Neon Proximal Femoral Nail

Surgical Technique

Dunitech

get better

Special thanks to
Contributing Surgeons,

Yalkın ÇAMURCU, MD,
Department of Orthopedics and Traumatology
Medical Faculty of Erzincan University
Erzincan, Turkey

Mehmet Cenk Cankuş, MD, FEBOT
Department of Orthopedics and Traumatology
Medical Faculty of Sanko University
Gaziantep, Turkey

Dunitech
get better

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*

TABLE OF CONTENTS

Neon Proximal Femoral Nail

Claw Technology

Dunitech leads innovational systems and aims to supply options for the surgeons to excel at their expertise. Claws are a novelty solution on distal locking systems designed to support the orthopedic trauma community.

Claws are titanium pins that act as anchors to provide a stable fixation, as well as other superior operative parameters.

- *Claws are made from titanium and mechanically deploy from within the nail.*
- *Claws penetrate through the cancellous bone and anchor in the cortical bone.*

We focus on operative parameters that are vital for the success of the fracture treatment.

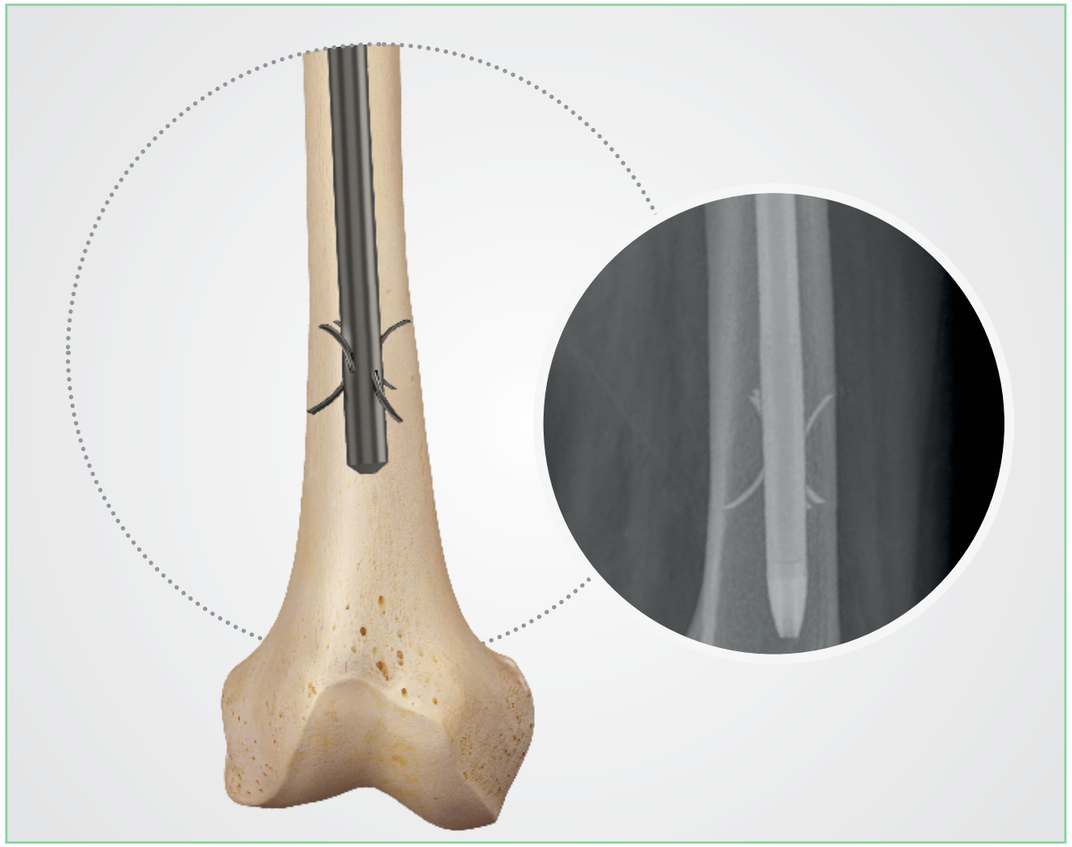
Dunitech's innovative devices allow healthcare professionals to reduce surgical time as well as the risk of pre- and postoperative complications.

By eliminating the distal incisions, the Claws significantly reduce radiation exposure and blood loss.

- ***Increased stability***
- ***Shorter operative time***
- ***Lower radiation exposure***
- ***Fewer incisions***
- ***Easy revision***
- ***No free-hand locking***
- ***Less bone removal***

Get Better Stability!

Six retractable Claws are designed to penetrate the cortex and provide exceptional axial and rotational stability.



Less Radiation Exposure

Claws significantly reduce the radiation exposure of the team in the operating room by avoiding the need of targeting the distal hole, reaming and inserting a screw for distal locking.[1, 2]

Fewer Incisions

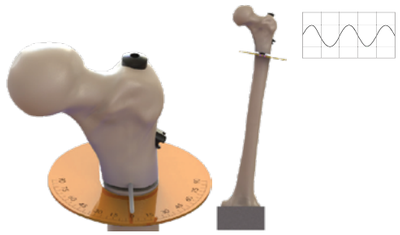
The nail is anchored by the Claws deployed from within the medullary canal. By avoiding extra incision, there will be fewer surgical scars, lower blood loss and shorter operative time while lowering the risk of infection.[2]

1. Çamurcu Y, Sofu H, Issın A, Koçkara N, Genç E, Çetinkaya M. Is talon tibial intramedullary nailing clinically superior compared to conventional locked nailing? Eklem Hastalik Cerrahisi. 2017 Dec;28(3):152-7.
2. Zehir S, Şahin E, Zehir R. Comparison of clinical outcomes with three different intramedullary nailing devices in the treatment of unstable trochanteric fractures. Ulus Travma Acil Cerrahi Derg 2015, Vol. 21, No. 6.

Claws are
reliably retractable!

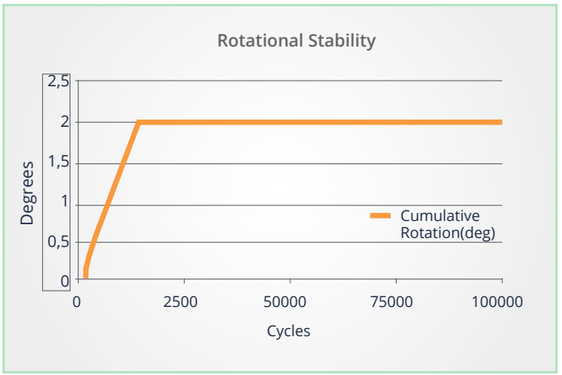
All Claws were **successfully retracted** after every test.

Conventional systems are subjected to screw breakage, screw headwear and drill bit breakage that may prevent the nail to be removed. Dunitech Claws are deployed within the nails from precise holes in a tight fit, preventing empty spaces for bone ingrowth.



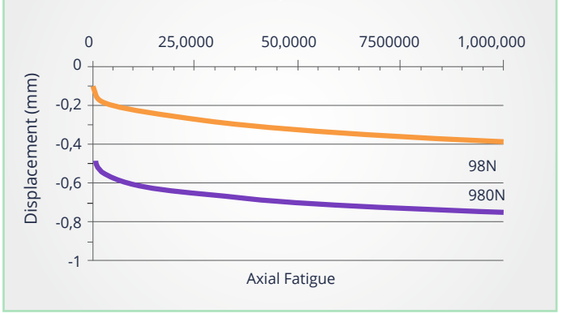
Rotational Stability

In unstable subtrochanteric fractures Claws provide superior rotational stability. After 10,000 cycles, the nail settled in and remained fixed until 100,000 cycles.



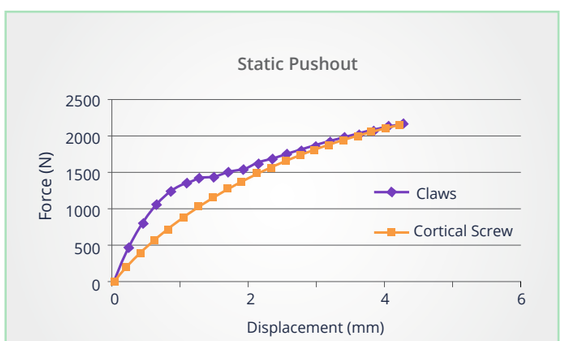
Claw's Axial Fatigue Strength

The average displacement observed at 1 million cycles was 0.74 mm.

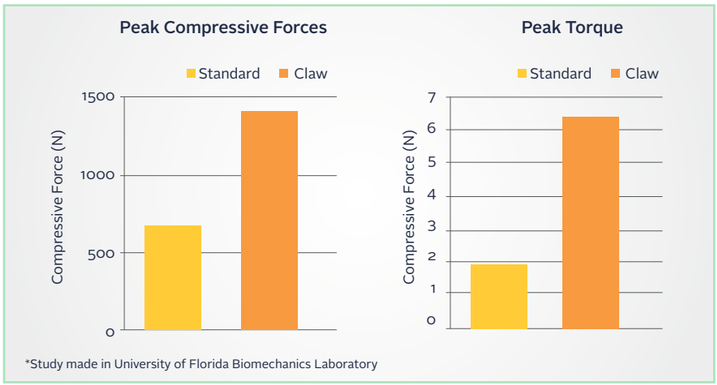


Claw's Axial Static Strength

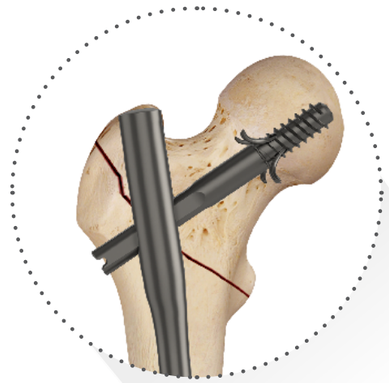
Claws resist to a higher force for a given displacement, compared to conventional stainless steel screws.



Four retractable Claws anchor the lag screw into the dense cortical bone of the femoral head-neck junction for superior control.



*Study made in University of Florida Biomechanics Laboratory



Rotational Stability

When deployed, the Claws' span is more than twice the diameter of the lag screw alone. The engagement of the Claws within the cortical bone at the junction between femoral head and neck leads to a three-time increase in the rotational resistance when compared to conventional screws.[1]

Lag Screw Cut-out

Neon's lag screw is equipped with Claw technology. The Claws anchor the Lag Screw into the cortical bone granting a stronger fixation, preventing relative movement and reducing the risk of cut-out.[2]

Compression

Due to the increased purchase into the cortical bone, the lag screws present two times more compression forces than conventional screws.[1]

1. Bramlet D, Wheeler D. Biomechanical evaluation of a new type of hip compression screw with retractable Claws. J Orthop Trauma 2003, 17:618–624.
2. 2. Zehir S, Şahin E, Zehir R. Comparison of clinical outcomes with three different intramedullary nailing devices in the treatment of unstable trochanteric fractures. Ulus Travma Acil Cerrahi Derg 2015, Vol. 21, No. 6.

Neon Proximal Femoral Nail Specifications

NEON KEY FIGURES

- **Proximal Diameter:** 15.5 mm
- **Distal Diameter:** 11 mm
- **Distal Claws Maximum Span:** 38 mm
- **Medial-Lateral Angle:** 4˚
- **End Cap Length:** 0 mm, 5 mm and 10 mm
- **Fully Cannulated Body:** Compatible with guide wire
- **Lag Screw Locking System:** Set Screw integrated into the nail. Designed for fixed or sliding configuration while preventing rotation.
- **Lag Screw Angle:** 120˚, 125˚ and 130˚
- **Material:** Titanium alloy with anodized type II surface treatment.

NEON SHORT FIGURES

- **Length:** 220 mm

NEON LONG FIGURES

- **Length:** 300 mm to 420 mm in 20 mm increments
- **Anteversion:** 10˚
- **Curvature Radius:** 2 m

LAG SCREW'S KEY FIGURES

- **Length**: 70 mm to 120 mm in 5 mm
- **Thread Diameter**: 11 mm
- **Compression Range**: 15 mm
- **Claw Lag Screw Maximum span**: 28 mm to anchor the Lag Screw in the cortical bone.
- **End cap**: Flush

Neon Proximal Femoral Nail Indications

INDICATIONS

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

PRECAUTIONS

Neon 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

- Fractures of the distal third
- 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

Surgical Technique

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.

Fig-1

Fig-2

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 4 degrees lateral to the tip of the greater trochanter (Fig-4).

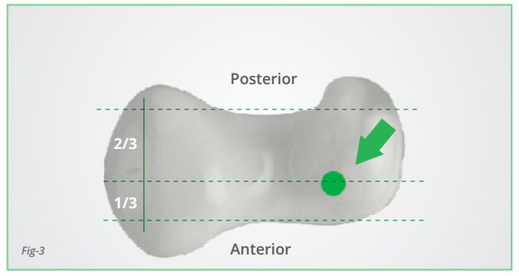


Fig-3

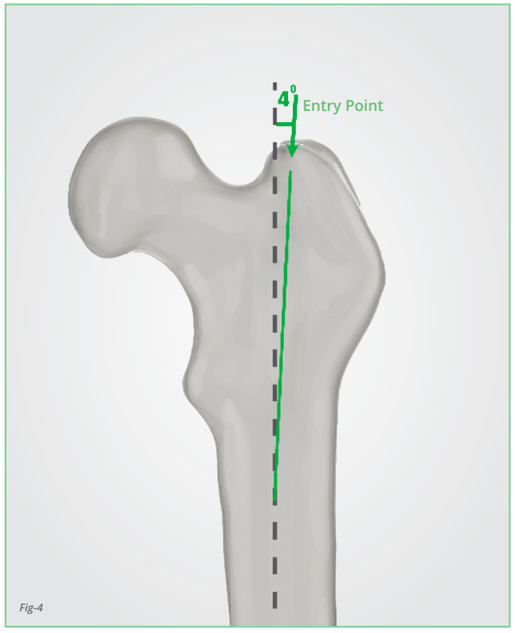
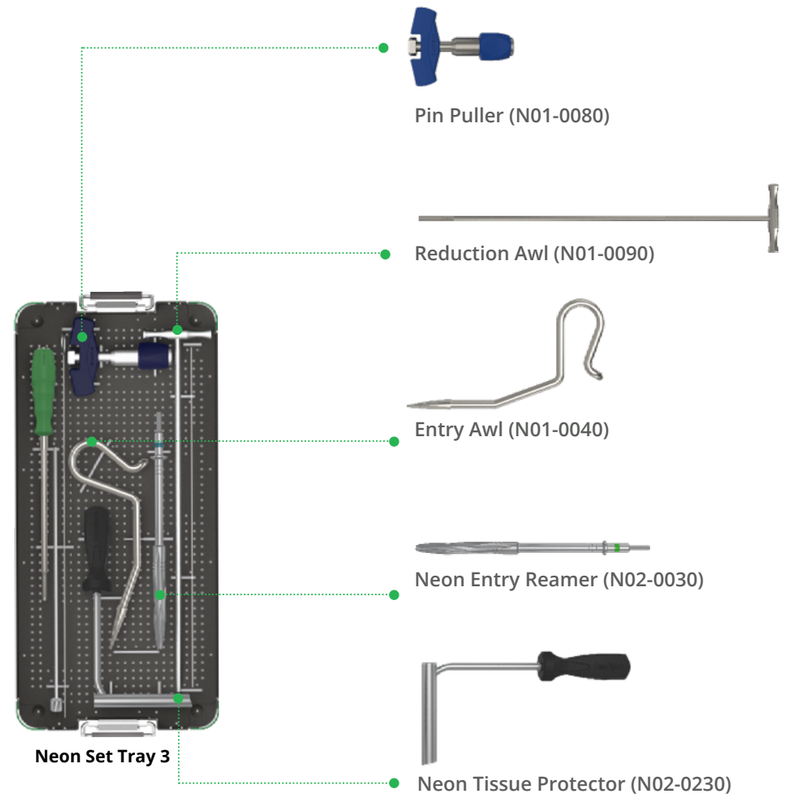


Fig-4

INSTRUMENTS FOR ACCESSING THE CANAL AND PROXIMAL REAMING



Trocar Tip Guide Wire 3 mm x 600 mm (N01-0250)

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

3 mm Guide Wire Sheath (N01-0280)

3. Accessing the Canal

Option 1: Trocar Tip Guide Wire

INSTRUMENTS:

- ✔ *Trocar Tip Guide Wire 3 mm x 600 mm (N01-0250)*

- Advance the 3 mm Trocar Tip Guide Wire 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.

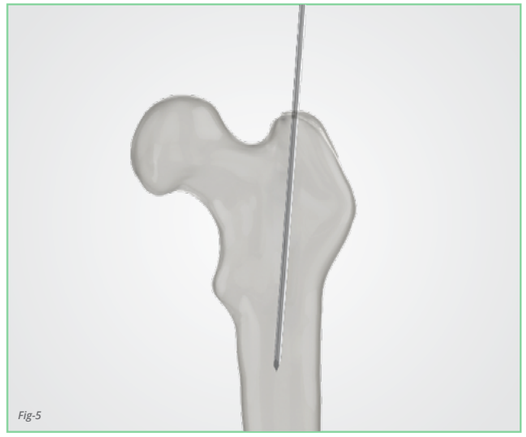


Fig-5

Option 2: Entry Awl and Trocar Tip Guide Wire

INSTRUMENTS:

- ✔ *Entry Awl (N01-0040)*
- ✔ *Trocar Tip Guide Wire 3 mm x 600 mm (N01-0250)*

- 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.

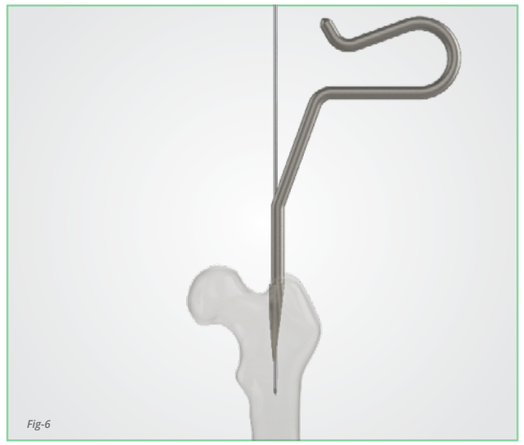


Fig-6

4. Proximal Reaming

INSTRUMENTS:

- ✔ *Neon Tissue Protector (N02-0230)*
- ✔ *Neon Entry Reamer (N02-0030)*
- ✔ *Ball Tip Guide Wire 3 mm x 900 mm (N01-0270)*
- ✔ *3 mm Guide Wire Sheath (N01-0280)*
- ✔ *Pin Puller (N01-0080)*
- ✔ *Reduction Awl (N01-0090) - Optional*

- Insert the Neon Tissue Protector through the incision and down to the bone. Secure the Neon Entry Reamer to a powered driver. Pass over the wire and through the Neon Tissue Protector. Ream the proximal femur to the desired depth.
- The reaming depth can be read radiographically as the grooves on the cutter head pass into the greater trochanter. Optionally, the grooves on the shank can be read as they pass on the proximal end of the Neon Tissue Protector. The grooves correspond to the three End Cap sizes – flush, 5 mm and 10 mm (Fig-7 and Fig-8). It is recommended to ream at least until the first groove.
- Exchange the 3 mm Trocar Tip Guide Wire to the Ball Tip Guide Wire and 3 mm Guide Wire Sheath. 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. If necessary use the Reduction Awl to assist with the fracture reduction or guide wire change.

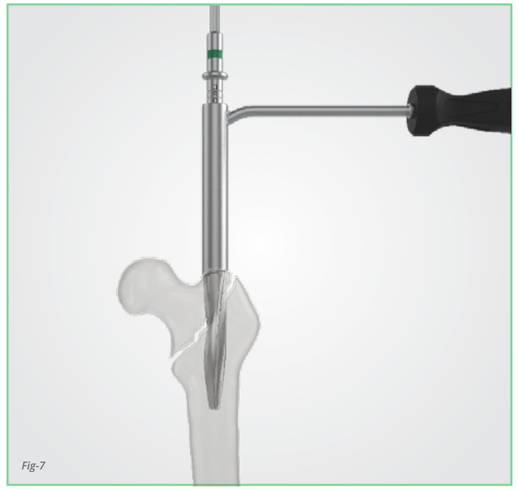
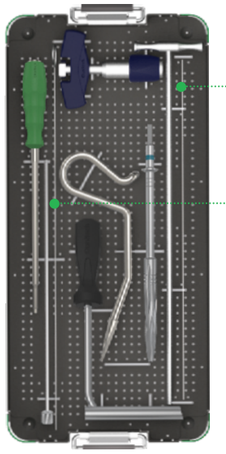


Fig-7

Fig-8

Fig-9

INSTRUMENTS FOR DETERMINING NAIL LENGTH AND DISTAL REAMING



Neon Set Tray 3

Neon Radiographic Claw Template (N02-0080)

Guide Wire Pusher (N01-0060)

Modular Flexible Reamer Shaft (N01-0240)

Modular Reamer Cutter Head (N01-0XX0)

5. Determining the Nail Length

INSTRUMENTS:

- ✔ *Neon Radiographic Claw Template (N02-0080)*

- Confirm that the fracture is well reduced and place the Neon Radiographic Claw Template over the thigh. The template shows approximately the full opening of the Claws which is 38 mm across when fully deployed.
- Position the image intensifier in AP view over the distal femur to assist with the template placement. The four Claws of the template should be just above the metaphyseal flare and touching the cortical bone (Fig-10b). This will help select the longest recommended nail and ensure that the Claws, when deployed, will anchor the nail correctly.
- Move the image intensifier to the proximal femur. Read the measurement radiographically at the tip of the greater trochanter (Fig-10a).

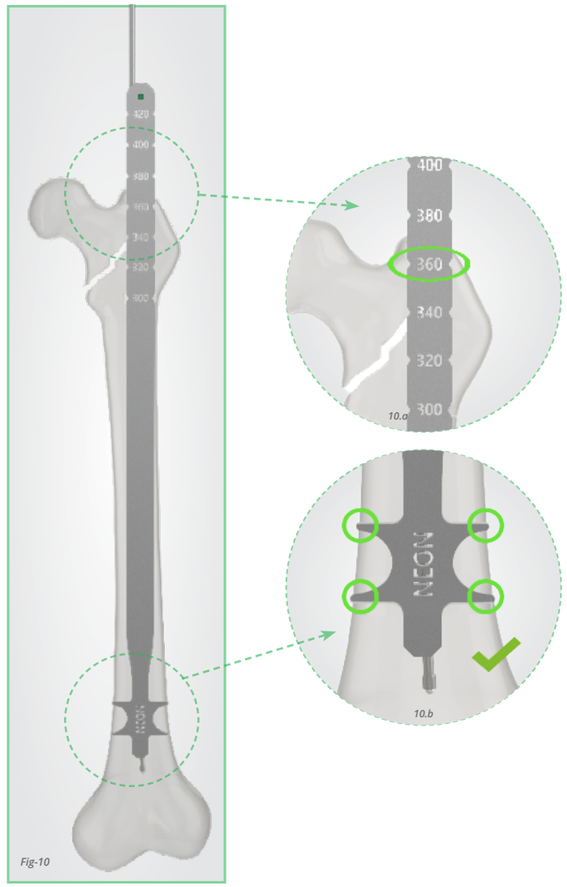


Fig-10

6. Distal Reaming

INSTRUMENTS:

- ✔ *Dunitech Intramedullary Reamer Set (INST-01-002)*
- ✔ *Guide Wire Pusher (N01-0060)*

- Confirm that the fracture reduction has been maintained. Starting from 8.5 mm Reamer Cutter Head, ream until the desired depth with steady pressure (Fig-11). By each pass, increase the diameter of the Reamer Cutter Head in 0.5 mm increments. Use the Guide Wire Pusher to keep the guide wire in place. If the sheath comes out with the reamer, insert it back before starting the next pass.
- The canal should be reamed to at least 12 mm, 1 mm above the nail diameter. To prevent accumulation of debris in the medullary canal, retract the reamer when necessary.
- After distal reaming, remove the 3 mm Guide Wire Sheath (Fig-12). The Sheath won't pass through the nail. If needed, use the Guide Wire Pusher to keep the Ball Tip Guide Wire in place.

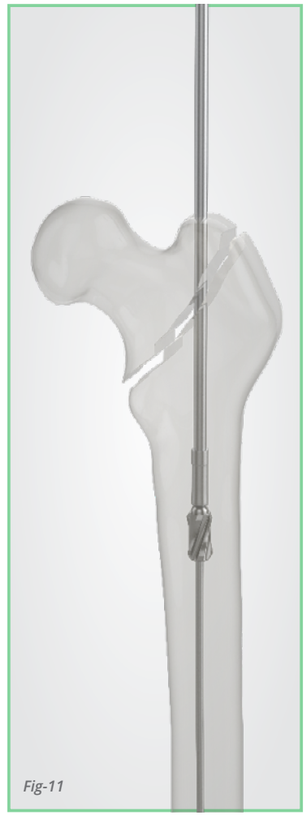
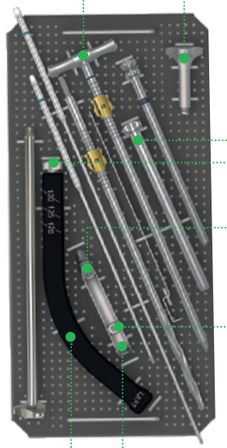


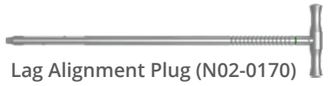
Fig-11

Fig-12

INSTRUMENTS FOR TARGET GUIDE ASSEMBLY AND NAIL INSERTION



Neon Set Tray 1



Lag Alignment Plug (N02-0170)

Impactor (N01-0070)

Lag Guide Sleeve (N02-0190)

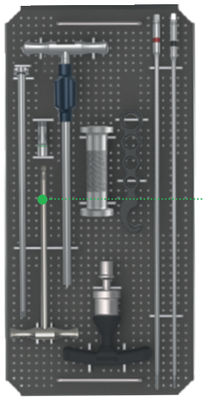
Guide Arm Lock (N02-0180)

Handle-Nail Connector Screw (N02-0070)

Handle-Arm Connector Screw (N02-0200)

Guide Handle (N02-0060)

Guide Arm (N02-0050)



Neon Set Tray 2

7 mm Hex Driver (N01-0030)

7. Assembling the Target Guide

INSTRUMENTS:

- ***Guide Arm (N02-0050)***
- ***Guide Handle (N02-0060)***
- ***Handle-Arm Connector Screw (N02-0200)***
- ***7 mm Hex Driver (N01-0030)***
- ***Guide Arm Lock (N02-0180)***

- 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.
- Insert the Guide Arm Lock into the bottom of the Guide Arm and engage the screw. Do not tighten at this moment.

Fig-13

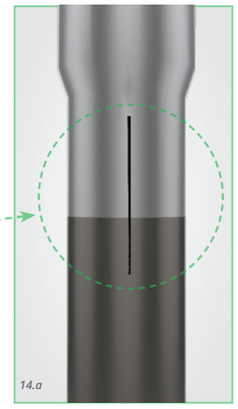
8. Attaching the Nail

INSTRUMENTS:

- ***Handle-Nail Connector Screw (N02-0070)***
- ***7 mm Hex Driver (N01-0030)***
- ***Lag Guide Sleeve (N02-0190)***
- ***Lag Alignment Plug (N02-0170)***

- 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 Guide Sleeve in the targeting hole corresponding to the nail in the Guide Arm. Advance until it contacts the nail and secures into place by tightening the Guide Arm Lock. 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 Alignment Plug through the nail. Retighten the connection between the nail and the handle.
- After confirming the alignment, loosen the Guide Arm Lock and remove the Lag Guide Sleeve and Lag Alignment Plug.

Fig-14



14.a

Fig-15

9. Inserting the Nail

INSTRUMENTS:

- ✔ *Impactor (N01-0070)*

Note:

- ✔ If the Guide Wire Sheath has not been removed, it has to be removed in before the insertion of the nail (Fig-12).
- ✔ 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 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).

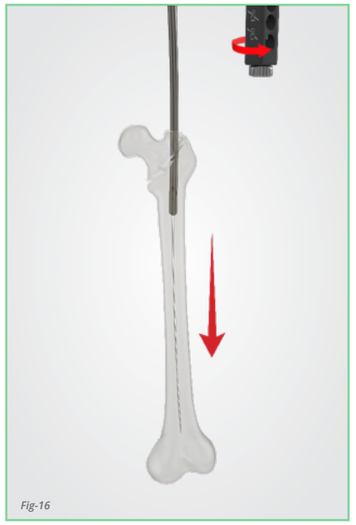


Fig-16

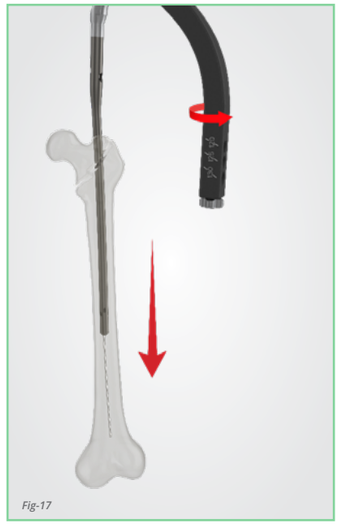


Fig-17

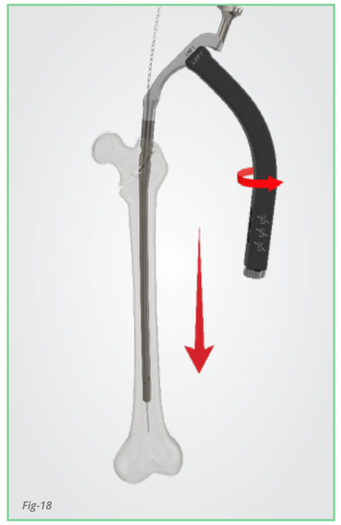


Fig-18

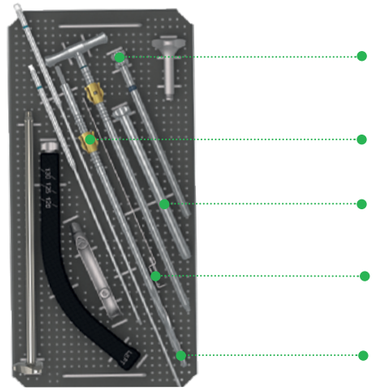
- If needed, the Impactor can be used for light hammer blows. If considerable resistance is encountered, do not use strong hammer strikes. It may cause loss of reduction or perioperative fracture. Instead, remove the nail, replace the sheath and further enlarge the medullary canal.

Note

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

- Once the nail is in its final position, remove the guide wire.

INSTRUMENTS FOR DRILLING FOR LAG SCREW



Neon Set Tray 1

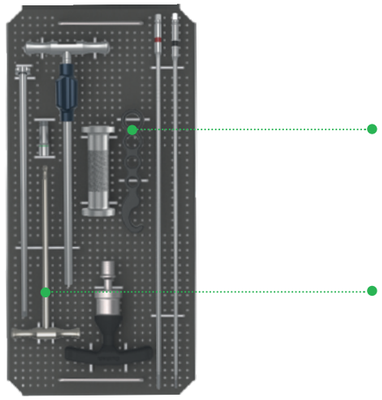
Lag Guide Pin Obturator (N02-0160)

Lag Drill Stop (N02-0120)

Lag Guide Sleeve (N02-0190)

Lag Screw Guide Pin Ruler (N02-0140)

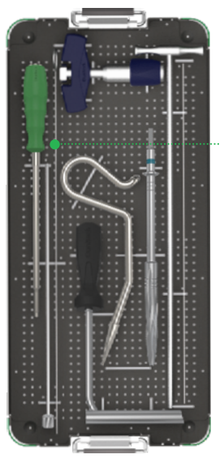
Lag Drill (N02-0130)



Neon Set Tray 2

Knob Wrench (N02-0150)

7 mm Hex Driver (N01-0030)



Neon Set Tray 3

Guide Wire Pusher (N01-0060)

Lag Guide Pin (N01-0260)

10. Preparing for Guide Pin Placement

INSTRUMENTS:

- ✔ *Lag Guide Sleeve (N02-0190)*
- ✔ *Lag Guide Pin Obturator (N02-0160)*
- ✔ *Knob Wrench (N02-0150)*
- ✔ *7 mm Hex Driver (N01-0030) – Optional*

- 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 slightly inferior 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 Lag Guide Pin Obturator through the Lag 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 obturator is touching the femoral cortex as demonstrated on Fig-19. Tighten the Guide Arm Lock with the help of the Knob Wrench or 7 mm Hex Driver (Fig-20).

Fig-19

Fig-20

Note

✔ The passage of the Lag Guide Sleeve may be obstructed by the Guide Arm Lock depending on how much its screw has been engaged into the Guide Arm.

✔ In those cases, ensure that the Guide Arm Lock is set flush with or slightly protruding from the Guide Arm as you can see on sectioned view on Fig-21.

Fig-21

11. Placing the Guide Pin

INSTRUMENTS:

- ✔ *Lag Guide Pin (N01-0260)*

- 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 Lag Guide Pin through the Lag Guide Pin Obturator 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 slightly inferior of the center of in the AP view. This position will allow the lag claws to anchor correctly.

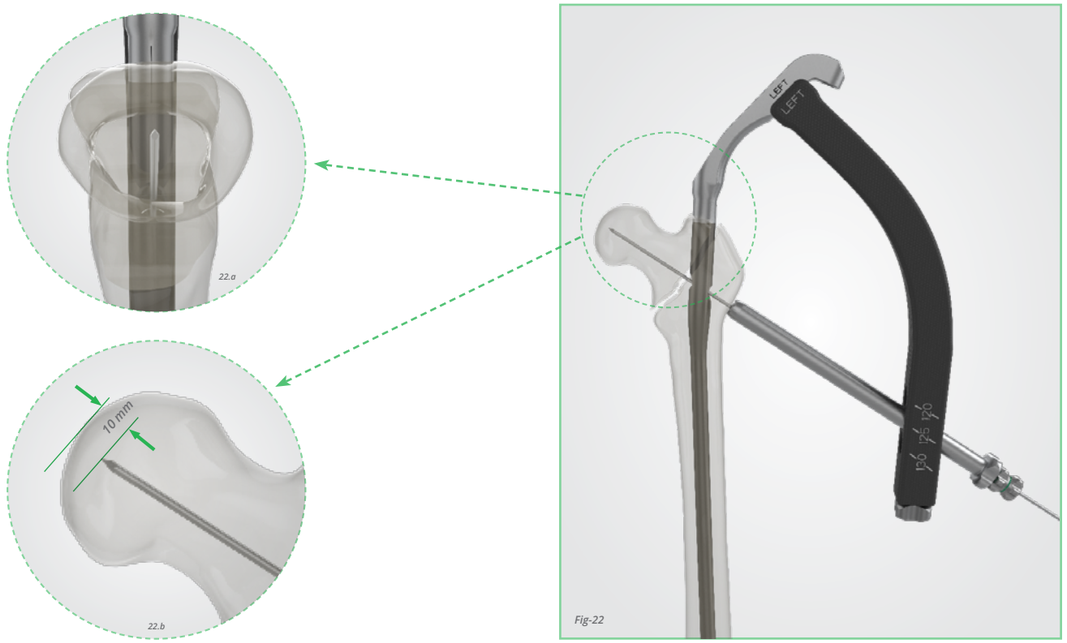


Fig-22

Note

✔ The correct Lag Guide Pin placement is very important because it will determine the final position of the lag screw and assist in choosing the drilling depth and lag screw size.

✔ Reposition the Lag Guide Pin if necessary.

12. Measure the Guide Pin Depth

INSTRUMENTS:

- ✔ *Lag Screw Guide Pin Ruler (N02-0140)*

- Move the Lag Guide Pin Obturator slightly out of the sleeve and fit the foot of the Lag Screw Guide Pin Ruler tightly between the sleeve and obturator (Fig-23).
- Read the depth of the guide pin (approximately 100 mm in this illustration).

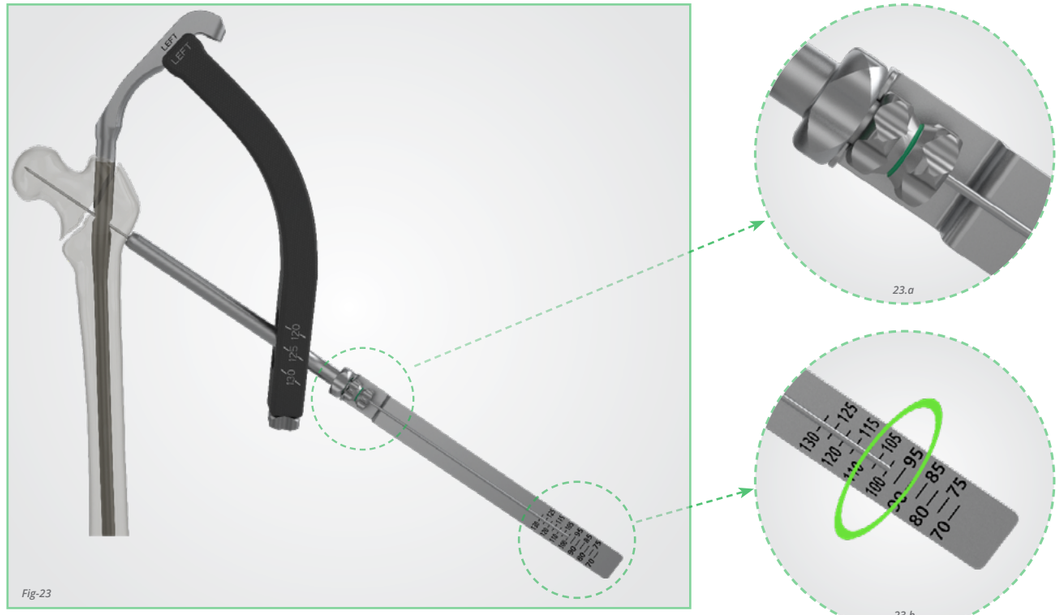


Fig-23

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 (N02-0130)*
- ✔ *Lag Drill Stop (N02-0120)*
- ✔ *Guide Wire Pusher (N01-0060)*

- Remove the Lag Pin Obturator and confirm that the Guide Arm Lock is tightly secured.
- Set the Lag Drill Stop to the desired depth on the Lag Drill (Fig-24). 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 Lag Guide Pin and insert it into the Lag 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 Lag Guide Sleeve. At the discretion of the surgeon, the drilling can stop before reaching the preset depth.
- Use the Guide Wire Pusher to keep the Lag Guide Pin in position while removing the Lag Drill.

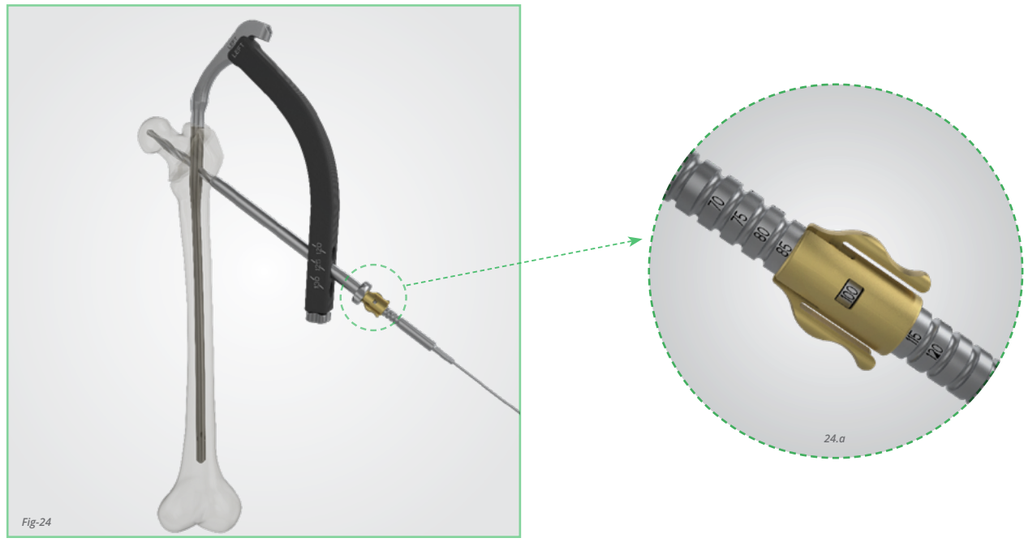
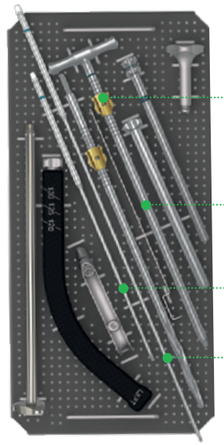


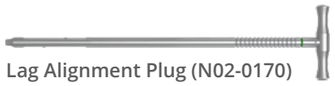
Fig-24

INSTRUMENTS FOR NAIL CLAWS DEPLOYMENT



Neon Set Tray 1

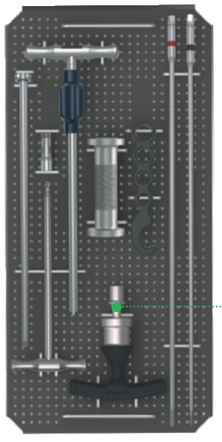
Lag Drill Stop (N02-0120)



Lag Alignment Plug (N02-0170)

Distal Claw Deployment Driver – Short (N02-0210), for Neon Short Nails

Distal Claw Deployment Driver – Long (N02-0220), For Neon Long Nails



Neon Set Tray 2

Torque Limiting Handle (N01-0170)

14. Placing the Lag Alignment Plug

INSTRUMENTS:

- ✔ *Lag Alignment Plug (N02-0170)*
- ✔ *Lag Drill Stop (N02-0120)*

- Set the Lag Drill Stop to the actual drilling depth on the Lag Alignment Plug. Pass the plug over the Lag Guide Pin and into the Lag Guide Sleeve until the stop contacts the sleeve.
- Align the handle of the Lag Alignment Plug so it is parallel to the Guide Arm (Fig-25). This will ensure the Distal Claw Deployment Driver will pass through the plug's slots.

Fig-25

25.a

25.b

Note

✔ The Lag Alignment Plug will prevent the nail from rotating while the Claws are deployed.

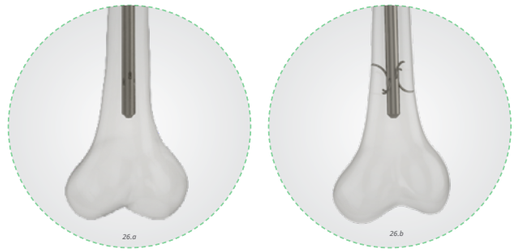
15. Deploying Nail Claws

INSTRUMENTS:

- ✔ *Distal Claw Deployment Driver – Short (N02-0210), for Neon Short Nails*
- ✔ *Distal Claw Deployment Driver – Long (N02-0220), for Neon Long Nails*
- ✔ *Torque Limiting Handle (N01-0170)*
- Remove the Lag Guide Pin to allow for the driver to pass.
- Attach the appropriate Distal Claw Deployment Driver to the Torque Limiting Handle. Insert the driver down the nail until it engages the distal Claw mechanism (Fig-26).
- Rotate the handle clockwise to deploy the Claws. A steady low torque should be felt before the cortical bone is reached. An increase in torque will indicate that the Claws started penetrating the cortex. During this stage, monitor under image intensifier positioned for a lateral view to prevent excessive cortical penetration.
- Full deployment of the Claw system is reached after 18 full turns of the handle. The amount of turns needed will depend on patient anatomy and nail placement. Stop deploying when full cortical anchoring is reached or when the Torque Limiting Handle trips to prevent excessive perforation through the cortical bone and into the soft tissue.

Fig-26

Before Deployment



26.a *26.b*

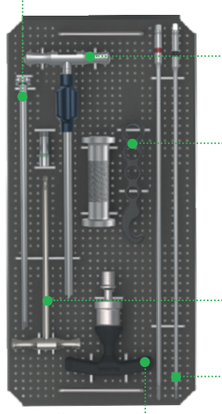
After Deployment

Note

- ✔ The Claws cannot be deployed using a powered driver. It may lead to excessive penetration and/or system failure due to over torque.
- ✔ Always use the Torque Limiting Handle.

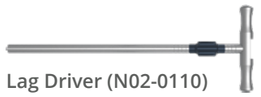
- Reinsert the Lag Guide Pin and remove the Lag Alignment Plug.

INSTRUMENTS FOR INSERTING THE LAG SCREW AND DEPLOYING LAG SCREW CLAWS



Neon Set Tray 2

Lag Driver Connector Screw (N02-0100)



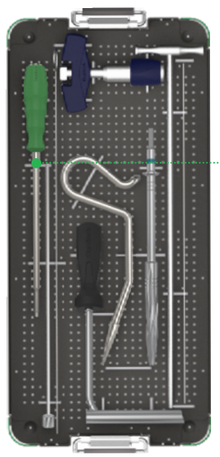
Lag Driver (N02-0110)

Knob Wrench (N02-0150)

7 mm Hex Driver (N01-0030)

Lag Claw Deployment Driver (N02-0020)

Torque Limiting Handle (N01-0170)



Neon Set Tray 3

5 mm Hex Driver (N01-0020)

16. Connecting Lag Screw and Lag Driver

INSTRUMENTS:

- ✔ *Lag Driver (N02-0110)*
- ✔ *Lag Driver Connector Screw (N02-0100)*
- ✔ *5 mm Hex Driver (N01-0020) – Optional*

- Choose the appropriate lag screw based on the measure of the Lag Guide 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 Driver Connector Screw into the Lag Driver. Mate the lag screw with the Lag Driver and secure by tightening the connector screw. If needed, use the 5 mm Hex Driver (Fig-27).

Fig-27

Fig-28

17. Setting the Lag Driver Compression Knob

- The function of the Lag Driver Compression Knob is to set the lag screw in its correct position in the femoral head and allow for compression across the fracture, if necessary.
- If no compression is expected, the lag screw's length will match the drilled depth. The Compression Knob will be set to '0'. After inserting the lag screw, if compression is still necessary, there is still 5 mm compression range (final knob position would rest in '-5').
- If compression is expected, a lag screw shorter than the drilled depth should be chosen to avoid excessive lateral protrusion. The knob should be set to the expected compression length. For example, if 95 mm was drilled and the expected compression is 5 mm, a 90 mm lag screw is chosen and the knob should be set to '5'.

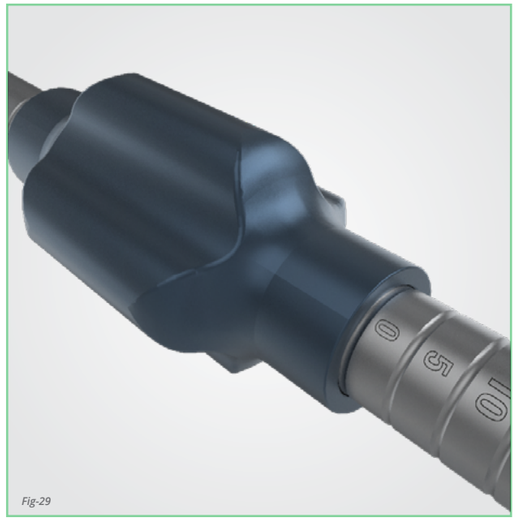


Fig-29

18. Inserting the Lag Screw

- Insert the lag screw and Lag Driver assembly over the Lag Guide Pin and into the Lag 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.
- The final position will be indicated by the contact between Lag Driver Compression Knob and the sleeve (Fig-30). The Lag Driver handle must be parallel to the Guide Arm (Fig-31) or perpendicular (Fig-32).
- Monitor the last few turns with an image intensifier.

Fig-30

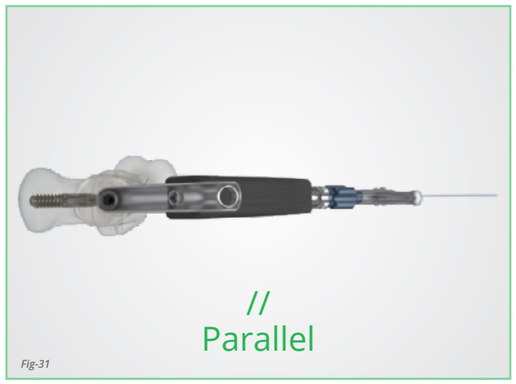


Fig-31

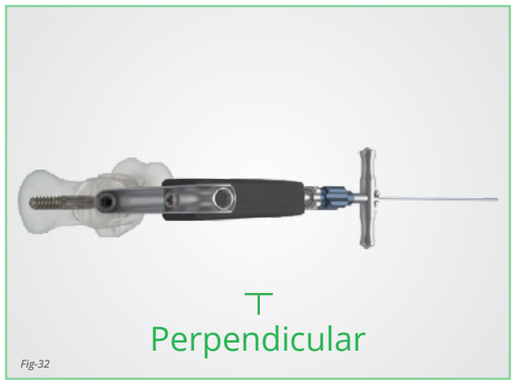


Fig-32

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.

19. Engaging the Set Screw

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*

- 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.

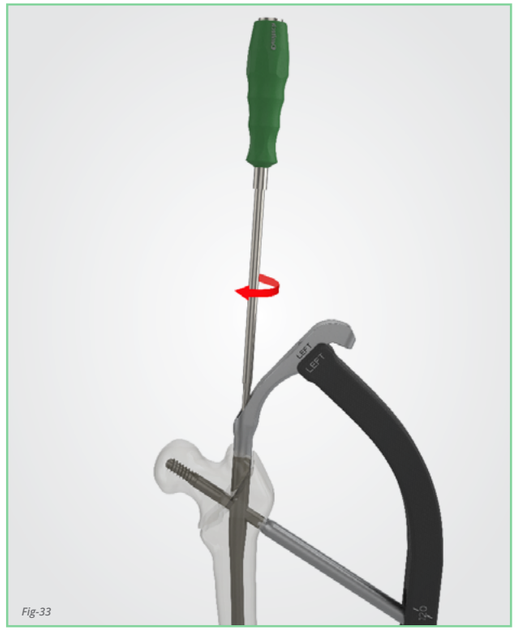


Fig-33

20. Deploying the Lag Screw Claws

INSTRUMENTS:

- ✔ *Lag Claw Deployment Driver (N02-0020)*
- ✔ *Torque Limiting Handle (N01-0170)*

- Attach the Lag Claw Deployment Driver to the Torque Limiting Handle and insert it through the Lag Driver Connector Screw until it engages the Lag Claw mechanism (Fig-34).
- Rotate it clockwise to deploy the Lag Claws. Deployment begins once resistance is felt. Full deployment of the Claw system is reached after 18 full turns of the handle. The amount of turns needed will depend on patient anatomy and lag screw placement. Monitor the deployment with the image intensifier.

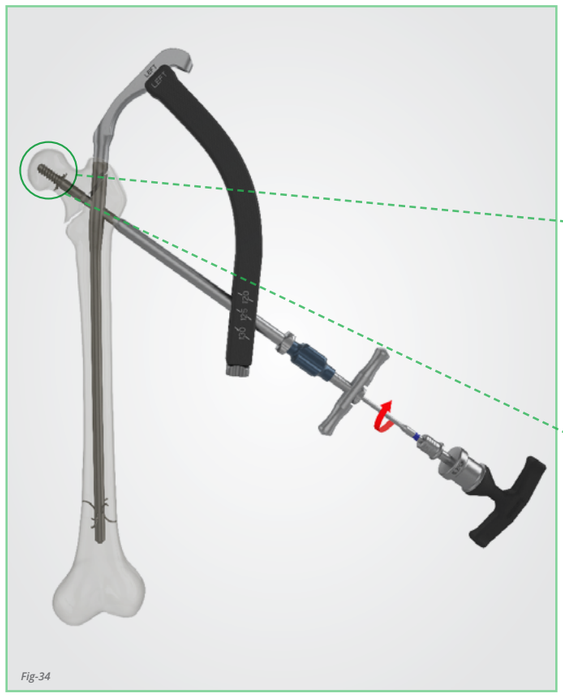
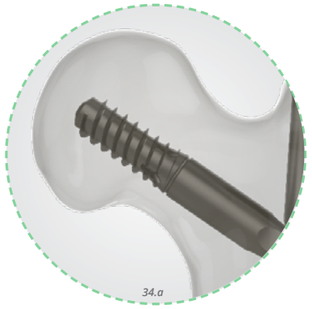


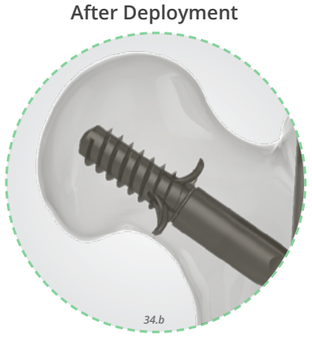
Fig-34

Before Deployment



34.a

After Deployment



34.b

Note:

- ✔ Stop deploying when the Torque Limiting Handle trips or when full cortical anchoring is reached to prevent excessive perforation through the cortical bone and into the soft tissue.
- ✔ The Claws are designed to penetrate the cortical bone in the junction of the femoral head and neck.

Note

- ✔ The Claws cannot be deployed using a powered driver. It may lead to excessive penetration and/or system failure due to over torque.
- ✔ Always use the Torque Limiting Handle.

21. Applying Compression - Optional

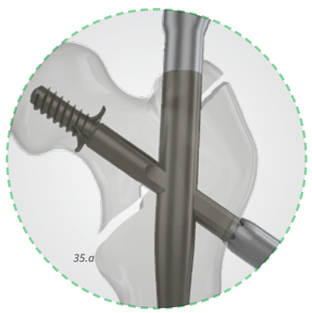
INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*
- ✔ *Knob Wrench (N02-0150)*

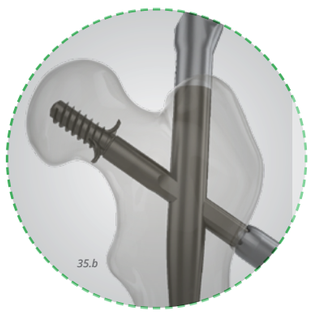
- Insert the 5 mm Hex Driver into the nail and rotate 1/4 turn counterclockwise to allow for the lag screw to slide (Fig-35).
- With the Knob Wrench, rotate the Lag Driver Compression Knob clockwise to pull back the lag screw (Fig-35). Monitor the compression with image intensifier. Over-compression may lead to Claws deformation.
- The available compression range will be the difference between the position where the knob was set and the '-5' position (e.g., if the knob was set to '+5', 10 mm of compression can be applied).

Fig-35

Before Compression


35.a

After Compression


35.b

22. Setting the Lag Screw

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*

The lag screw can be set to a fixed configuration (no rotation or sliding allowed), or sliding configuration (allowed to slide but not to rotate). The integrated Set Screw's configuration will determine the fixation type and it is at the discretion of the surgeon.

Option 1: Fixed Configuration

- This configuration will lock the lag screw completely, preventing it from sliding or rotating.
- Insert the 5 mm Hex Driver into the nail and rotate it clockwise until the Set Screw is fully tightened against the lag screw's flats (Fig-36).

Option 2: Sliding Configuration

- The lag screw's flats can be set to allow for sliding while preventing rotation. This means that any intraoperative compression that is applied can be maintained postoperatively and further compression can be applied as the patient bears weight.
- Insert the 5 mm Hex Driver into the nail and rotate clockwise until the set screw is fully tightened against the lag screw's flats (Fig-36).
- Turn the driver 1/8 turn counterclockwise. This will loosen the Set Screw Slightly, allowing the lag screw to slide in the lateral direction, but not to rotate.

Fig-36

23. Removing Lag Screw Targeting System

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020) - Optional*
- ✔ *Knob Wrench (N02-0150)*
- ✔ *7 mm Hex Driver (N01-0030) – Optional*
- Release the Lag Driver Connector Screw disengaging the Lag Driver from the lag screw. Use the 5 mm Hex Driver if needed (Fig-37). Pull it out of the Lag Guide Sleeve.
- With the Knob Wrench, loosen the Guide Arm Lock and pull the Lag Guide Sleeve out of the Guide Arm (Fig-38). Alternatively, the 7 mm Hex Driver can be used.

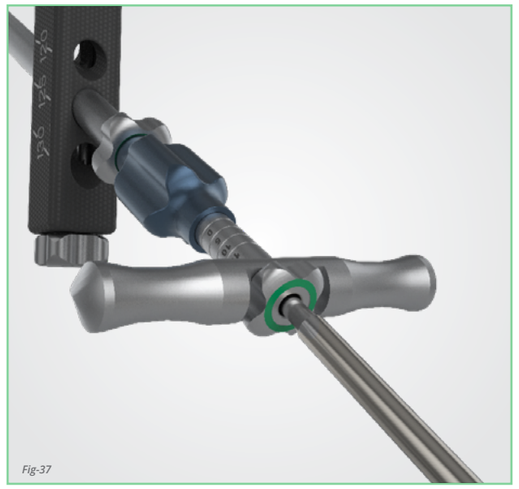


Fig-37

Fig-38

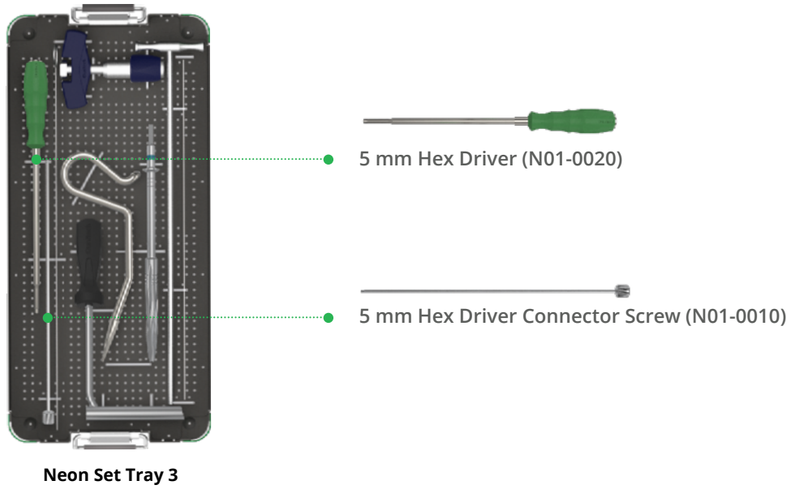
24. Removing the Targeting Assembly

INSTRUMENTS:

- ✔ *7 mm Hex Driver (N01-0030)*
- 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.

Fig-39

INSTRUMENTS FOR INSERTING END CAPS



Neon Set Tray 3

25. Inserting Nail End Cap

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*
- ✔ *5 mm Hex Driver Connector Screw (N01-0010)*
- Mate the 5 mm Hex Driver to the nail end cap.
- Insert the 5 mm Hex Driver Connector Screw through the driver and rotate clockwise to secure the end cap to the driver (Fig-40).
- 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-41).
- Rotate the connector screw counterclockwise to disengage the driver from the end cap.

Fig-40

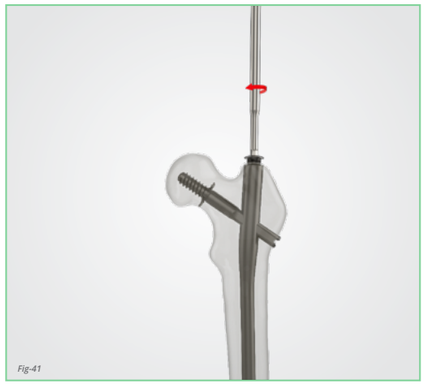


Fig-41

26. Inserting Lag Screw End Cap

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*
- ✔ *5 mm Hex Driver Connector Screw (N01-0010)*
- Mate the 5 mm Hex Driver to the lag screw end cap.
- Insert the 5 mm Hex Driver Connector Screw through the driver and rotate clockwise to secure the end cap to the driver (Fig-42).
- Pass the end cap through the incision and mate with the lag screw in the lateral femur, 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.

Fig-42

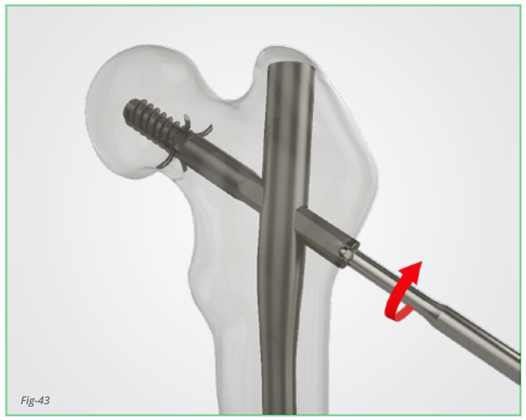
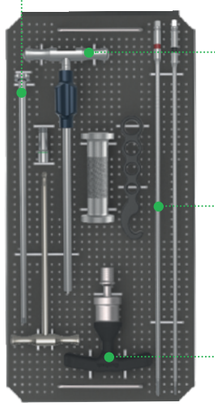


Fig-43

NOTES

Nail Removal

INSTRUMENTS FOR REMOVING THE LAG SCREW



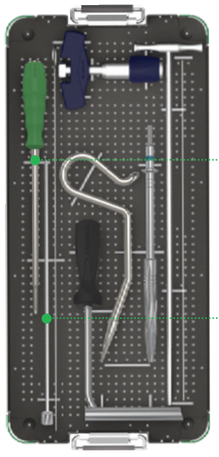
Lag Driver Connector Screw (N02-0100)

Lag Driver (N02-0110)

Lag Claw Retractor Driver (N02-0010)

Torque Limiting Handle (N01-0170)

Neon Set Tray 2



5 mm Hex Driver (N01-0020)

5 mm Hex Driver Connector Screw (N01-0010)

Lag Guide Pin (N01-0260)

Neon Set Tray 3

1. Removing Lag Screw End Cap

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*
- ✔ *5 mm Hex Driver Connector Screw (N01-0010)*
- Insert the 5 mm Hex Driver Connector screw into the 5 mm Hex Driver and mate the driver to the lag screw end cap.
- Rotate the connector screw clockwise to secure the end cap to the driver.
- Rotate the driver counterclockwise until the lag screw end cap it is fully released (Fig-44).

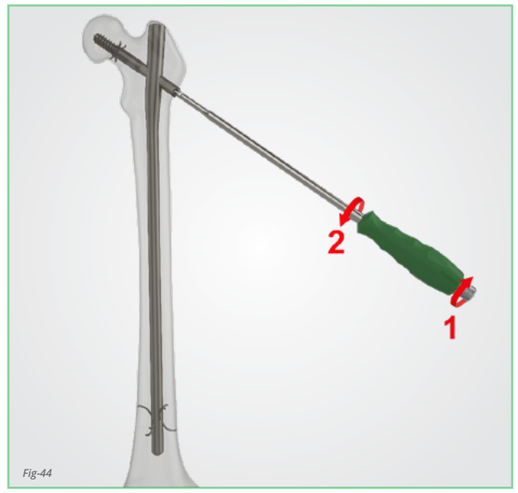


Fig-44

2. Attaching the Lag Driver

INSTRUMENTS:

- ✔ *Lag Guide Pin (N01-0260)*
- ✔ *Lag Driver (N02-0110)*
- ✔ *Lag Driver Connector Screw (N02-0100)*
- Insert the Lag Guide Pin through the lag screw to clean any debris.
- Insert the Lag Driver Connector Screw into the Lag Driver, pass the assembly over the guide pin and mate the driver with the lag screw. Secure the assembly by rotating the connector screw clockwise.
- Remove the Lag Guide Pin (Fig-45).

Fig-45

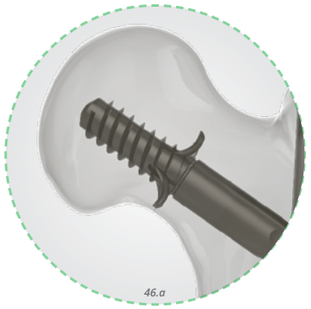
3. Retracting Lag Screw Claws

INSTRUMENTS:

- ***Lag Claw Retractor Driver (N02-0010)***
- ***Torque Limiting Handle (N01-0170)***
- ***T Extraction Handle (N01-0320) - Optional (if using the Revision Set)***
- Attach Lag Claw Retractor Driver to the Torque Limiting Handle or T Extraction Handle and insert it into the Lag Driver Connector Screw until it engages the Lag Claw mechanism (Fig-46).
- Rotate it clockwise to retract the Lag Claws (approximately 24 turns will fully retract the Claws).
- The full retraction can be confirmed by reading the lag screw size on the mark on the Lag Claw Retractor Driver that is in line with the Lag Driver Connector Screw.
- If the lag screw size is unknown, confirm the full retraction radiographically.

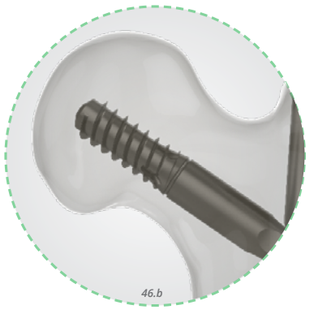
Fig-46

Before Retraction



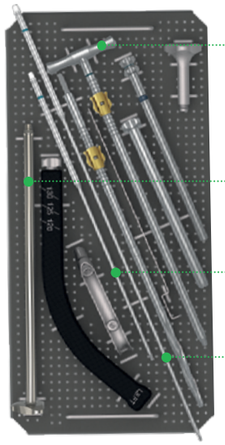
46.a

After Retraction



46.b

INSTRUMENTS FOR REMOVING THE NAIL



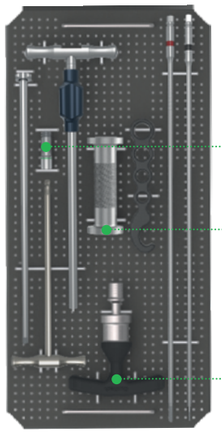
Neon Set Tray 1

Lag Alignment Plug (N02-0170)

Extractor Connector (N01-0050)

Distal Claw Deployment Driver – Short (N02-0210), for Neon Short Nails

Distal Claw Deployment Driver – Long (N02-0220), For Neon Long Nails

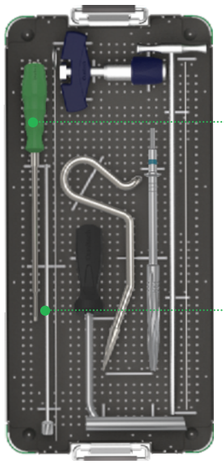


Neon Set Tray 2

Neon Extractor Connector (N02-0040)

Slide Hammer (N01-0160)

Torque Limiting Handle (N01-0170)



Neon Set Tray 3

5 mm Hex Driver (N01-0020)

5 mm Hex Driver Connector Screw (N01-0010)

4. Removing Nail End Cap and Disengaging the Set Screw

INSTRUMENTS:

- ✔ *5 mm Hex Driver (N01-0020)*
- ✔ *5 mm Hex Driver Connector Screw (N01-0010)*

- 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 it 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 two full turns counterclockwise to release the lag screw.

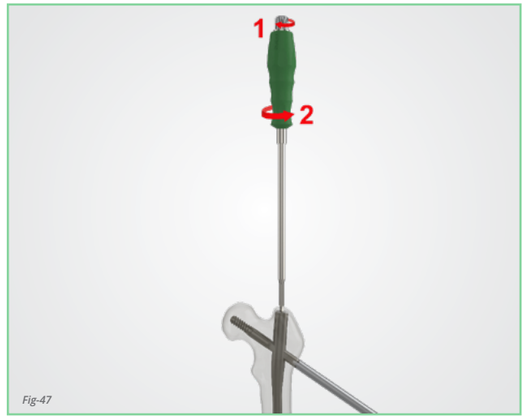


Fig-47

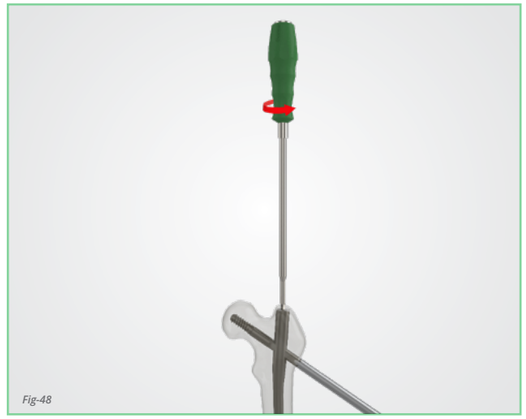


Fig-48

5. Removing the Lag Screw

- By rotating the Lag Driver counterclockwise, remove the lag screw (Fig-49).

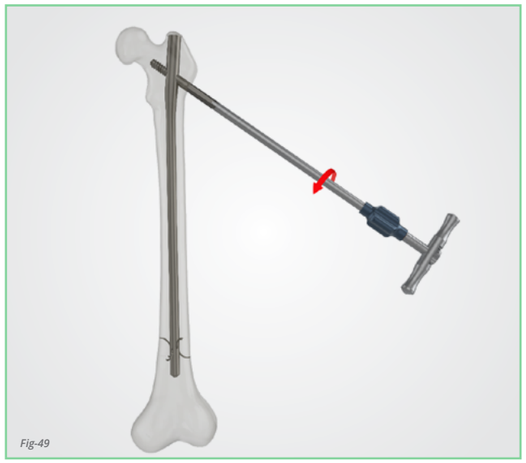


Fig-49

6. Retracting Nail Claws

INSTRUMENTS:

- ✔ *Lag Alignment Plug (N02-0170)*
- ✔ *Distal Claw Deployment Driver – Short (N02-0210), for Neon Short Nails*
- ✔ *Distal Claw Deployment Driver – Long (N02-0220), For Neon Long Nails*
- ✔ *Torque Limiting Handle (N01-0170)*
- ✔ *T Extraction Handle (N01-0320) - Optional (if using the Revision Set)*

- Insert the Lag Alignment Plug into the lag screw hole to prevent the nail from rotating while retracting the Claws. The handle must be parallel to the proximal part of the nail as to allow the passage of the Distal Claw Deployment Driver through its slots. Attach the appropriate Distal Claw Deployment Driver to the Torque Limiting Handle or T Extraction Handle. Insert the driver down the nail until it engages the distal Claw mechanism.
- Rotate the handle counterclockwise to retract the Claws. A fully deployed Claw mechanism would need 18 turns to be completely retracted (Fig-50).

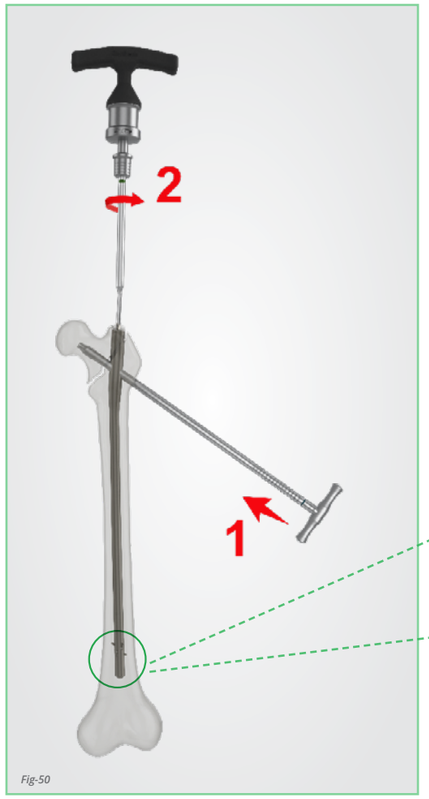
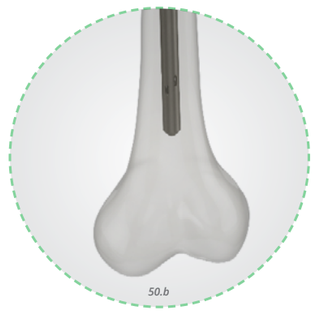


Fig-50

Before Retraction


50.a

After Retraction


50.b

7. Removing the Nail

INSTRUMENTS:

- ***Extractor (N01-0050)***
- ***Slide Hammer (N01-0160)***
- ***Neon Extractor Connector (N02-0040)***
- Attach the Neon Extractor Connector into Extractor and pass the Slide Hammer over it.
- Mate the Neon Extractor Connector with the nail and rotate the Extractor clockwise to secure the assembly to the nail.
- With the help of the Slide Hammer, remove the nail from the femur (Fig-51).

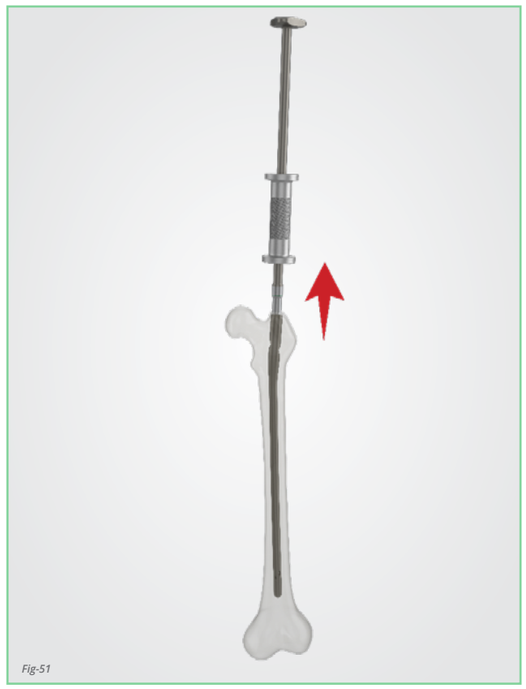
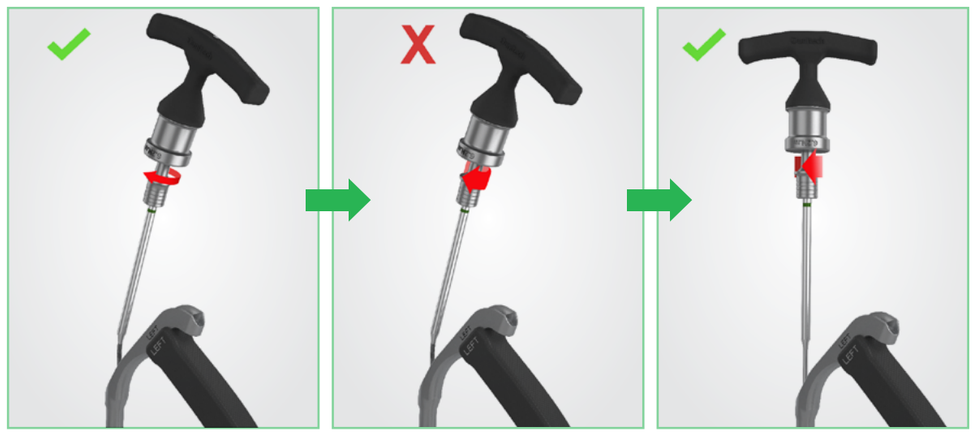


Fig-51

Correct Use of the Flexible Shaft

The Distal Claw Deployment Driver has a flexible shaft. The more the shaft is flexed, the less torque it can deliver before permanently deforming.

To ensure the continued functionality of the instrument, the shaft should be returned to a straight orientation when significant resistance is felt.



High Torque / Minimal Resistance

Low Torque / Significant Resistance

Catalogue Information

Neon Proximal Femoral Nail, Short

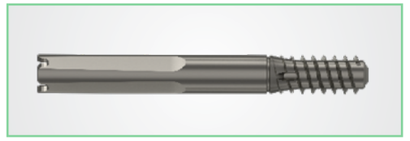
Angle	Lenght (mm)	Catalogue Code
120°	220	NEON-120-220
125°	220	NEON-125-220
130°	220	NEON-130-220

Neon Proximal Femoral Nail, Long

Angle	Lenght (mm)	Catalogue Code Left	Catalogue Code Right
125°	300	NEON-125-30L	NEON-125-30R
125°	320	NEON-125-32L	NEON-125-32R
125°	340	NEON-125-34L	NEON-125-34R
125°	360	NEON-125-36L	NEON-125-36R
125°	380	NEON-125-38L	NEON-125-38R
125°	400	NEON-125-40L	NEON-125-40R
125°	420	NEON-125-42L	NEON-125-42R

Nail End Caps

Extension (mm)	Catalogue Code
0 (flush)	NEON-155-000
5	NEON-155-005
10	NEON-155-010



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 Screw End Cap

Extension (mm)	Catalogue Code
0 (flush)	DCLS-07-010

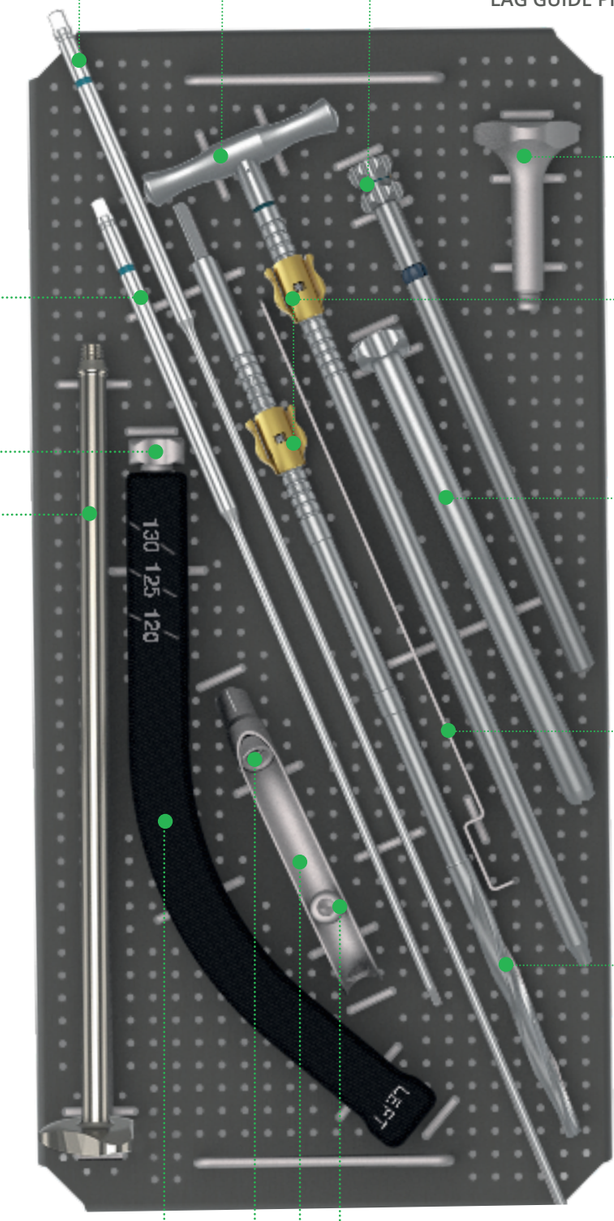
Note

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

Neon Tool Set

- Neon Tray 1
- Neon Tray 2
- Neon Tray 3

Neon Tray 1



N02-0220 DISTAL CLAW DEPLOYMENT DRIVER - LONG

N02-0170 LAG ALIGNMENT PLUG

N02-0160 LAG GUIDE PIN OBTURATOR

N01-0070 IMPACTOR

N02-0210 DISTAL CLAW DEPLOYMENT DRIVER - SHORT

N02-0120 LAG DRILL STOP

N02-0180 GUIDE ARM LOCK

N02-0190 LAG GUIDE SLEEVE

N01-0140 LAG SCREW GUIDE PIN RULER

N01-0050 EXTRACTOR

N02-0130 LAG DRILL

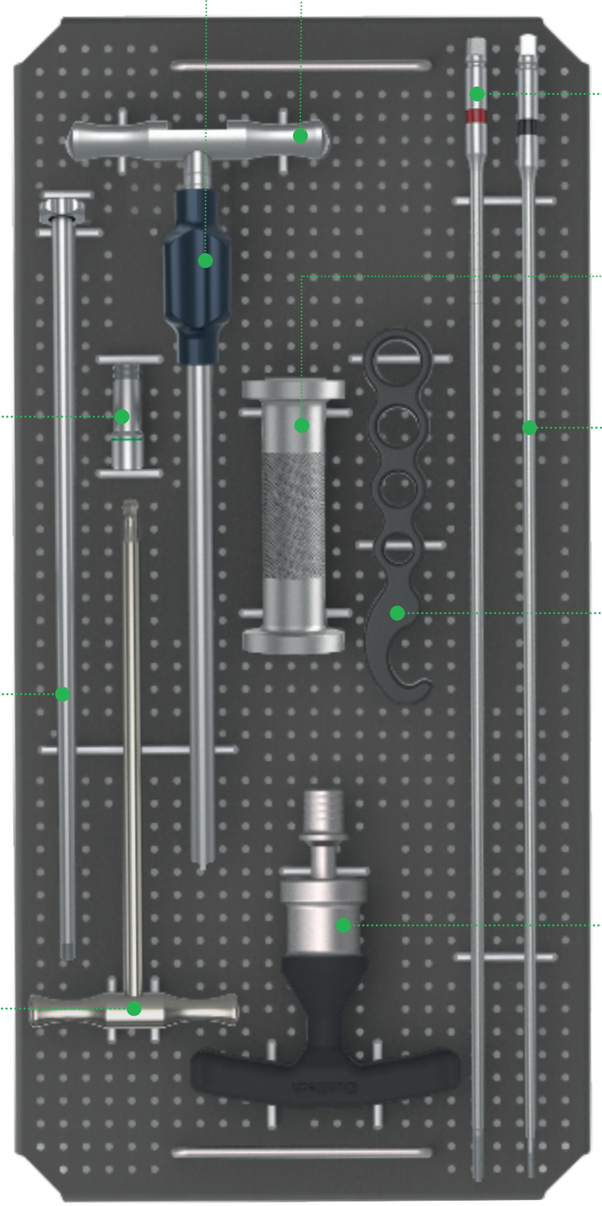
N02-0200 HANDLE - ARM CONNECTOR SCREW

N02-0050 GUIDE ARM

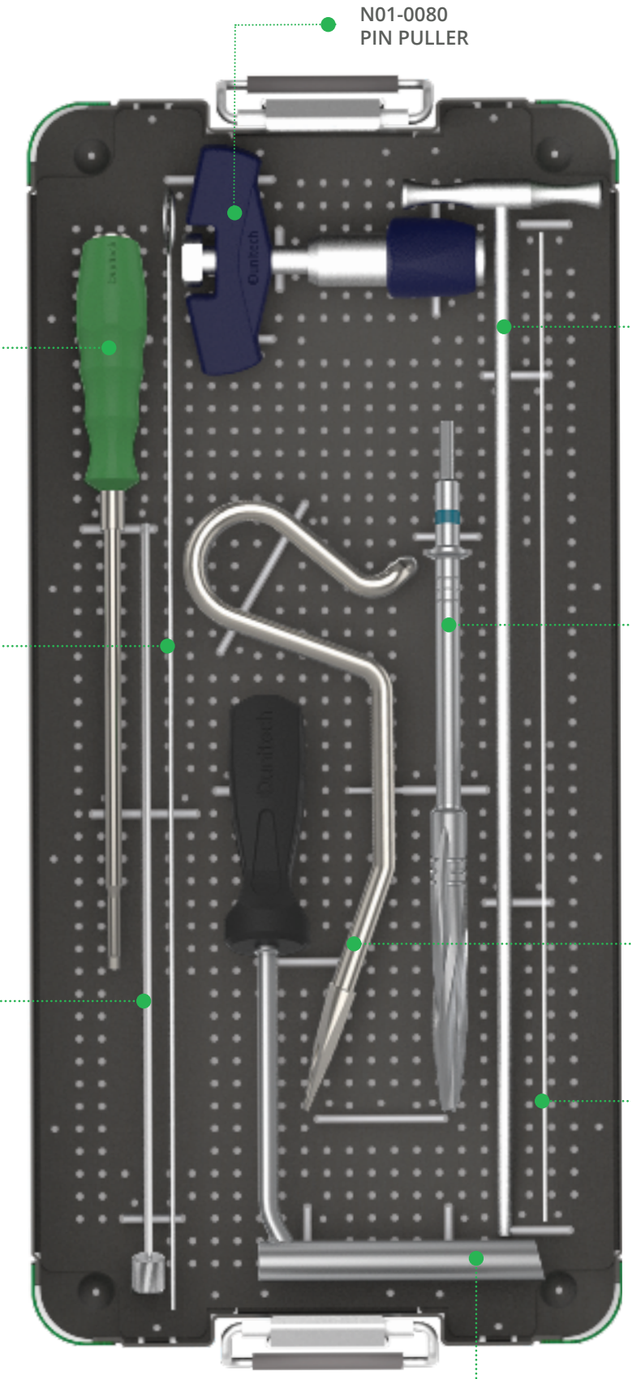
N02-0060 GUIDE HANDLE

N02-0070 HANDLE - NAIL CONNECTOR SCREW

Neon Tray 2



Neon Tray 3



NOTES

Document Number: NEON-ST-01, Release Date: 20/01/2019, Revision Number: 1, Revision Date: 01/04/2020

Product availability is subject to the regulatory and/or medical practices in individual markets. Some or all products described in those documents may not be available in your region. Please contact your Dunitech representative for information regarding product availability in your area.

Dunitech is a registered Oliga brand.

OLIGA MAKINA ELEKTRONIK SANAYI LTD. STI.
İvedik OSB Mh. 1453 Cd. No: 5/D 06378 Yenimahalle, Ankara / TURKEY
+90 312 220 1577 info@oliga.com.tr / www.oliga.com.tr

www.duni-tech.com