



NTAN Proximal Femoral Nail

Surgical Technique

Get Better

Expertise and enthusiasm can be perfectly combined into a top-notch medical engineering company!

We contribute to the development of health services by providing superior technology products at competitive costs.

We envision a socially conscious business environment serving the health industry and patients get better.

Dunitech branded products are designed and engineered to keep our promise;

Easier Operation
Better Fixation

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Ntan Proximal Femoral Nail Specifications

Ntan KEY FIGURES

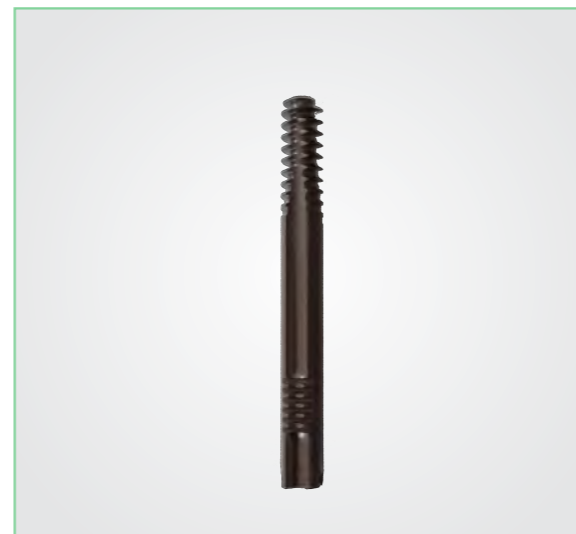
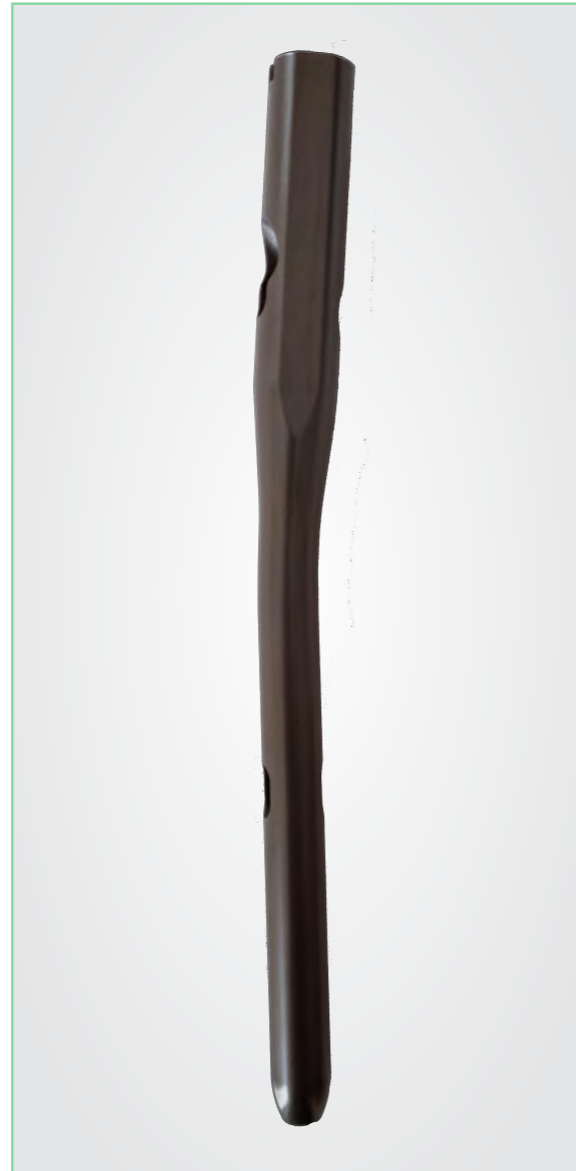
- Proximal Diameter: 16.3 mm
- Distal Diameter: 10 mm, 11.5 mm, 13mm
- Fully Cannulated Body: Compatible with guide wire
- Lag Screw Angle: 130°
- Material: Titanium alloy with anodized type II surface treatment.

Ntan SHORT FIGURES

- Length: 180, 200, 220 mm

LAG SCREW'S KEY FIGURES

- Length: 70 mm to 120 mm in 5 mm
- Thread Diameter: 10.5 mm
- Compression Range: 15 mm



Ntan Proximal Femoral Nail Indications

INDICATIONS

- Intertrochanteric fractures
- Stable and unstable pertrochanteric fractures
- High subtrochanteric fractures without shaft extension
- Low subtrochanteric fractures (Ntan Long Nails only)
- Osteoporotic fractures
- Pathologic/impending pathologic fractures
- Malunions/nonunions

PRECAUTIONS

NTAN Proximal Femoral nails and accessories were not evaluated for safety and compatibility in the magnetic resonance (MR) environment and no tests for heating or migration were conducted for those products in MR environment.

CONTRAINDICATIONS

- Femoral neck fractures

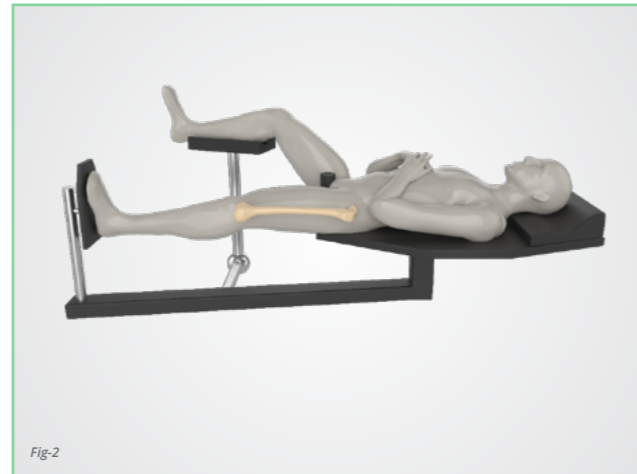
The following conditions may present an increased risk of implant failure. This list is not meant to be comprehensive. Physicians should use their clinical judgement when determining the appropriate implant and approach for a given patient.

- Infection
- Incomplete fusion of the epiphysis
- Cognitive and/or physical impairment that would lead to unacceptable risk of fixation failure
- Metal sensitivity or allergic reaction to foreign bodies
- Loss of bone stock or insufficient bone quality to support the device
- Obliterated or narrow medullary canal
- Obese patients
- In the same region as a pre-implanted screw plate
- In comminuted and/or intraarticular fractures
- In open fractures with inadequate soft tissue cover and/or with associated arterial injury



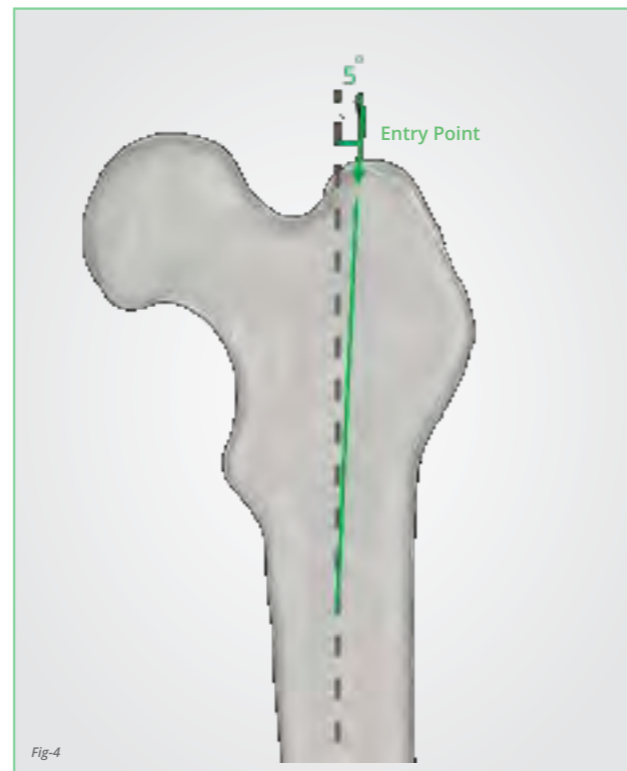
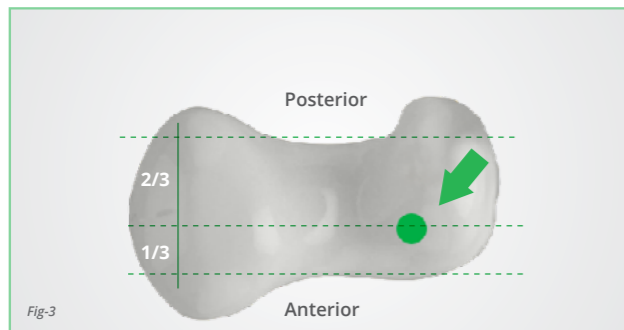
1. Patient Positioning and Fracture Reduction

- Place the patient in the supine or lateral decubitus position according to surgeon preference on a fracture or other radiolucent table.
- Apply traction to the affected leg and place it in slight adduction to ease access to the greater trochanter and intramedullary canal. Alternatively, the torso can be abducted 10-15° towards the unaffected leg. The unaffected leg should be placed in a leg holder or extended away from the affected leg (Fig-1 and Fig-2). Position the image intensifier as to ensure that AP and lateral views of the proximal femur can be easily obtained.
- Reduce the fracture as anatomically as possible through closed reduction before prepping and draping the patient.



2. Incision and Entry Point

- Make a longitudinal incision proximal to the greater trochanter. Dissect down through the incision separating the gluteus medius in line with the fibers and palpate the greater trochanter.
- The entry point is aligned with the intramedullary canal in lateral view. Typically, this is at the junction of the anterior one-third and posterior two-thirds of the greater trochanter (Fig-3). In the AP view, it is 5 degrees lateral to the tip of the greater trochanter (Fig-4).



INSTRUMENTS FOR ACCESSING THE CANAL AND PROXIMAL REAMING



NTAN Set Tray 1

NTAN Threaded Pin Dia 3.2x400 (N05-0250)

Ball Tip Guide Wire 3 mm x 900 mm (N01-0270)

NTAN T-Handle (N05-0030)

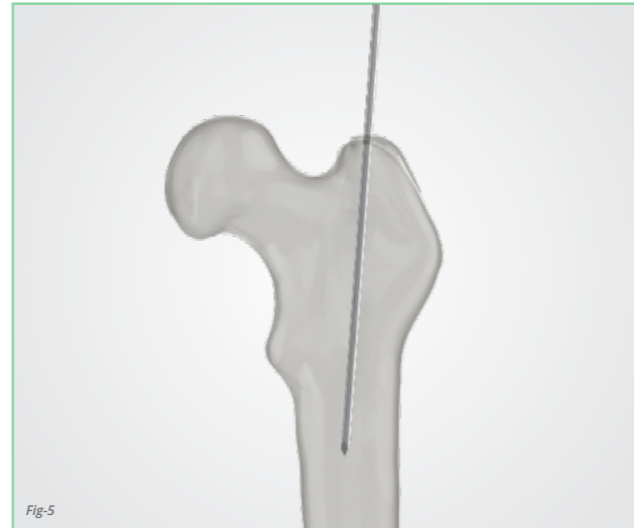


3. Accessing the Canal

Option 1: Trocar Tip Guide Wire

INSTRUMENTS:

- ✓ **NTAN Threaded Pin Dia 3.2 x 400 (N05-0250)**
- Advance the NTAN Threaded Pin Dia 3.2x400 through the entry point and into the proximal femur with the help of a powered driver (Fig-5).
- The wire should be centered in the canal on the lateral view and intersect the center of the canal just beyond the lesser trochanter on the AP view.
- Withdraw and reposition the wire as necessary.



Option 2: Entry Awl and Guide Wire

INSTRUMENTS:

- ✓ **Entry Awl (N05-0040)**
- ✓ **Guide Wire 3.2mm x 400 mm (N05-0250)**
- Insert the Entry Awl through the incision and down to the bone.
- Rotate the Entry Awl back and forth to penetrate the proximal femur.
- Care must be taken not to displace the fracture.
- Pass the 3 mm Trocar Tip Guide Wire through the Entry Awl and down to the bone (Fig-6).
- Withdraw and reposition the wire as necessary.
- Remove the Entry Awl.



4. Proximal Reaming

INSTRUMENTS:

- ✓ **NTAN T Handle (N05-0030)**
 - ✓ **NTAN Tissue Protector (N05-0010)**
 - ✓ **NTAN Entry Reamer (N05-0020)**
 - ✓ **Ball Tip Guide Wire 3 mm x 900 mm (N01-0270)**
 - ✓ **Pin Puller (N05-0050)**
- Insert the NTAN Tissue Protector through the incision and down to the bone. Secure the NTAN Entry Reamer to a powered driver. Pass over the wire and through the NTAN Tissue Protector. Ream the proximal femur to the desired depth.
 - Exchange the 3 mm Trocar Tip Guide Wire to the Ball Tip Guide Wire. Loosen up the Pin Puller's lock and pass the Guide Wire through it. Lock the wire by rotating the Pin Puller's drum and move it to the desired depth (Fig-9). Ensure that the guide wire in the correct position with the help of image intensifier. Withdraw and reposition the wire as necessary.
 - Confirm that the fracture is well reduced.
 - Remove the Pin Puller
 - Alternatively, Entry Reamer can be used with NTAN-T Handle instead of power tool.



5. Distal Reaming

INSTRUMENTS:

- ✓ Flexible Reamer Dia 10/11/12/13/14 (N05-0060/0070/0080/0090/0100)
- ✓ NTAN T Handle (N05-0030)

- Confirm that the fracture reduction has been maintained. Starting from 10 mm Reamer, ream until the desired depth with steady pressure (Fig-11). By each pass, increase the diameter of the Reamer in 1 mm increments.
- The canal should be reamed to at least 11 mm, 1 mm above the smallest nail diameter. For bigger sizes continue on reaming, to prevent accumulation of debris in the medullary canal, retract the reamer when necessary.

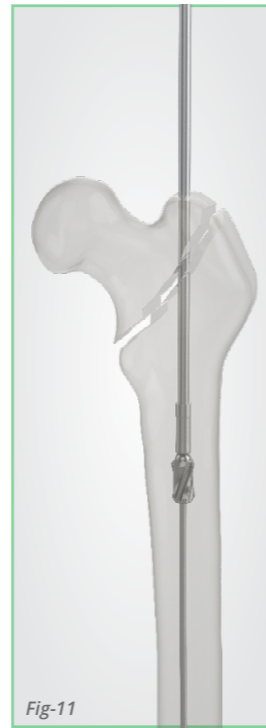


Fig-11

6. Assembling the Target Guide

INSTRUMENTS:

- ✓ Guide Arm (N05-00180)
- ✓ Guide Handle (N05-0110)
- ✓ Handle-Arm Connector Screw (N05-0190)
- ✓ 7 mm Hex Driver (N05-0130)

- Mate the Guide Arm to the Guide Handle and use the 7 mm Hex Driver to tighten the Handle-Arm Connector Screw (Fig-13). Ensure that the connection is tight before proceeding.



Fig-13

INSTRUMENTS FOR DISTAL REAMING, TARGET GUIDE ASSEMBLY AND NAIL INSERTION



NTAN Set Tray 2



NTAN Set Tray 1

7. Engaging the Set Screw

INSTRUMENTS:

- ✓ 5 mm Hex Driver (N05-0340)
- With the Lag Driver's handle perpendicular or parallel to the Guide Arm, insert the 5 mm Hex Driver to the nail and mate it to the integrated set screw.
- Rotate the driver clockwise until the set screw engages the lag screw (Fig. 33).
- Do not overtighten the set screw at this point.



Fig-33

8. Attaching the Nail

INSTRUMENTS:

- ✓ Handle-Nail Connector Screw (N05-0190)
- ✓ NTAN Proximal Lag Guide Sleeve (N05-0200)
- ✓ 7 mm Hex Driver (N05-0130)
- ✓ Lag Drill (N05-0300)

- Insert the set screw into the nail with the help of 5mm flexible Hex Driver distal end of the set screw should not pass into the lag screw hole in the nail. It should stay loose in this step.
- Mate the desired nail to the Guide Handle and use the 7 mm Hex Driver to tighten the Handle-Nail Connector Screw (Fig-14). Ensure that the reference line on the nail is aligned to the corresponding line on the Guide Handle and that the connection is tight before proceeding (Fig-14a).
- To verify correct alignment, insert the Lag Drill in the targeting hole corresponding to the nail in the Guide Arm. Advance until it contacts the nail. Insert the Lag Alignment Plug through the Lag Guide Sleeve and advance until it passes through the Lag Screw hole in the nail (Fig-15). If there's a misalignment, first check if the targeting hole used to correspond to the angle on the nail. If so, loosen the connection between the nail and Guide Handle and pass the Lag Drill through the nail. Retighten the connection between the nail and the handle.
- After confirming the alignment, remove the Lag Guide Sleeve and Lag Drill.



9. Inserting the Nail

INSTRUMENTS:

- ✓ NTAN Impactor Connector (N05-0140)
- ✓ NTAN Sliding Hammer (N05-0160)
- ✓ NTAN Wrench (N05-0170)

Note:

- ✓ If a traditional ball tip guide wire was used, it must be exchanged for a smooth guide wire. The tip of traditional ball tip guide wires won't pass through the nail.

- Assemble the impactor connector into the Guide Handle. Pass the nail over the guide wire, through the incision and into the bone. Hold the targeting arm vertically as you enter the proximal femur. With steady pressure, advance the nail down the femur while rotating the targeting arm down (Fig-16 to Fig-18).



- If needed, the Impactor can be used for light hammer blows. If considerable resistance is encountered, do not use strong hammer strikes. It may cause loss of reduction or perioperative fracture. Instead, remove the nail, replace the sheath and further enlarge the medullary canal.

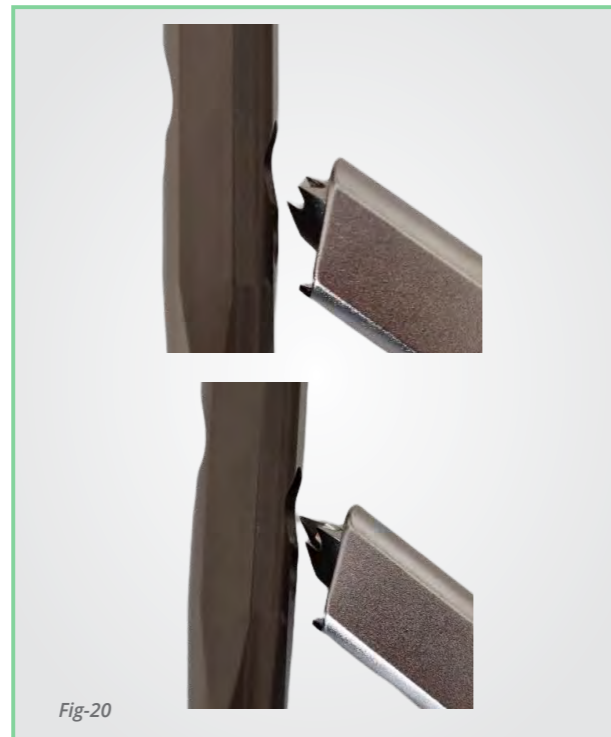
Note

- ✓ Do not strike the Guide Arm or Guide Handle with a slap hammer or any other mallet.

10. Preparing for Guide Pin Placement

INSTRUMENTS:

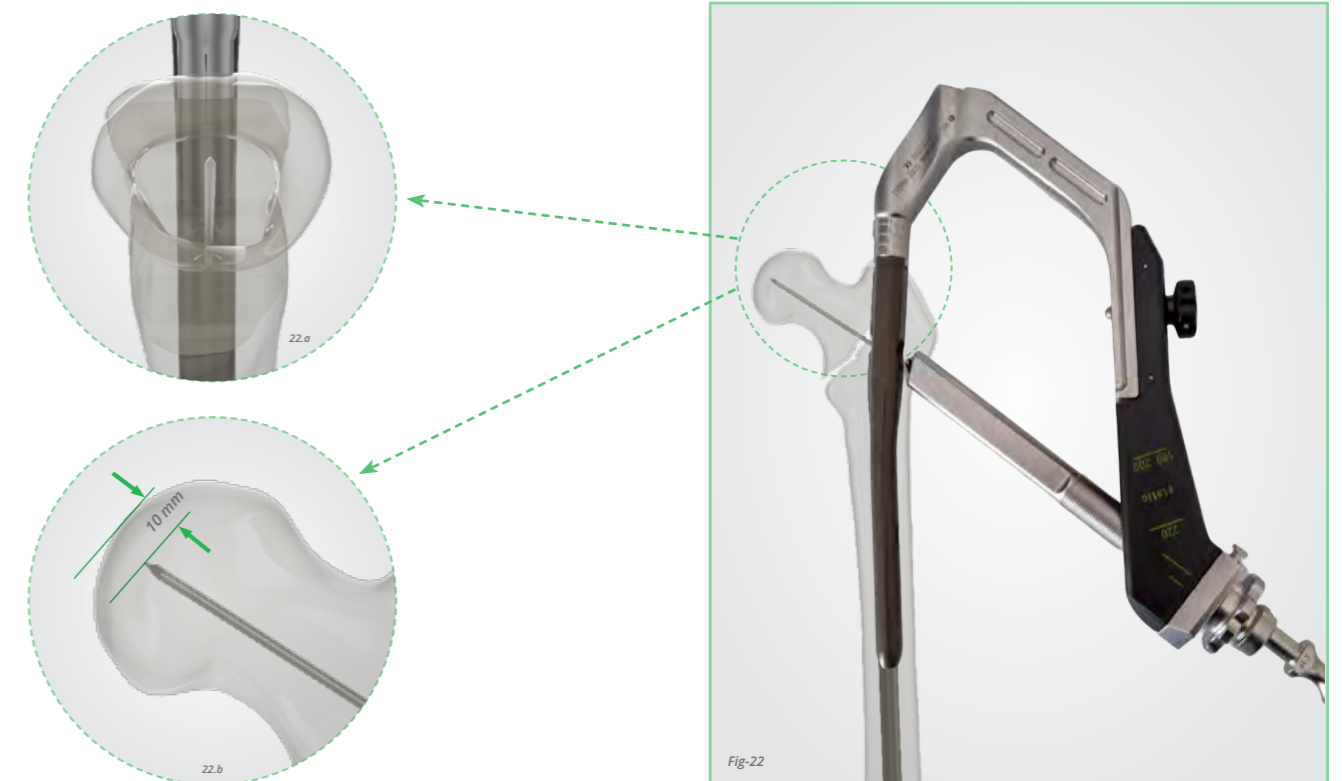
- ✓ *NTAN Proximal Guide Sleeve (N05-0200)*
 - ✓ *NTAN Proximal Sleeve (N05-0220)*
 - ✓ *NTAN Sleeve Trocar (N05-0230)*
 - ✓ *NTAN Pin Sleeve (N05-0240)*
 - ✓ *7 mm Hex Driver (N05-0030)*
- Set the nail in its final depth with the help of the image intensifier in the AP view. The projected axis of the lag screw should be in the middle to the axis of the femoral neck (Fig-19). A ruler can be used on the monitor screen to assist in optimal nail placement.
 - Insert the Proximal Sleeve through the Proximal Guide Sleeve and introduce the assembly through the corresponding hole in the Guide Arm, advancing until the skin. Make a small incision and advance the assembly until in contact with the femur. Confirm radiographically that the Proximal Guide Sleeve is touching the femoral cortex as demonstrated on Fig-19.
 - Insert Proximal Trocar (N05-0230) in to the Proximal Sleeve and fix on entrance point on the bone.
 - Remove the Proximal Sleeve and Proximal Trocar.
 - Insert the Pin Sleeve to the same area and push it till it touches to the bone.



11. Placing the Threaded Pin

INSTRUMENTS:

- ✓ *NTAN Threaded Pin Dia 3.2 x 400 (N05-0250)*
- Set the nail in its final orientation with the help of the image intensifier in the lateral view. Arrange the image intensifier for a true lateral position. The Guide Arm should perfectly overlap the nail and femoral head, as seen in Fig-22a. If the Guide Arm is lateral to the nail and/or femoral head, reorient the nail, so they overlap.
 - Insert the Threaded Pin through the Pin Sleeve until it reaches the lateral femoral cortex. With a powered tool and applying steady pressure, advance the pin subchondrally until its tip is at 10 mm of the joint level (Fig-22b). The minimal distance to the joint area is 5 mm.
 - The final Lag Guide Pin position should be centered in the lateral view and AP view.



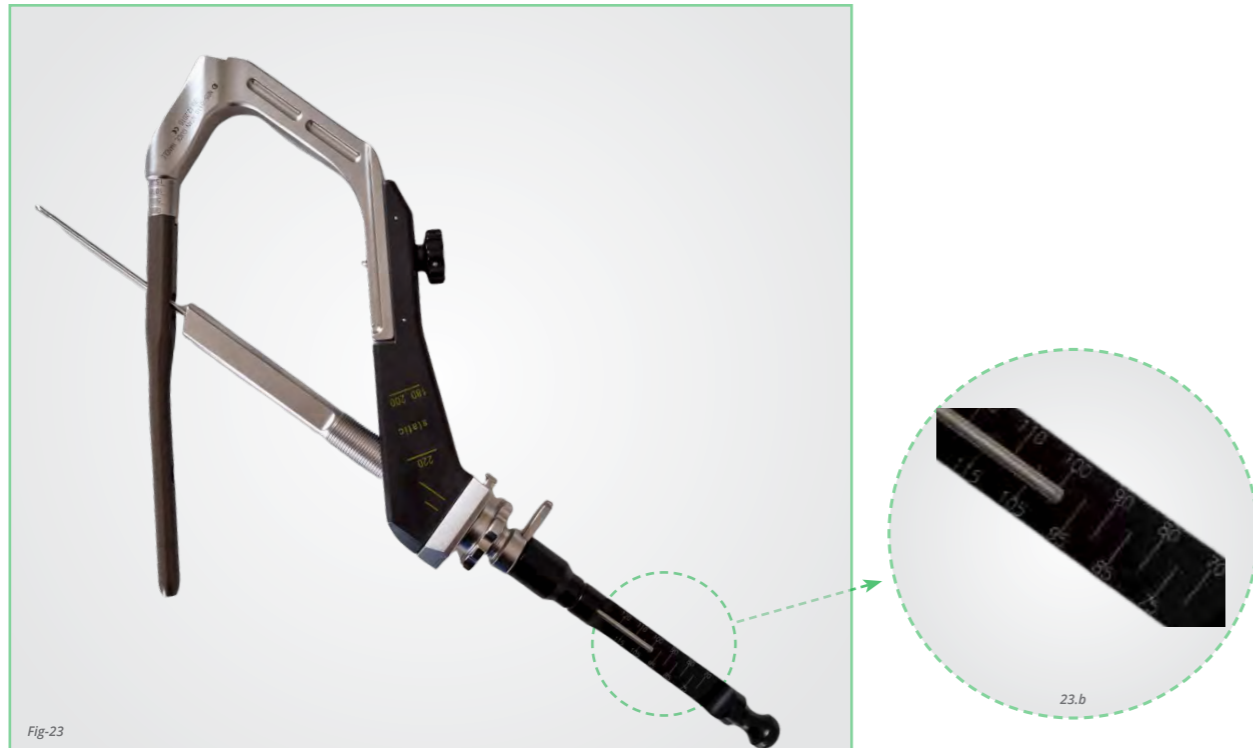
Note

- ✓ screw and assist in choosing the drilling depth and lag screw size.
- ✓ Reposition the Lag Guide Pin if necessary.

12. Measure the Threaded Pin Depth

INSTRUMENTS:

- ✓ **Lag depth gauge (N05-0260)**
- Place the NTAN Lag Depth Gauge (N05-0260) as shown in the figure. Threaded Pin should pass from the hole inside the Depth Gauge.
- Read the depth of the guide pin
- Remove the Lag Depth Gauge



Note

- ✓ The ruler is calibrated to the tip of the Lag Guide Pin.
- ✓ The drilling depth and lag screw size are at the discretion of the surgeon.

13. Drilling for Lag Screw

INSTRUMENTS:

- ✓ **Lag Drill (N05-0300)**
 - ✓ **Lag Drill Stop (N05-0310)**
 - ✓ **NTAN Drill Bit Dia 6.5 (N05-0270)**
 - ✓ **NTAN Drill Stop-Short (N05-0280)**
 - ✓ **NTAN Drill Stop-Long (N05-0290)**
- Use NTAN Drill Bit Dia 6.5 (N05-0270) to drill the hole for lag compression screw. It should be drilled 5mm less than the measurement read for the lag screw. Then remove the drill bit.
 - Insert NTAN Drill Stop-(Short upto 100mm lag screw length and Long for sizes 105 - 120mm).
 - Remove the Pin Sleeve.
 - Set the Lag Drill Stop to the desired depth on the Lag Drill (Fig-24.1). Typically, the Lag Drill Stop is set to the measure obtained in the previous step. Connect the Lag Drill to a powered tool, pass it over the Threaded Pin and insert it into the NTAN Proximal Guide Sleeve.
 - Drill with a gentle pressure monitoring the progress under the image intensifier. When the set drilling depth is reached, the Lag Drill Stop will contact the Proximal Guide Sleeve. At the discretion of the surgeon, the drilling can stop before reaching the preset depth.
 - Remove the Lag Drill and Drill Stop- Short / Long.



14. Connecting Lag Screw and Lag Driver

INSTRUMENTS:

✓ Lag Driver (N05-0330)

✓ Lag Driver Connector Screw (N05-0120)

✓ 5 mm Hex Driver (N05-0340) – Optional

- Choose the appropriate lag screw based on the measure of the Threaded Pin. The surgeon should consider the depth drilled and the compression of the fracture gap needed when selecting the lag screw size to avoid excessive lateral lag screw protrusion.
- Introduce the Lag Screw Holder into the Lag T Driver. Mate the lag screw with the Lag T Driver and secure by tightening the lag screw holder. If needed, use the 3.5 mm Hex Wrench (Fig-27).
- Slot on the lag screw should be on the same side with the slot on the Lag T Driver.



15. Inserting the Lag Screw

- Insert the lag screw and Lag T Driver assembly over the Threaded Pin and into the Proximal Guide Sleeve.
- Slide the assembly until resistance is met.
- Advance the lag screw by turning the driver clockwise and applying steady pressure until the lag screw threads engage the bone. At this stage, the assembly should advance itself with continued turning.
- Slot on the Lag T Driver should be facing the distal side of the nail where the compression screw will be placed
- Compression distance mark should be set to 5mm when the inserting is finished as seen in (Fig-31).
- Monitor the last few turns with an image intensifier.



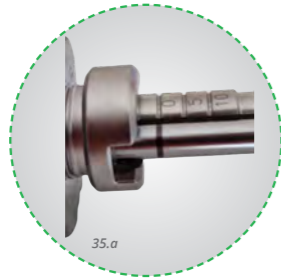
Note

- ✓ The final position of the Lag Driver's handle must be PARALLEL or PERPENDICULAR to the Guide Arm. This positioning will align the lag screw's flats to the integrated set screw and prevent the lag screw from rotating.

- Remove the Lag Guide Pin.

16. Applying Compression

- Introduce the 5mm Hex Driver connector Screw (N05-0350) into the 5mm Hex Driver (N05-0340). Mate the Compression screw with the system and secure with tightening the lag compression screw.
- Insert the 5mm Hex Driver and lag compression screw into the proximal Guide Sleeve.
- Slide the assembly until resistance is met.
- Advance the compression screw by turning the 5mm Hex Driver clockwise.
- Continue on turning till the second line on the 5mm Hex Driver is on the same axis with 0mm line on the Lag T Driver as seen in figure 35.a.



17. Setting the Lag Screw

INSTRUMENTS:

- ✓ 5 mm Hex Driver (N05-0340)

The lag screw should be set to a fixed configuration (no rotation or sliding allowed). The integrated Set Screw's configuration will make the fixation.

- Insert the 5 mm Flexible Driver into the nail and rotate it clockwise until the Set Screw is fully tightened against the lag screw's threads (Fig-36).



18. Removing Lag Screw Targeting System

INSTRUMENTS:

- ✓ 5 mm Hex Driver (N05-0340) - Optional
- ✓ Knob Wrench (N05-0440)
- ✓ 7 mm Hex Driver (N05-0130) - Optional
- Release the 5mm Hex Driver Connector Screw disengaging the 5mm Hex Driver from the compression screw. Pull it out of the Proximal Guide Sleeve.
- Release the Lag Screw Holder from the Lag T Driver with the help of 3.5 mm Hex Wrench. Pull the Lag T Driver out of the proximal Guide Sleeve.



19. Distal Locking (Dynamic-Static)

- Distal locking can be done either static or dynamic. For the static locking, same guide arm used for the lag screw insertion will be used. If dynamic locking is needed, Static guide arm should be disassembled and dynamic guide arm should be assembled to the Guide Handle.
- Drilling, measurement and screw insertion steps are same for static and dynamic distal locking.
- To use static or dynamic locking is surgeon's choice.



Dynamic



Static

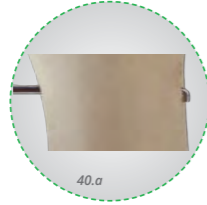
20. Drilling for Distal Locking

- Insert the 4.3 mm Distal Trocar into the Distal Drill Sleeve Dia 8.2 /Dia 4.3.
- Insert the assembly into the Distal Outer Sleeve Dia 11mm / Dia 8.2 x 170.
- Pass the assembly through the distal locking hole on the guide arm (dynamic or static). Nails with the length of 180 and 200 mm uses the same hole. for 220 mm nails, there is another hole on the guide arm. They are all laser marked.
- Advance the assembly until the distal drill sleeve touched the skin and make a small incision.
- Advance the assembly until the distal drill sleeve touches the cortical bone. Push the distal trocar in order to make an entrance mark on the bone.
- Pull back distal trocar and send the 4.3mm drill bit inside the distal drill sleeve. Drill through both cortices with the drill bit while distal drill sleeve touching the lateral cortex.



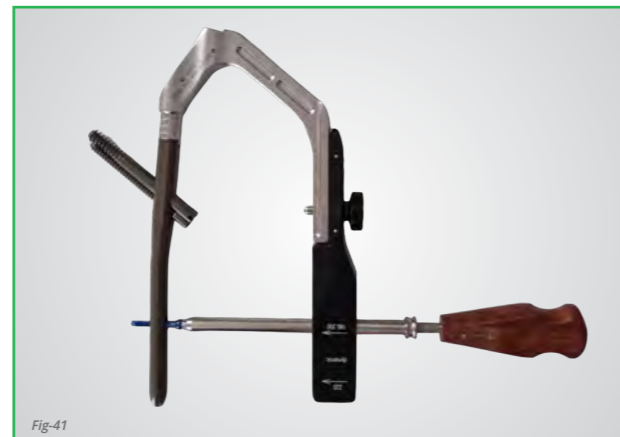
21. Distal Locking - Determining the length of the screw

- Pull back 4.3mm Drill Bit and Distal Drill Sleeve. Sent the depth gauge Dia 3.2 x 400 into the distal outer sleeve. Hook on the end of the depth gauge should catch the second cortex's outer body. Then you can read the screw length from the ruler on the depth gauge.
- Pull back the depth gauge.



22. Distal Locking - Inserting the Screw

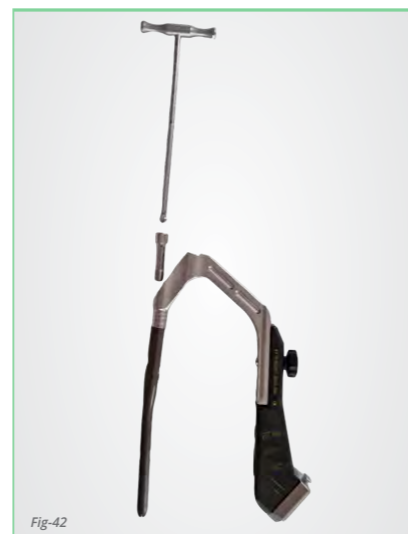
- Take the measured screw and the 5mm Hex Driver from the Sterilization container. Mate the Hex Driver and selected screw.
- Insert the screw / driver assembly through the distal outer sleeve until it touches the bone.
- Rotate the driver to thread up the screw until its head seats against the later cortex. Do not over tighten the screw as it may lead to screw stripping.
- Remove the 5mm Hex Driver and Distal Outer Sleeve.



23. Removing the Targeting Assembly

INSTRUMENTS:

- ✓ 7 mm Hex Driver (N05-0130)
- Mate the 7 mm Hex Driver with the Handle-Nail Connector Screw that is connecting the Guide Handle to the nail (Fig-39).
- Disengage the screw from the nail and remove the targeting assembly.



24. Inserting Nail End Cap

INSTRUMENTS:

- ✓ 5 mm Hex Driver (N05-0340)
- ✓ 5 mm Hex Driver Connector Screw (N05-0350)
- Mate the 5 mm Flexible Hex Driver to the nail end cap.
- Pass the end cap through the incision and mate with the proximal end of the nail, rotating clockwise with the driver until it is fully threaded (Fig-43).
- Rotate the connector screw counterclockwise to disengage the driver from the end cap.



Nail Removal

1. Removing Nail End Cap and Disengaging the Set Screw

INSTRUMENTS:

✓ 5 mm Hex Driver (N05-0340)

✓ 5 mm Hex Driver Connector Screw (N05-0350)

- Insert the 5 mm Hex Driver Connector screw into the 5 mm Hex Driver and mate the driver to the nail end cap. Rotate the connector screw clockwise to secure the end cap to the driver. Turn the driver counterclockwise until the end cap is fully released (Fig-47).
- Remove end cap from the nail.
- Insert the 5 mm Hex Driver into the nail and mate it with the integrated set screw (Fig-48). Turn counterclockwise to release the lag screw.
- Instead of using 5mm Hex Driver and 5mm Hex Driver Connector Screw, 5mm Flexible Driver can be used as option.



2. Removing the Lag Compression Screw

- Send the 5mm Hex Driver and 5mm Hex Driver Connector Screw into the compression screw. Secure it with turning the connector screw clockwise. By rotating the 5mm Hex Driver counter clockwise, remove the compression screw.



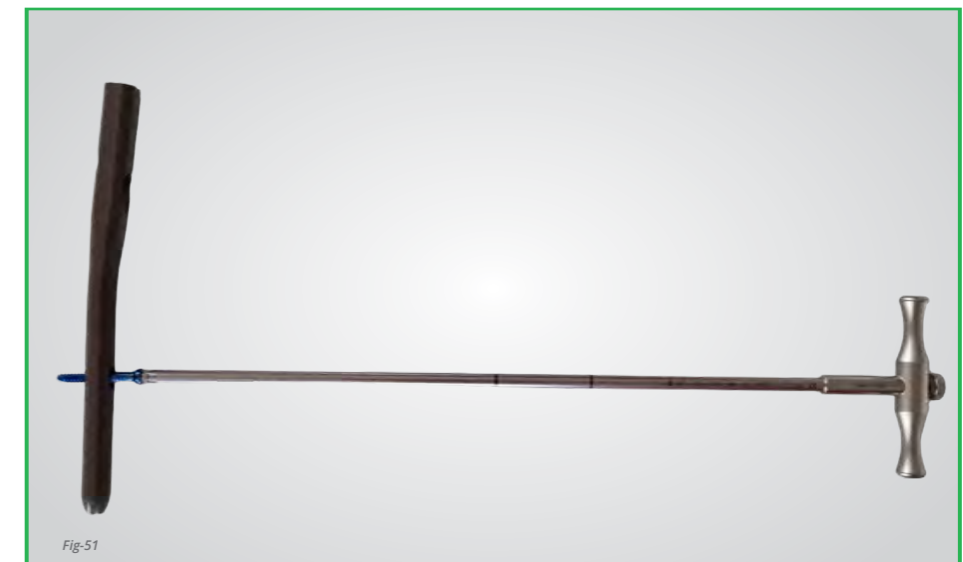
3. Removing the Lag Screw

- Send the NTAN Lag T driver and NTAN Lag Screw Holder into the Sliding Lag Screw. Screw it with turning the lag screw holder clockwise. By rotating the Lag T Driver counter clockwise remove the sliding lag screw.



4. Removing the Distal Locking Screw

- Send the 5mm Hex Driver and 5mm Hex Driver Connector Screw into the distal locking screw. secure it with turning the connector screw clockwise. By rotating the 5mm Hex Driver counter clockwise, remove the distal locking screw.



5. Removing the Nail

INSTRUMENTS:

✓ *NTAN Nail Extractor Rod (N05-0150)*

✓ *Slide Hammer (N05-0140)*

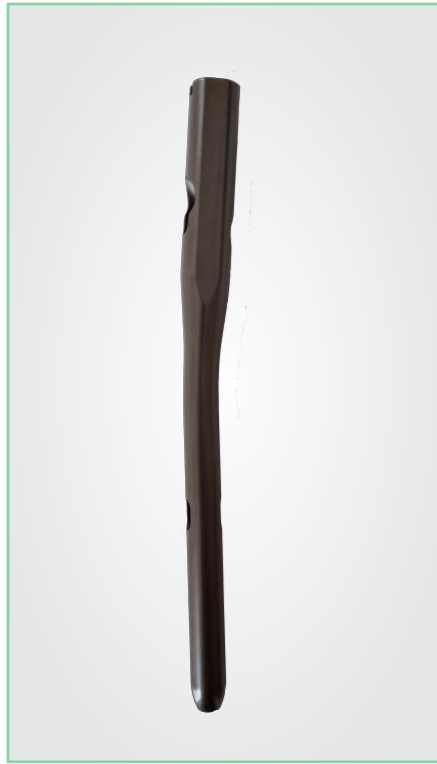
✓ *NTAN Impactor (N05-0140)*

- Nail extractor connector can be directly attached to the nail or Impactor connector can be attached between the nail and nail extractor rod. Upon the patient's position, it is at surgeon's discretion.
- With the help of the Sliding Hammer, remove the nail from the Femur.



NOTES

Catalogue Information



NTAN Proximal Femoral Nail, Short

Angle	Length (mm)	Catalogue Code
130°	180	NTAN-130-180
130°	200	NTAN-130-200
130°	220	NTAN-130-220



Cortical Locking Screw

Length (mm)	Catalogue Code
30	NTAN-005-030
35	NTAN-005-035
40	NTAN-005-040
45	NTAN-005-045
50	NTAN-005-050
55	NTAN-005-055
60	NTAN-005-060



Nail End Caps

Extension (mm)	Catalogue Code
0 (flush)	NTAN-155-000



Lag Screws

Extension (mm)	Catalogue Code
70	DCLS-011-070
75	DCLS-011-075
80	DCLS-011-080
85	DCLS-011-085
90	DCLS-011-090
95	DCLS-011-095
100	DCLS-011-100
105	DCLS-011-105
110	DCLS-011-110
115	DCLS-011-115
120	DCLS-011-120



Lag Compression Screws

Extension (mm)	Catalogue Code
65	DCLS-011-065
70	DCLS-011-070
75	DCLS-011-075
80	DCLS-011-080
85	DCLS-011-085
90	DCLS-011-090
95	DCLS-011-095
100	DCLS-011-100
105	DCLS-011-105
110	DCLS-011-110
115	DCLS-011-115

Note

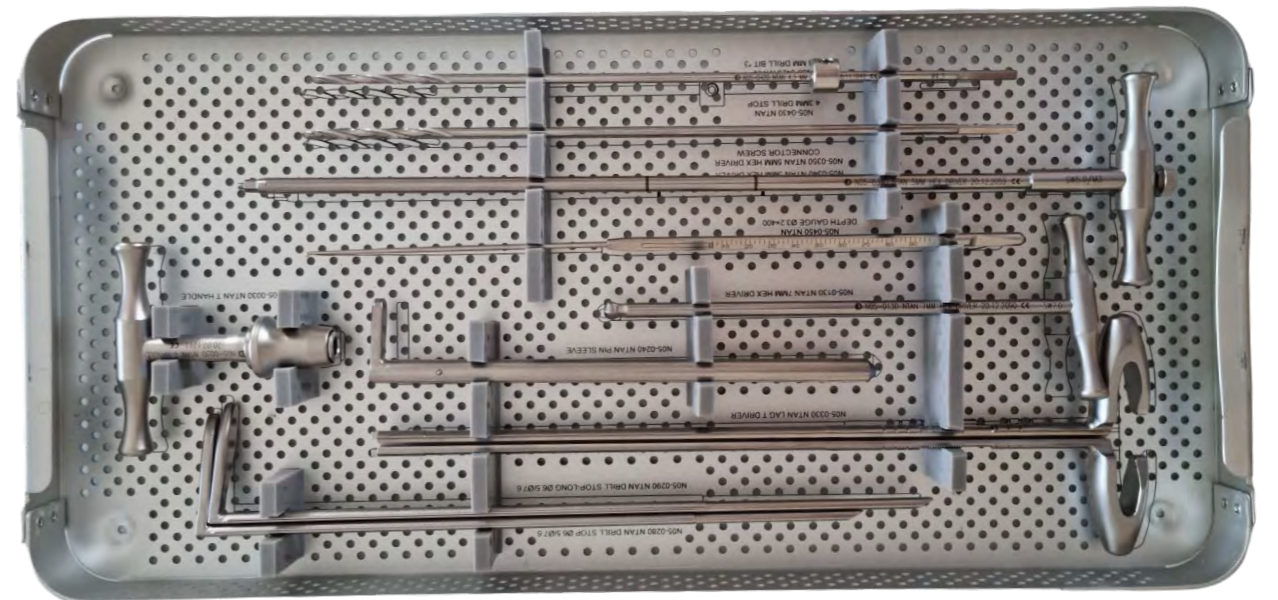
✓ The pictures of the implants shown in this section are not to scale.

Ntan Tool Set

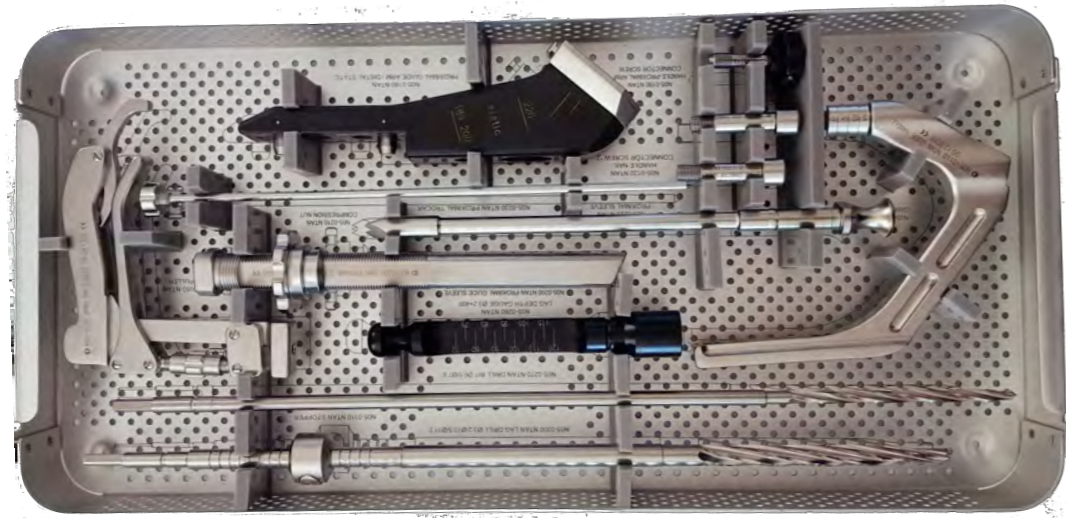
- Ntaan Tray 1
- Ntan Tray 2
- Ntan Tray 3
- Ntan Tray 4



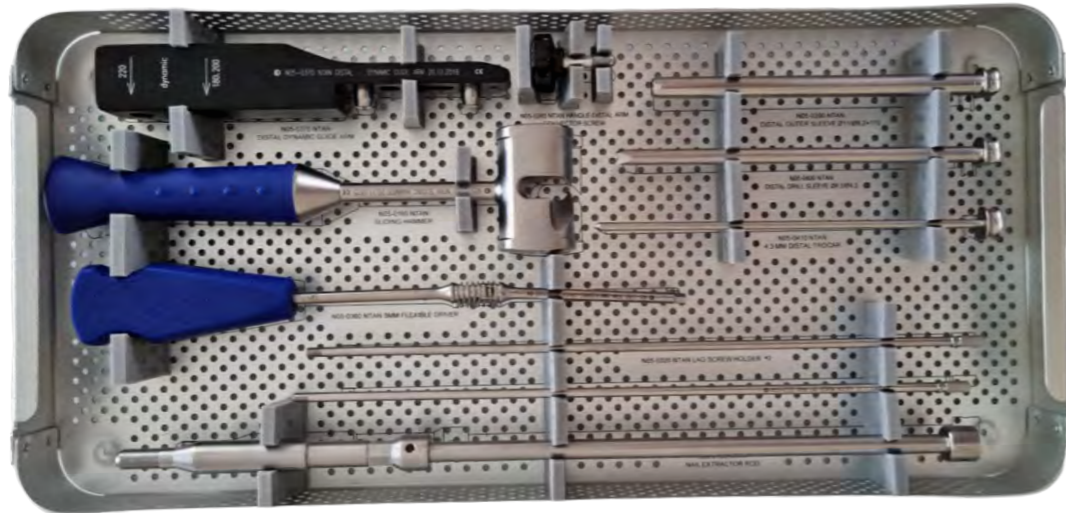
Ntan Tray 1



Ntan Tray 2



Ntan Tray 3



Ntan Tray 4

NOTES

