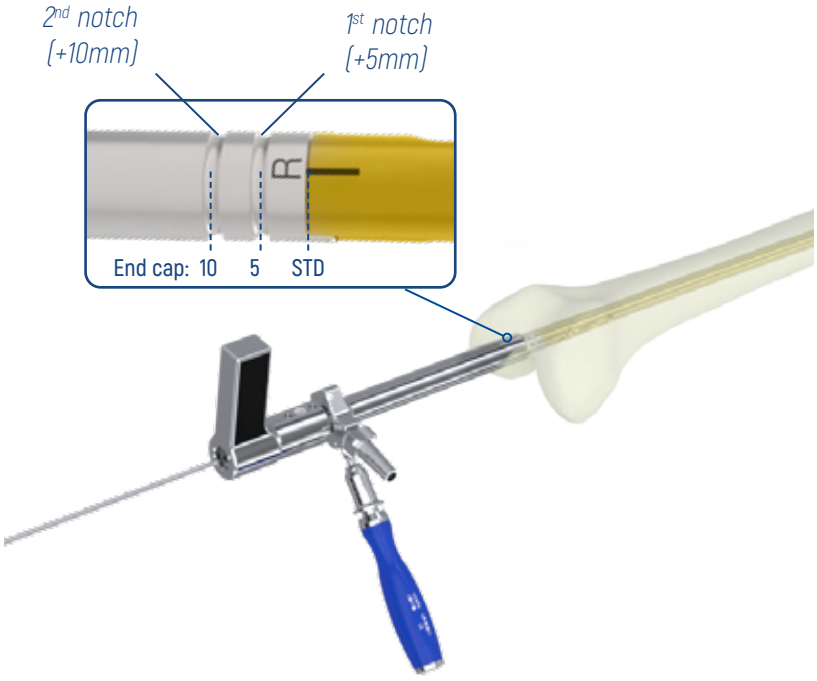
Nail-inserter assembly

The connection between nail inserter and nail is the same for both left and right femurs.

Attach the chosen nail onto the nail inserter, aligning the reference line on the nail with the "R" mark on the nail inserter.
Connect the T-handle with Hudson coupling with the Wrench, 8mm, Hudson coupling. Hereinafter referred to as T-wrench. (1)
Tighten the connection screw with the T-wrench. (2)



Nail insertion



Insert the Estremo nail on the guide wire by hand and advance it inside the medullary canal through the tissue protection sleeve.

If necessary, tap on the handle of the inserter with the Slotted hammer until reaching one of the two reference notches, which correspond to the other two sizes of end caps besides the standard one.

Once the nail has passed the fracture line, remove the Guide wire with olive ø2.5x800mm and check the final position of the nail with both AP and ML projections.

INSTRUMENTS REQUIRED

Nail inserter
(ESTREMO guide DT030008)

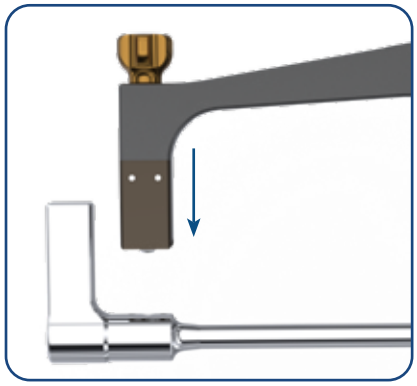
DT030070
Cannulated T-handle with
Hudson coupling

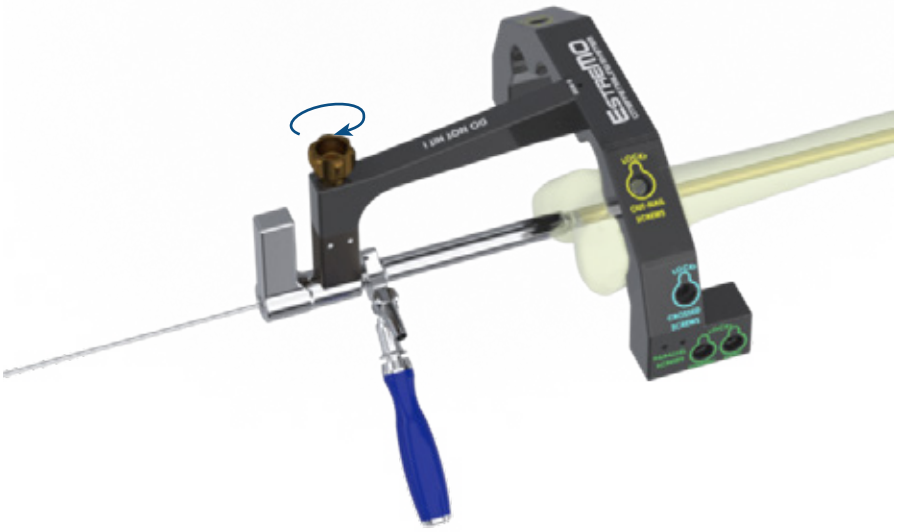
DT030045
Wrench, 8mm
Hudson coupling, short

DT030080
Slotted hammer

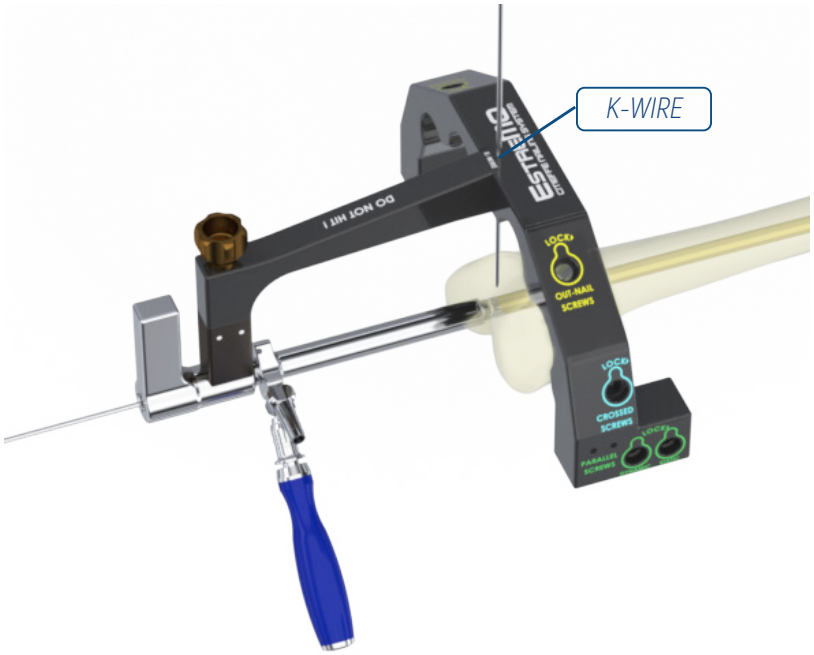
Targeting device assembly

Connect the Estremo carbon fiber guide to the inserter and screw the gold knob firmly.





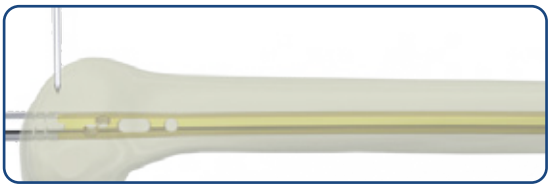
Nail depth monitoring



It is possible to verify the correct nail depth introducing a K. wire through the hole of the targeting device, marked *K-WIRE*.

The tip of the K. wire indicates the distal end of the nail.

Use the image intensifier to check the nail depth.



NOTE:
If compression with the Compression device is to be performed, the nail will shift distally up to 8.4mm (refer to page 5 for details).

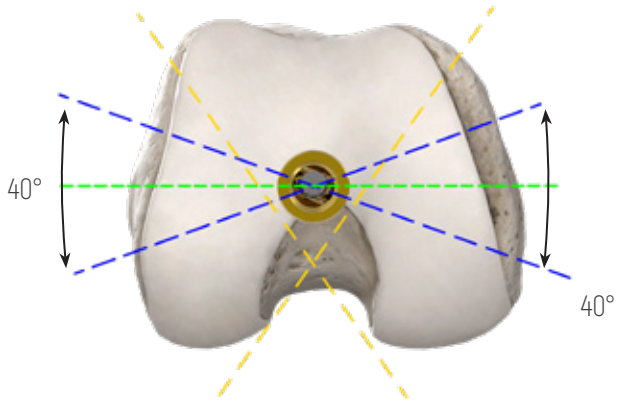
Remove the K. wire.

INSTRUMENTS REQUIRED

DT030008
ESTREMO guide

66987
K. wire trocar tip ø3x350mm STERILE

Distal guided locking options



- - - Parallel screws
- - - 40° crossed screws
- - - Out-nail screws

Depending on the fracture the distal locking can be performed with the following options:

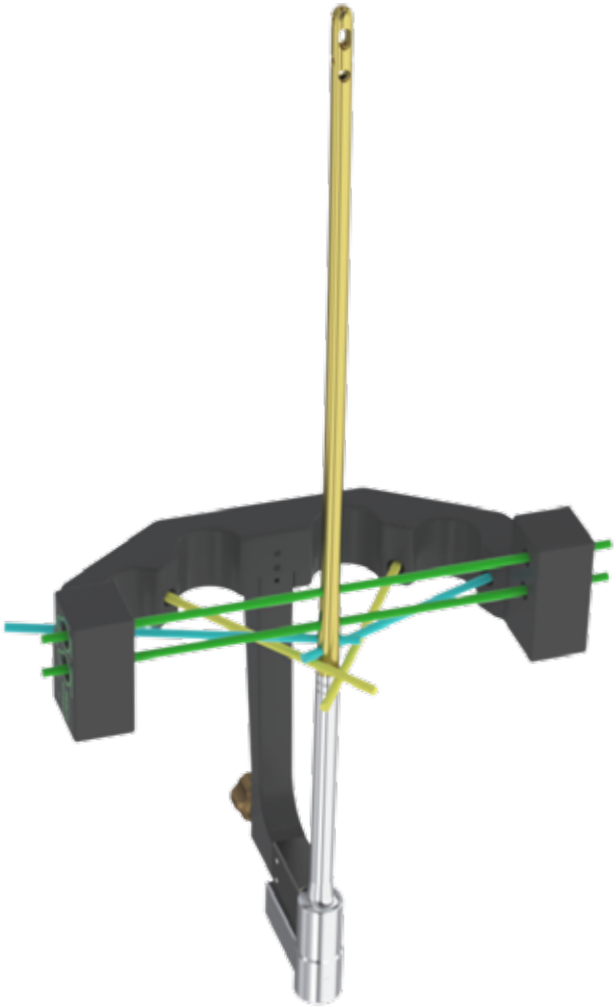
- two parallel screws with lateromedial access;
- two screws crossed at 40°.

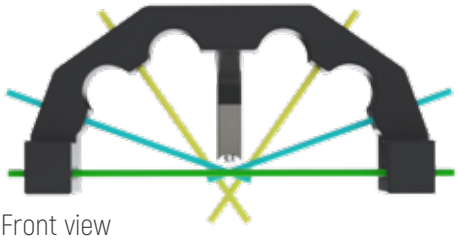
An additional locking option can be performed by inserting two out-nail screws.

⚠ *Compression with the Compression device can only be performed starting from the dynamic hole (parallel screws).*
For more detail about the compression view page 45.

⚠ *Compression with the Compression device can't be performed on the solid nail.*

NOTE:
The locking with crossed screws is the most distal locking option. In order to obtain optimal angular stability it is suggested to insert the Estremo locking end cap.





Front view

Side view

PARALLEL SCREWS, marked green on the targeting guide
Insertion of parallel screws with lateromedial access.

CROSSED SCREWS, marked blue on the targeting guide
Insertion of the crossed screws at 40°.

OUT-NAIL, marked yellow on the targeting guide
Insertion of out-nail screws.

NOTE:
Rondò cannulated screws are available to be used in the out-nail holes for a correct bone fragments compression.

Distal, Proximal locking and Compression steps

Distal Guided locking: Dynamic screw

Dynamic distal screw preparation

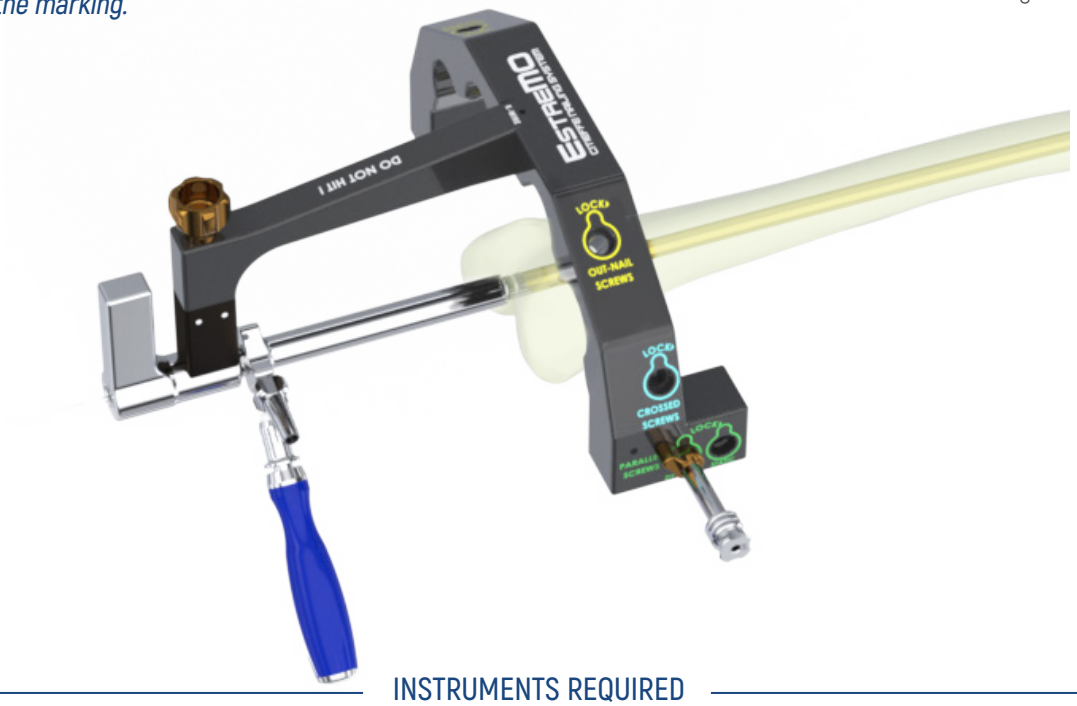
1) Insert and screw the Trocar for drill bit, ø4mm into the Cannula.

2) Introduce them into the hole marked DYNAMIC until they are in contact with the cortical bone.

⚠ *The gold lever must be facing upwards and aligned with the marking.*

3) Push the cannula lever down on the cannula until reaching the seat of the centering guide.

4) Rotate the lever clockwise, following the directions of the marking (Lock>), to anchor the cannula to the guide.



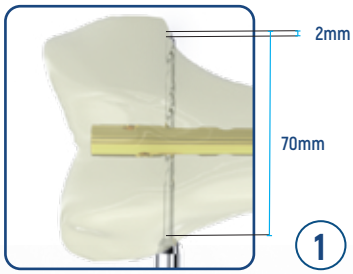
INSTRUMENTS REQUIRED

DT030020
Cannula

DT030027
Trocar for drill bit, ø4mm

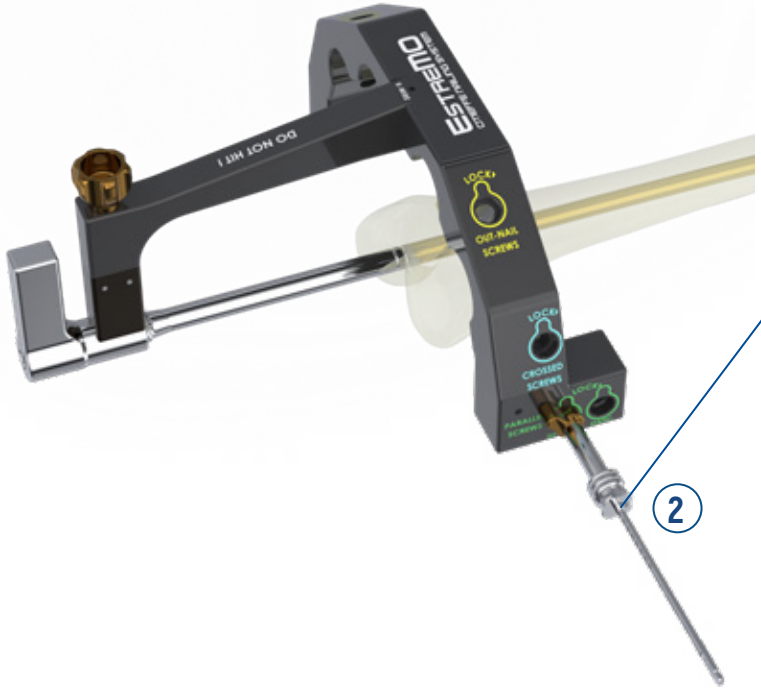
Dynamic distal screw preparation and measurement

The image refers to the 70mm screw size



Insert the drill bit, ø4x350mm into the trocar and drill both cortices.
Ensure the tip of drill bit is in the proper position prior to measuring as it shows in the image: the tip must go beyond the second cortex of at least 2mm. (1)

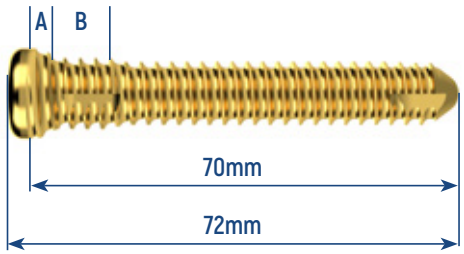
Read the length of the screw directly on the shaft of the graduated drill bit at the edge of the trocar (2).



Remove the graduated drill bit and the trocar.

⚠ *When in-between sizes, always select the longer size.*

Cortical screw characteristics:



A Approximately 2mm length with increased core diameter

B Increased resistance will be felt during screw insertion due to proximal screw self-tapping build up (0.5mm) for enhanced stability (approximately 4mm length)

Example: code DT352070 (Cortical screw ø5.2mm L.70mm)

INSTRUMENTS REQUIRED

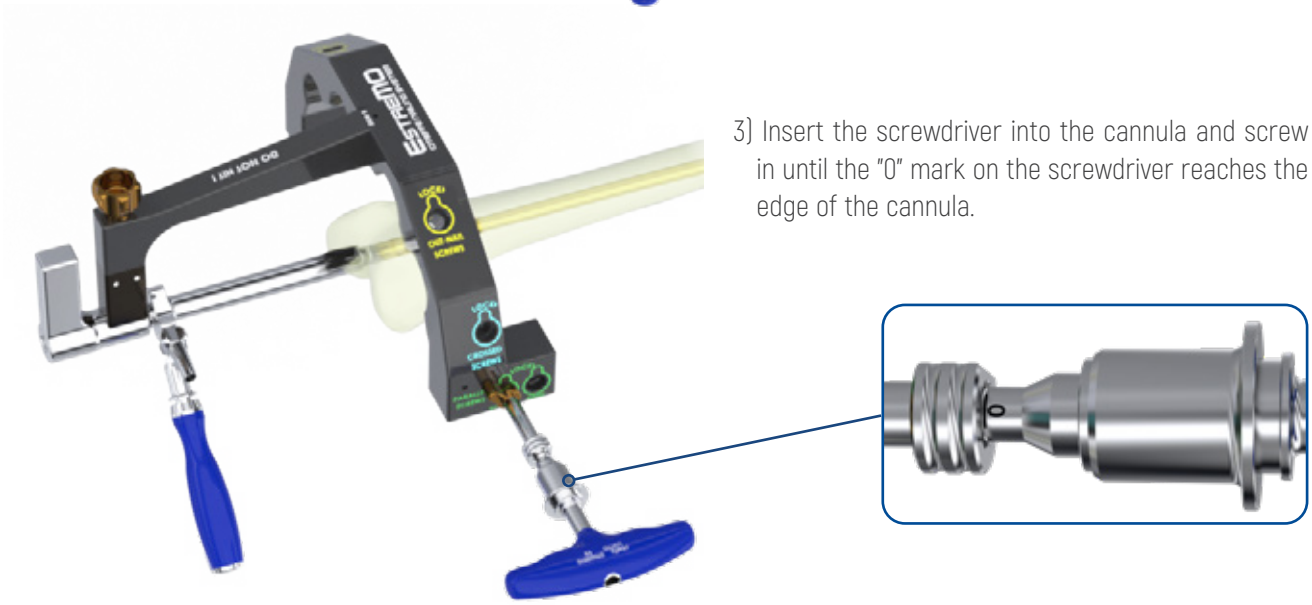
DT03013A
Graduated drill bit, ø4x350mm STERILE

Dynamic distal screw insertion

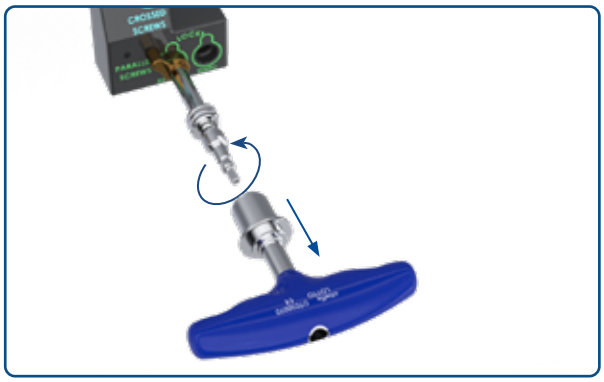
Select the correct cortical screw ø5.2mm.

1) Position the screw on the Screwdriver, 5mm Hudson coupling, and assembly it manually rotating the pin clockwise.

2) Connect the Cannulated T-handle on the screwdriver.



3) Insert the screwdriver into the cannula and screw in until the "0" mark on the screwdriver reaches the edge of the cannula.



4) Remove the cannulated T-Handle and loosen the pin of the screwdriver manually or with the Allen wrench, 2.5mm and remove the screwdriver.

INSTRUMENTS REQUIRED

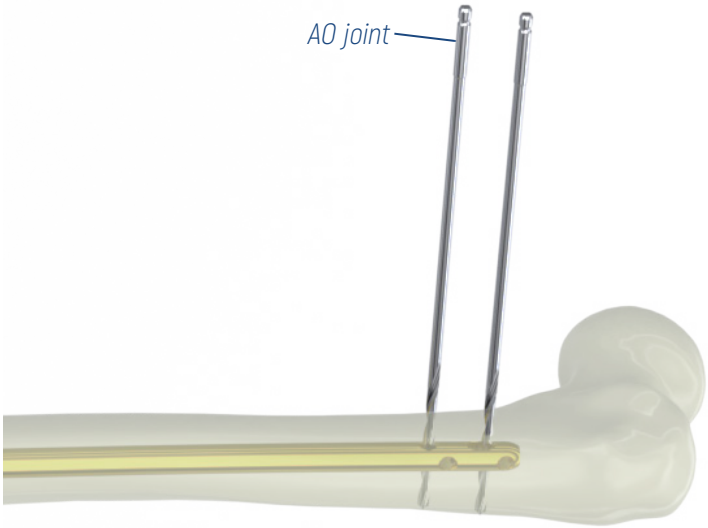
DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

970025
Allen wrench, 2.5mm

Proximal Locking (Free-Hand technique)

Preparation of proximal locking



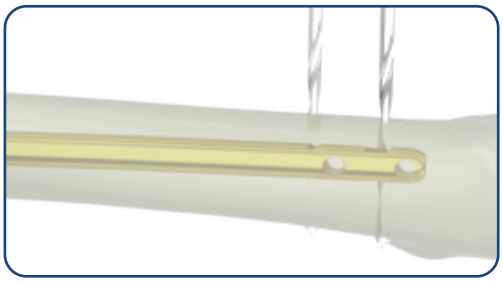
Under X-Ray control, check the reduction, correct the alignment of the fragments and the length of the limb before performing proximal locking with the free-hand technique.

Drill bi-cortical using the Drill bit, ø4x195mm.

Under X-Ray control, make sure the drill bit passes through the nail holes both on AP and ML axis.

NOTE:
It is suggested to start with the most proximal hole.

If you use a solid nail (ø8mm), the bone screws to be used for the steps are ø4mm and the drill bit to be used is ø3.2x195mm (SF1324).



INSTRUMENTS REQUIRED

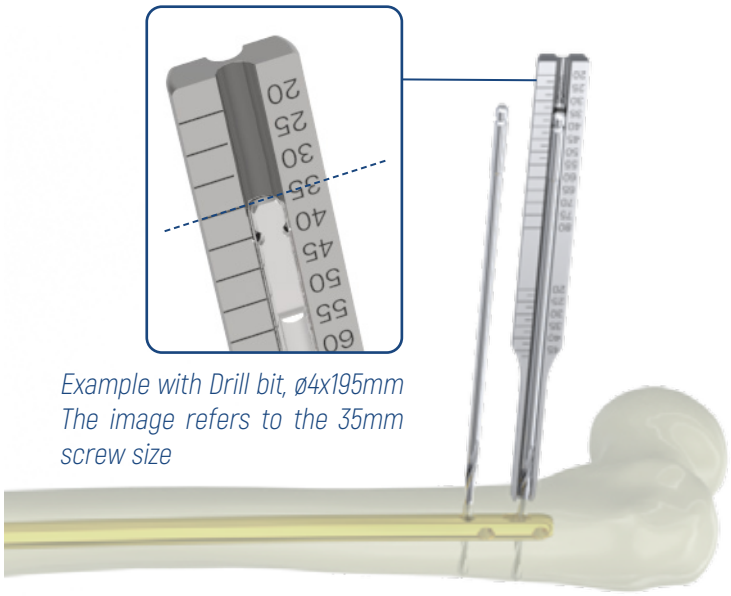
DT03016A
Drill bit, ø4x195mm STERILE

DT03016A
Drill bit, ø4x195mm STERILE

Proximal screw length measurement options

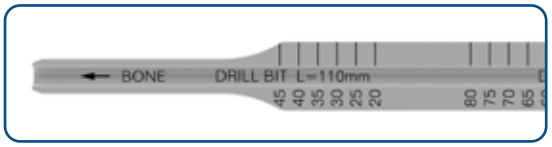
To measure the length of the cortical screws it's possible to use either the screw ruler (A) or the Screws depth gauge (B)

A) Screws ruler



Example with Drill bit, ø4x195mm
The image refers to the 35mm screw size

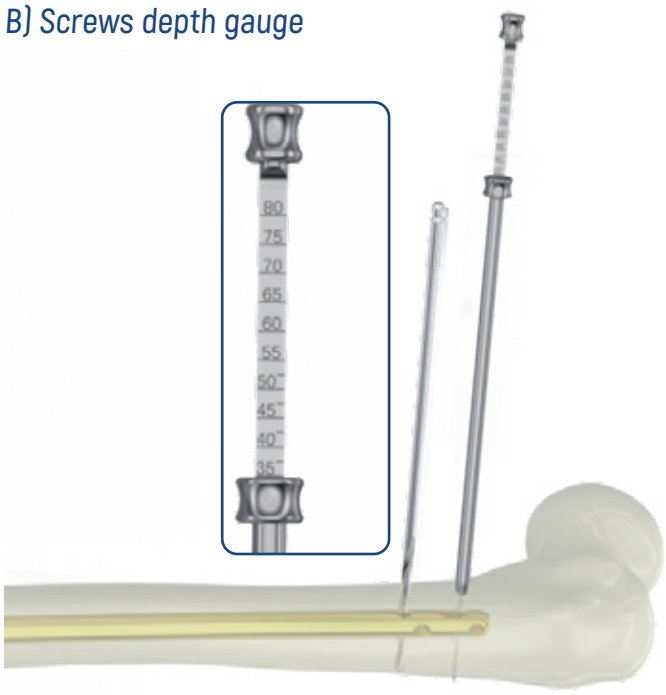
A) Insert the Screws ruler (with the marking "BONE" facing upwards) on the drill bit until touching cortex. The end of the drill bit on the screws ruler shows the length of the screw to be used.



Remove the drill bit.

⚠ *Make sure to read the correct numerical scale based on the drill bit that is used. (110mm or 195mm)*

B) Screws depth gauge



B) If you use the Screws depth gauge, remove the drill bit.
Insert the gauge into the hole making sure that the external sleeve comes into contact with the bone and the tip hooks the second cortex. Read the length of the screw directly on the depth gauge scale.

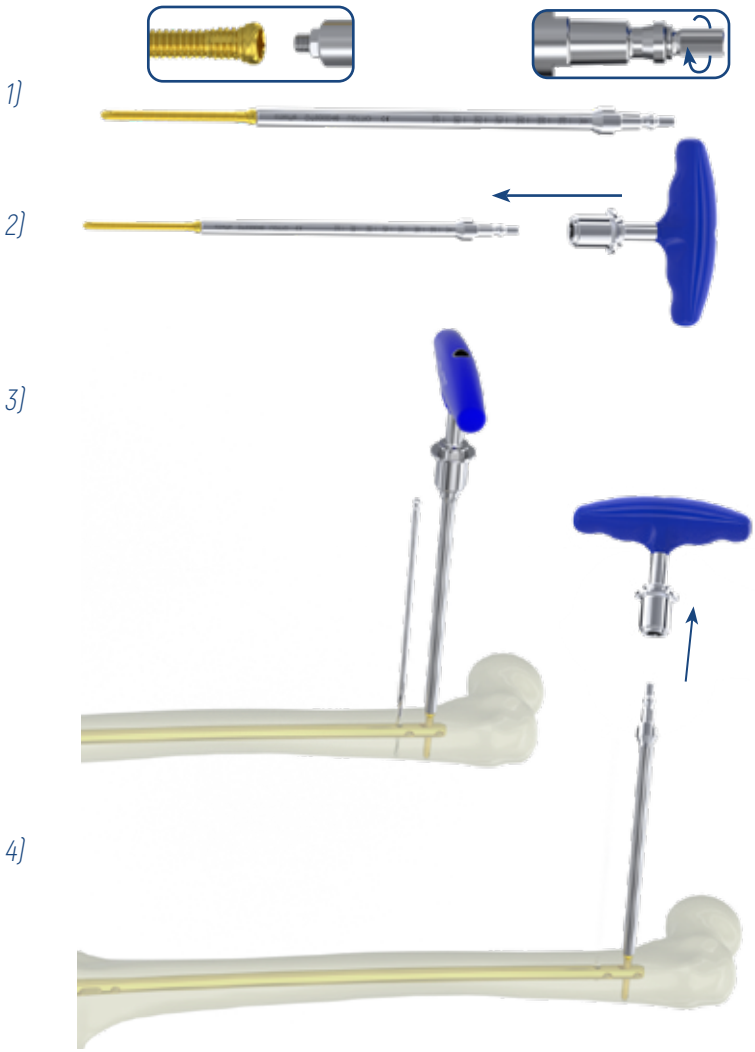
⚠ *When in-between sizes, always select the longer size.*

INSTRUMENTS REQUIRED

DT030030
Screws ruler (use BONE side)

DT030061
Screws depth gauge

First proximal screw insertion



Select the correct cortical screw ø5.2mm and remove the drill bit..

1) Position the screw on the Screwdriver, 5mm Hudson coupling, and assembly it manually rotating the pin clockwise.

2) Connect the Cannulated T-handle on the screwdriver.

3) Insert the first proximal screw.

4) Remove the cannulated T-Handle and loosen the pin of the screwdriver manually or with the Allen wrench, 2.5mm and remove the screwdriver.

Second proximal screw insertion

Repeat the same steps for the selection (Page 43) of the cortical screw 5.2mm and second distal screw insertion (Page 44).

INSTRUMENTS REQUIRED

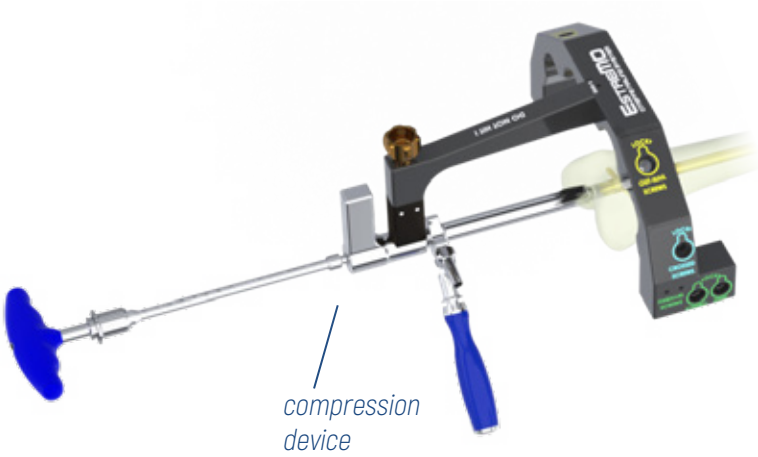
DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

970025
Allen wrench, 2.5mm

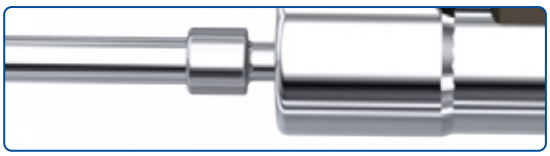
Fracture compression (optional)

Compression device insertion

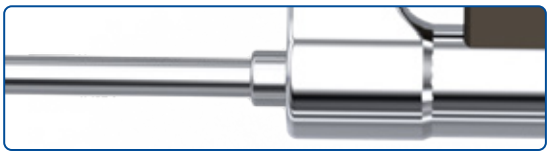


Fracture line compression can be performed only when the nail is locked distally with the screw inserted in the dynamic hole and there is at least one proximal screw used.

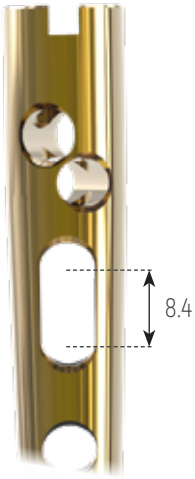
Fit the Compression device into the Screwdriver, 5mm Hudson coupling and introduce it into the nail inserter. Turn the screwdriver clockwise, using the image intensifier to check compression progress.



Pre-compression



Post-compression



NOTE:
During compression, the nail will shift distally up to a maximum of 8.4mm.

⚠ ***Compression with the Compression device can't be performed on the solid nail.***

INSTRUMENTS REQUIRED

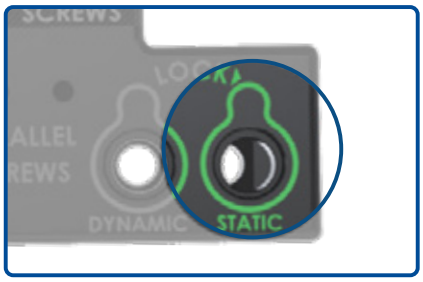
DT030052
Compression device

DT030070
Cannulated T-handle with
Hudson coupling

DT030046
Screwdriver, 5mm
Hudson coupling

Fracture compression (optional)

Compression device removal

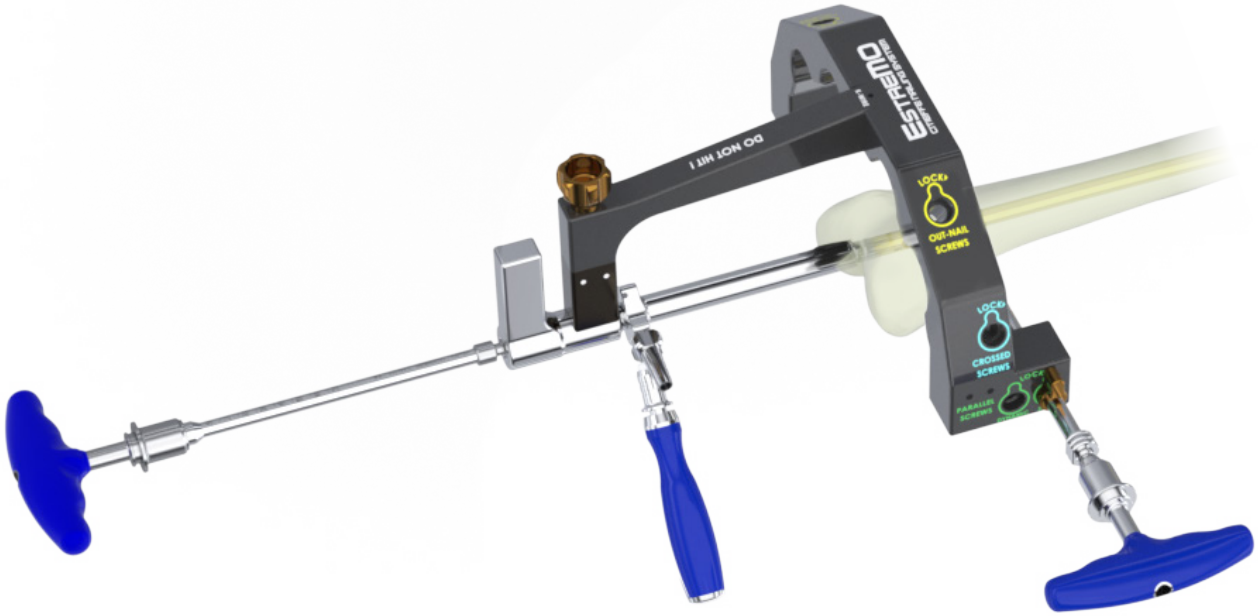


Insert the static distal screw into the hole marked STATIC while maintaining the compression obtained. Follow the step on pages 39 to 41.

Remove the compression device.

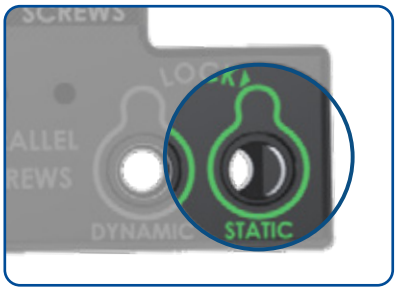
NOTE:
During compression, the nail will shift distally up to a maximum of 8.4mm.

⚠ ***Compression with the Compression device can't be performed on the solid nail.***



Distal Guided Locking: Static Screw

Repeat steps shown on page 39 using the hole marked STATIC.
Select the correct cortical screw ø5.2mm. (Page 40)
Repeat the same steps as done for the dynamic distal screw insertion. (Page 41)



Distal Guided Locking: Crossed screw

To insert the crossed screws, repeat the same steps on page 39 using the holes marked CROSSED SCREWS.
Repeat the same steps for the selection of the correct cortical screw ø5.2mm (as shown on page 40) and for the screw insertion (as shown on page 41).

NOTE:
The locking with crossed screws is the most distal locking option. In order to obtain optimal angular stability it is suggested to insert the Estremo locking end cap.

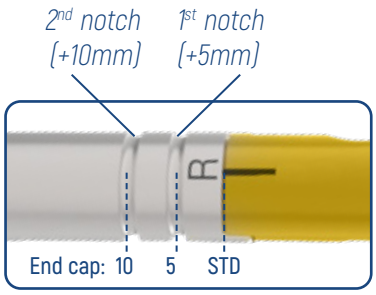
Distal Guided Locking: Out-Nail screw

To insert out-nail screws, repeat the same steps on page 39 but in the holes marked OUT-NAIL. It is possible to choose between two options:

A) Cortical screws ø5.2mm
B) Rondò cannulated screws ø6.5mm

For more details about the insertion follow the steps "ADDENDUM OUT-NAIL SCREWS" on page 52.

Targeting device removal



Remove the targeting device by loosening the connection screw using the T-wrench.

NOTE:
Before removing guide take note of reference notch on the nail inserter to aid in Estremo end cap selection.

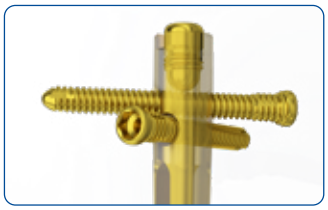
INSTRUMENTS REQUIRED

DT030070
Cannulated T-handle with
Hudson coupling

DT030045
Wrench, 8mm
Hudson coupling, short

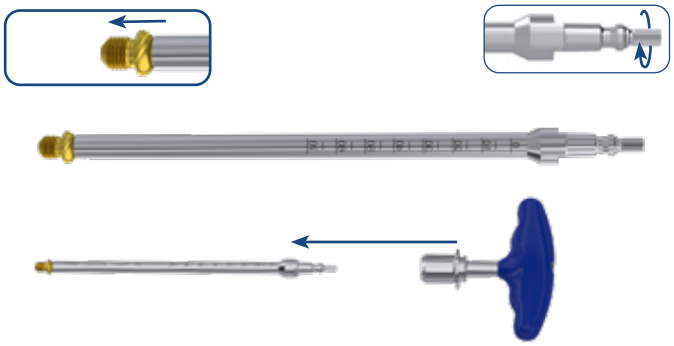
End cap insertion

Select the correct end cap.
If you have used crossed screws, in order to obtain optimal angular stability, it is suggested to use the Estremo locking end cap.



Locking End Cap correct placement

1)



1) Position the end cap on the Screwdriver, 5mm Hudson coupling, and assembly it rotating manually the pin clockwise. Connect cannulated T-Handle on the screwdriver.

2)

2) Insert the end cap

Remove the T-handle, unscrew the pin manually or with the Allen wrench, 2.5mm, and remove the screwdriver.

Remove the tissue protection sleeve.

Suture the incision using the most suitable technique.

INSTRUMENTS REQUIRED

DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

970025
Allen wrench, 2.5mm

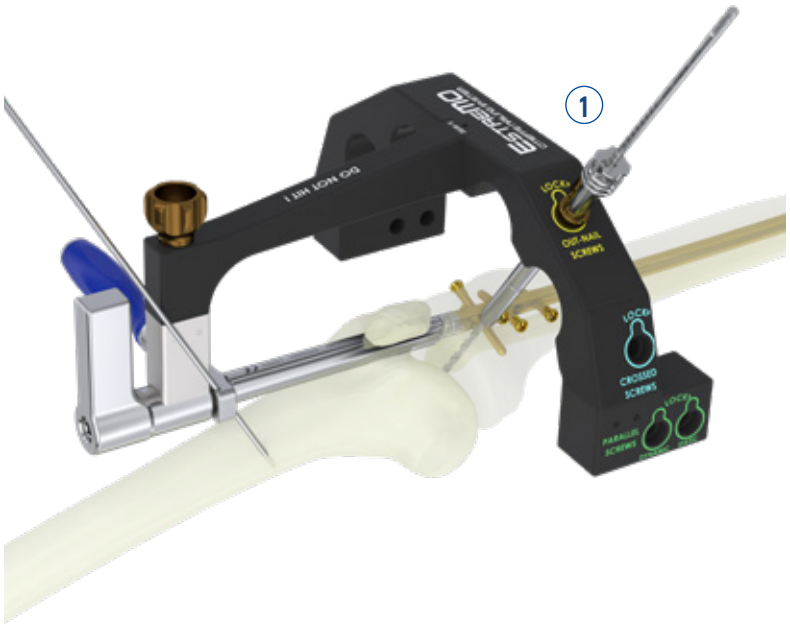
Operative technique - Out-nail cortical screws ø5.2mm (Opt.)

Preparation for the out-nail screw insertion

Insert and screw the Trocar for drill bit, ø4mm into the Cannula.

Introduce them into the hole marked OUT-NAIL until they are in contact with the cortical bone.

⚠ *The gold lever must be facing upwards and aligned with the marking.*



Push the cannula lever down on the cannula until reaching the seat of the centering guide.
Rotate the lever clockwise, following the marked arrow, to anchor the cannula to the guide. (For detail see page 18)

Insert the Graduated Drill bit through the trocar and drill up to the desired length.

Read the length of the screw directly on the shaft of the graduated drill bit at the edge of the trocar (1).

Remove the graduated drill bit and the trocar.

The image refers to the 60mm screw size

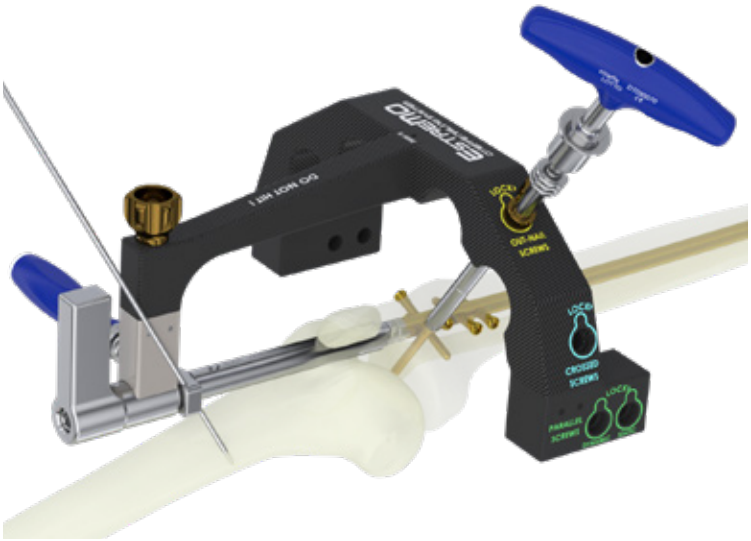
INSTRUMENTS REQUIRED

DT030020
Cannula

DT030027
Trocar for drill bit, ø4mm

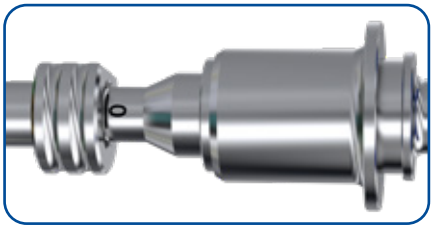
DT03013A
Graduated drill bit, ø4x350mm STERILE

Out-nail screw insertion

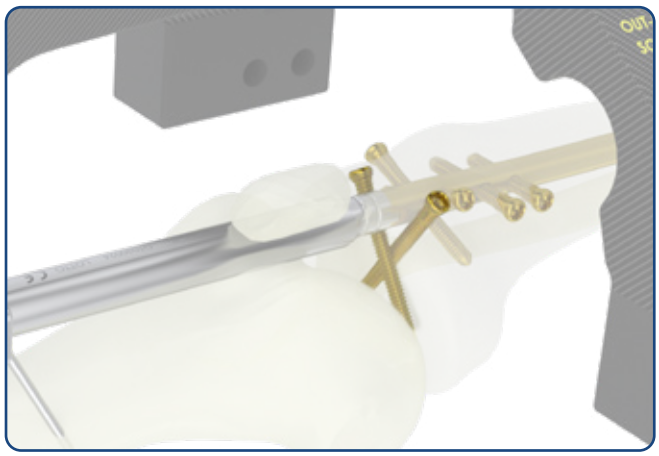


Select the correct cortical screw and attach it to the screwdriver.

Insert the screwdriver into the cannula and screw it until the "0" mark on the screwdriver reaches the edge of the cannula.



Remove the screwdriver and the cannula.



INSTRUMENTS REQUIRED

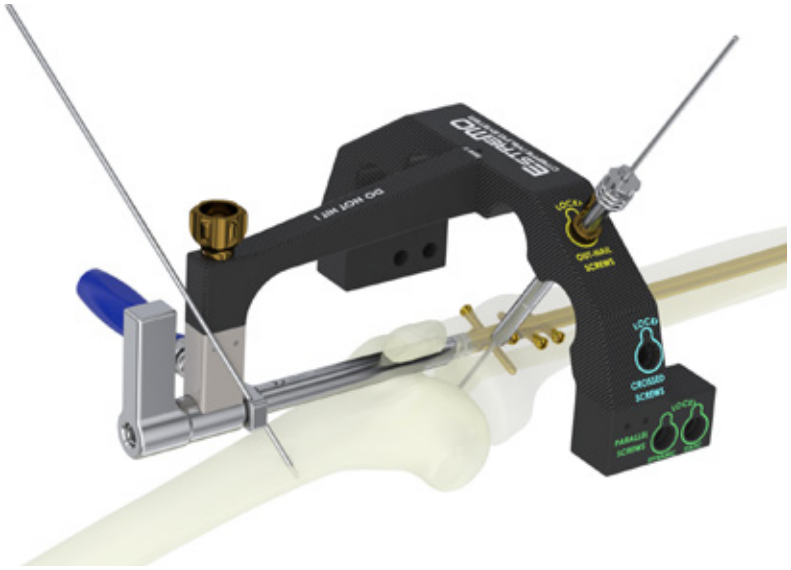
DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

970025
Allen wrench, 2.5mm

Operative technique - Out-nail Rondò cannulated screws ø6.5mm (Opt.)

Preparation for the out-nail screw insertion

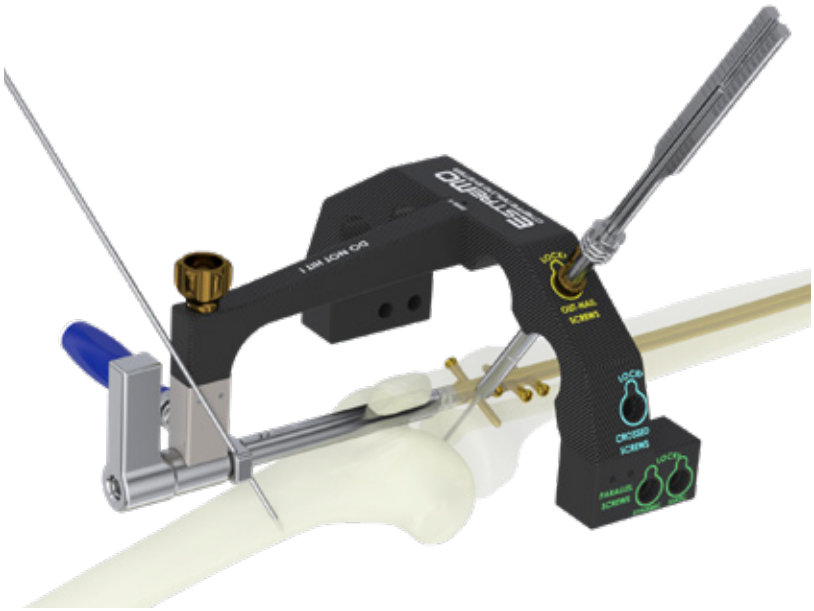


Insert and screw the Trocar, ø3mm into the Cannula.

Introduce them into the hole marked OUT-NAIL until they are in contact with the cortical bone.

⚠ *The gold lever must be facing upwards and aligned with the marking.*

Push the cannula lever down on the cannula until reaching the seat of the centering guide.
Rotate the lever clockwise, following the marked arrow, to anchor the cannula to the guide.
(For detail see page 18).



Insert the K. wire trocar tip ø3x350mm through the trocar and ensure the tip of K. wire is in the desired position prior to measuring.

Place the Screws ruler (with the marking "TROCAR" facing upwards) on the K. Wire until touching with its tip the trocar.

The end of the K. Wire on the screw ruler, shows the length of the screw to be used.

The image refers to the 60mm screw size

INSTRUMENTS REQUIRED

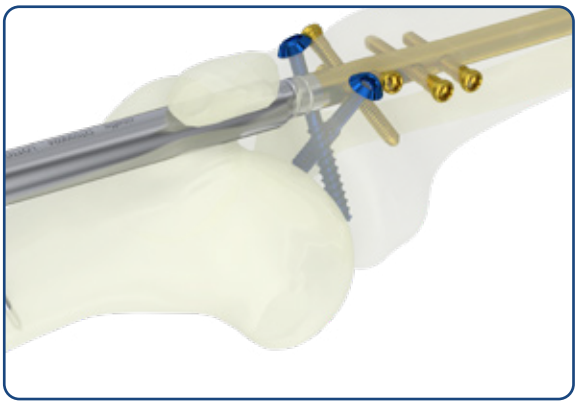
DT030020
Cannula

DT030025
Trocar, ø3mm

66987
K. wire trocar tip ø3x350mm STERILE

DT030030
Screws ruler (use TROCAR side)

Out-nail screw insertion



Remove the cannula and the trocar.

Unscrew the gold knob and remove the targeting guide.

Select the correct out-nail screw (recommended cannulated Rondò screw, refer to page 60 for details).

Remove the pin (retentive core) from the screwdriver stem.

Insert the screw using the screwdriver over the K. wire and turn it clockwise.
The screw track is created by the self-tapping profile of the screw.

When the washer is in contact with the first cortex it avoids further sinking of the screw in the bone.

Remove the K. wire.

NOTE:
If necessary, re-attach the targeting guide to the nail inserter and repeat the steps for the second out-nail screw insertion.

INSTRUMENTS REQUIRED

DT030046
Screwdriver, 5mm
Hudson coupling

DT030070
Cannulated T-handle with
Hudson coupling

ORDERING INFORMATION

TITANIUM STERILE

Solid nail ø8mm

Code	L. (mm)	Code	L. (mm)
DT308260	260	DT308335	335
DT308275	275	DT308350	350
DT308290	290	DT308365	365
DT308305	305	DT308380	380
DT308320	320	DT308395	395

Cannulated nail

ø9mm

Code	L. (mm)
DT309260	260
DT309275	275
DT309290	290
DT309305	305
DT309320	320
DT309335	335
DT309350	350
DT309365	365
DT309380	380
DT309395	395
DT309410	410
DT309425	425
DT309440	440
DT309455	455
DT309470	470

ø10mm

Code	L. (mm)
DT310260	260
DT310275	275
DT310290	290
DT310305	305
DT310320	320
DT310335	335
DT310350	350
DT310365	365
DT310380	380
DT310395	395
DT310410	410
DT310425	425
DT310440	440
DT310455	455
DT310470	470

ø11mm

Code	L. (mm)
DT311260	260
DT311275	275
DT311290	290
DT311305	305
DT311320	320
DT311335	335
DT311350	350
DT311365	365
DT311380	380
DT311395	395
DT311410	410
DT311425	425
DT311440	440
DT311455	455
DT311470	470

ø12mm

Code	L. (mm)
DT312260	260
DT312275	275
DT312290	290
DT312305	305
DT312320	320
DT312335	335
DT312350	350
DT312365	365
DT312380	380
DT312395	395
DT312410	410
DT312425	425
DT312440	440
DT312455	455
DT312470	470

ø13mm

Code	L. (mm)
DT313260	260
DT313275	275
DT313290	290
DT313305	305
DT313320	320
DT313335	335
DT313350	350
DT313365	365
DT313380	380
DT313395	395
DT313410	410
DT313425	425
DT313440	440
DT313455	455
DT313470	470

on request

Cortical screw ø5.2mm

Code	L. (mm)
DT352022	22.5
DT352025	25
DT352027	27.5
DT352030	30
DT352032	32.5
DT352035	35
DT352037	37.5
DT352040	40

Code	L. (mm)
DT352042	42.5
DT352045	45
DT352047	47.5
DT352050	50
DT352052	52.5
DT352055	55
DT352060	60
DT352065	65

Code	L. (mm)
DT352070	70
DT352075	75
DT352080	80
DT352085	85
DT352090	90
DT352095	95
DT352100	100
DT352105	105
DT352110	110

Cortical screw ø4mm (solid nail distal holes only)

Code	L. (mm)
DT340020	20
DT340025	25
DT340030	30
DT340035	35
DT340040	40

ESTREMO end cap

Code	Size	Nail length increment
DT300000	STD	3.5mm
DT300005	5mm	8.5mm
DT300010	10mm	13.5mm

ESTREMO locking end cap

Code	Size	Nail length increment
DT300100	STD	1.5mm
DT300105	5mm	5mm
DT300110	10mm	10mm

on request

Out-nail screw

ø6.5mm Rondò screw (L. 16mm thread with double pitch)

Code	Screw ø (mm)	Washer ø (mm)	Thread L. (mm)	Total L. (mm)
VT-65030	6.5	12	16	30
VT-65035	6.5	12	16	35
VT-65040	6.5	12	16	40
VT-65045	6.5	12	16	45
VT-65050	6.5	12	16	50
VT-65055	6.5	12	16	55
VT-65060	6.5	12	16	60
VT-65065	6.5	12	16	65
VT-65070	6.5	12	16	70

Code	Screw ø (mm)	Washer ø (mm)	Thread L. (mm)	Total L. (mm)
VT-65075	6.5	12	16	75
VT-65080	6.5	12	16	80
VT-65085	6.5	12	16	85
VT-65090	6.5	12	16	90
VT-65095	6.5	12	16	95
VT-65100	6.5	12	16	100
VT-65105	6.5	12	16	105
VT-65110	6.5	12	16	110
VT-65115	6.5	12	16	115
VT-65120	6.5	12	16	120

ø6.5mm Rondò screw (L. 32mm thread with double pitch)

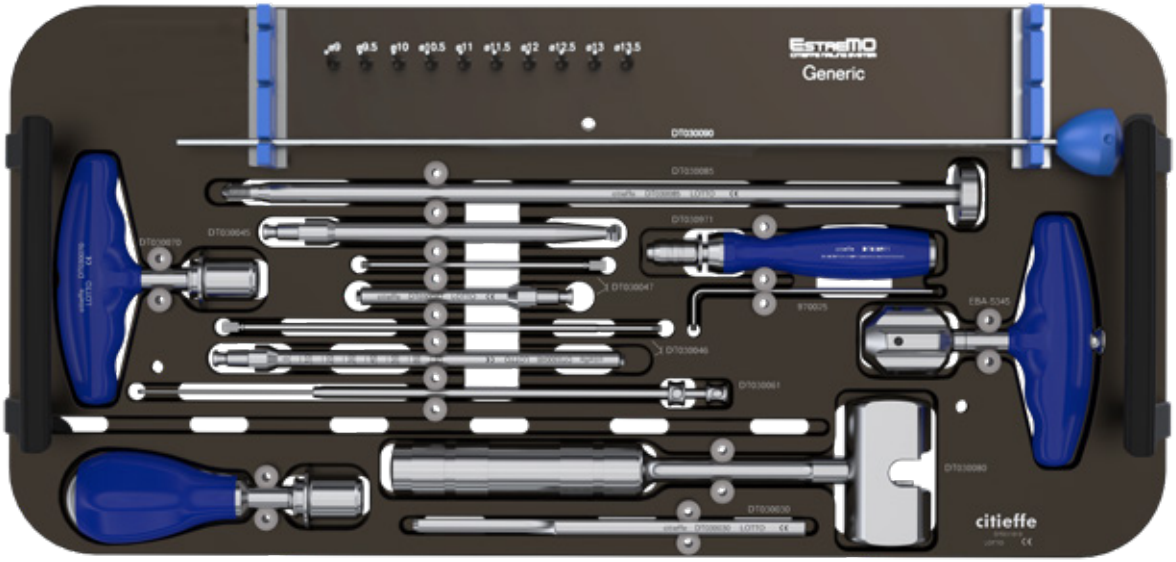
Code	Screw ø (mm)	Washer ø (mm)	Thread L. (mm)	Total L. (mm)
VT-66040	6.5	12	32	40
VT-66045	6.5	12	32	45
VT-66050	6.5	12	32	50
VT-66055	6.5	12	32	55
VT-66060	6.5	12	32	60
VT-66065	6.5	12	32	65
VT-66070	6.5	12	32	70
VT-66075	6.5	12	32	75

Code	Screw ø (mm)	Washer ø (mm)	Thread L. (mm)	Total L. (mm)
VT-66080	6.5	12	32	80
VT-66085	6.5	12	32	85
VT-66090	6.5	12	32	90
VT-66095	6.5	12	32	95
VT-66100	6.5	12	32	100
VT-66105	6.5	12	32	105
VT-66110	6.5	12	32	110
VT-66115	6.5	12	32	115
VT-66120	6.5	12	32	120

on request

ORDERING INFORMATION - INSTRUMENT SETS

Generic tray



Code	Description	Q.ty
DT030030	Screws ruler	1
DT030045	Wrench, 8mm Hudson coupling, short	1
DT030046	Screwdriver, 5mm Hudson coupling (two parts)	1
DT030047	Screwdriver, 5mm Hudson coupling, short (two parts)	1
DT030061	Screws depth gauge	1
DT030070	Cannulated T-handle with Hudson coupling	1
DT030080	Slotted hammer	1
DT030085	Extractor, threaded M8x1	1
DT030090	Obturator with handle	1
DT030971	Cannulated "D20" handle with AO coupling	1
34.680-RAL5010	Cannulated Teardrop-handle with Hudson coupling	1
970025	Allen Wrench, 2.5mm	1
EBA-5345	Chuck for ø2.5-3mm wire	1
DT031010	ESTREMO instrument set tray, generic empty	1

NOTE:
The tray has holders to accommodate reamers heads with sizes from ø9mm to ø13.5mm (ø2.7mm inner hole) and two flexible reamer stems.

Tibia Suprapatellar+Retrograde Femur tray

Code	Description	Q.ty
DT030008	ESTREMO guide, carbon fiber (three parts)	1
DT030015	Cannulated Awl	1
DT030016	Fracture align. guide wire exchange tool, Hudson	1
DT030020	Cannula	2
DT030024	Tissue protection sleeve AO joint (two parts)	1
DT030025	Trocar, ø3mm	2
DT030026	Multihole trocar	1
DT030027	Trocar for drill bit, ø4mm	2
DT030032	Nails ruler, wire 800mm	1
DT030052	Compression device	1
DT03010H	Cannulated reamer, ø12.5mm (Hudson)	1
GH5040	Hudson-Hudson adapter	1
DT030023	Tissue protection sleeve AO joint, suprapatellar (two parts)	Optional
DT030028	Multihole trocar ø13mm, suprapatellar	Optional
DT031009	ESTREMO instrument set tray, supra+retro empty	1

Sterile disposables

STERILE

Code	Description	Q.ty
66987	Kirschner wire, trocar tip ø3x350mm	4
EBA-5304	Guide wire with olive ø2.5x800mm	2
DT03013A	Graduated drill bit, ø4x350mm	2
DT03015A	Drill bit, ø4x350mm (AO joint)	2
DT03016A	Drill bit, ø4x195mm (AO joint)	2
DT03019A	Drill bit, ø4x110mm (AO joint)	2
DT030002	Guide wire with olive ø3x800mm	Optional
DT030004	Guide wire with olive ø3.2x800mm	Optional
EBA-5233	Nails ruler kit with Guide wire with olive ø2.5x800mm	Optional
EBA-5234	Nails ruler kit with Guide wire with olive ø2.5x1000mm	Optional
DT030062	Nails ruler kit with Guide wire with olive ø3x800mm	Optional
DT030063	Nails ruler kit with Guide wire with olive ø3x1000mm	Optional
SF1324	Drill bit, ø3.2x195mm	Optional
DT030968	Countersink for ESTREMO screws ø5.2mm Hudson	Optional
4047	Handle for scalpel ø8x400mm	Optional

Optional instruments

Code	Description
GH5041	ZIH-ZIH adapter
DT030031	Template nails length
DT03010T	Cannulated reamer, ø12.5mm (Trinkle joint)
DT03012A	Graduated drill bit, ø4mm (AO joint)
DT03013H	Cannulated drill, ø5mm (Hudson joint)

EstreMO
CITIEFFE NAILING SYSTEM

Intramedullary nailing system

Tibial nail - Suprapatellar approach
Femoral nail - Retrograde approach

citieffe®
Essential moves in Trauma

INSPIRED BY PEOPLE
MOVED BY INNOVATION

Citieffe s.r.l.
Via Armaroli, 21, 40012 Calderara di Reno (BO) - Italy
Tel +39 051 721850 - Fax +39 051 721870
info@citieffe.com | www.citieffe.com

Citieffe Inc.
3692 Grand Ave #473 Miami, Florida 33133 USA
info-usa@citieffe.com | orders-usa@citieffe.com
www.citieffe.com/us/

For more information scan the Qrcode

YOUR DISTRIBUTOR IS