PFN
Proximal Femoral Nail

Surgical technique
357.590 Radiographic Ruler for Femoral Nails
357.008 Reverse Awl for PFN
351.050 Tissue Protector

399.505 Hammer, synthetic
311.720 Tap Ø 6.5 mm, cannulated, calibrated
357.048 Wrench for Femoral Neck Screws, with Compression Device, complete (consisting of 357.050/357.051/357.052)*
357.791 Depth Gauge for Locking Bolts
319.460 Cleaning Stilet Ø 2.8 mm
319.240 Cleaning Brush Ø 2.9 mm
357.009 Cleaning Stilet Ø 2.8 mm, length 450 mm

357.071 Hammer Guide, for No. 357.026
357.026 Slide Hammer 400 g
321.170 Pin Wrench Ø 4.5 mm
357.073 Extraction Holding Sleeve for Hip Pin

*Alternative to 357.053
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**Warning**

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

Standard/Short PFN
The short femoral nail is used for small stature.

Indications
- Pertrochanteric fractures
- Intertrochanteric fractures
- High subtrochanteric fractures

Contraindications
- Low subtrochanteric fractures
- Femoral shaft fractures
- Isolated or combined medial femoral neck fractures

Long PFN

Indications
- Low and extended subtrochanteric fractures
- Ipsilateral trochanteric fractures
- Combination of fractures (trochanteric area/shaft)
- Pathological fractures

Contraindications
- Isolated or combined medial femoral neck fractures
- End Cap (273/473.150)

- Proximal diameter 17.0 mm

- Self-tapping Hip Pin Ø 6.5 mm (234/434.072–110)
  - Lengths 60–110 mm (<5 mm>)
  - For true rotational stability
  - Featuring insertion safety stop

- Self-tapping Femoral Neck Screw Ø 11.0 mm
  (273/473.080–120)
  - Lengths 80–120 mm (<5 mm>)
  - Featuring insertion safety stop

- Anatomical 6° ML angle

- Distal diameters of 10, 11, and 12 mm enable unreamed insertion

- Distal Locking Bolt Ø 4.9 mm (259/459.260–960)
  - Lengths 26–100 mm (<2 mm) from 26 to 60 mm,
    <4 mm> from 60 to 80 mm,
    <5 mm> from 80 to 100 mm)
  - A choice of static and/or dynamic interlocking
    (dynamization: 5 mm)

- Flexible distal nail end (length: 58 mm) minimizes stress concentration
- The PFN is available in titanium alloy (Ti-6Al-7Nb) and stainless steel
- Total length: 240 mm (standard nail)
  200 mm (short nail)

CCD angle
Standard: 125°/130°/135°
Short: 130°
Quick steps for Standard/Short PFN

1 Preparation

2 Insert PFN

3 Position guide wires
B Preoperative planning

C Insertion point

B Open femur

C Insert PFN

B Image intensifier control (AP)

C Image intensifier control (axially)
4 Insert hip pin

5 Insert femoral neck screw

6 Insert locking bolt and end cap
B Drill hole for hip pin

C Insert hip pin

B Drill hole for femoral neck screw

C Insert femoral neck screw

B Insert locking bolt

C Insert end cap
Position patient

Position patient supine on an extension table or a radiolucent operating table. Position the C-arm of the image intensifier in such a way that it can visualize the proximal femur exactly in the lateral and AP planes.

For unimpeded access to the medullary cavity, abduct the upper part of the body by about 10°–15° to the contralateral side (or adduct the affected leg by 10°–15°).

Determine CCD angle

Take an AP X-ray of the unaffected side preoperatively. Determine the CCD angle using a goniometer or the preoperative planning template.

Standard PFN is available in 125°/130°/135°.
Short PFN is available in 130°.

Reduce fracture

If possible carry out closed reduction of the fracture under image intensifier control. If this procedure cannot be performed in a closed manner, then open reduction is required.

Warning: Anatomical reduction and a secure fixation of the patient on the operating table are absolutely vital preconditions for easy handling and a good surgical result.
Determine nail diameter

Determine the distal nail diameter by placing the AO/ASIF planning template over the isthmus on an AP X-ray.

**Alternative**

Under image intensifier control, place the Radiographic Ruler (357.590) on the femur and position the square marking over the isthmus. If the transition to the cortex is still visible to the left and right of the marking, the corresponding nail diameter may be used.

If the PFN Ø 10.0 mm is still too thick, the medullary canal must be reamed accordingly.

**Warning**

Excessive force will have to be used if too thick a nail is introduced. This may result in loss of reduction and bone fractures.

**Approach**

Palpate the greater trochanter.

Make a 5 cm incision approximately 5 to 8 cm proximal from the tip of the greater trochanter. Make a parallel incision in the fasciae of the Gluteus medius and split the Gluteus medius in line with its fibres.
1

Determine nail insertion point and insert guide wire

- In the AP view, the nail insertion point is normally found on the tip or slightly lateral to the tip of the greater trochanter in the curved extension of the medullary cavity.
- The mediolateral angle of the implant is 6°. This means that the 2.8 mm Guide Wire (357.039) must be inserted laterally at an angle of 6° to the shaft. On the lateral view, the guide wire must be located in the centre of the medullary canal, up to a depth of 15 cm. The guide wire can be inserted either manually with the Universal Chuck with T-Handle (393.100) or a power tool with the Quick Coupling for Kirschner Wires (511.790).
- Percutaneous technique: Insert guide wire through the Protection Sleeve 20.0/17.0 (357.001) and the Drill Sleeve 17.0/2.8 (357.002). Then remove the drill sleeve 17.0/2.8.

Note: A correctly selected insertion point and angle are essential for a good surgical result. Check the correct position of the guide wire with the aid of x-rays and by positioning a nail anteriorly on the femur.

2

Open femur

- Guide the 17.0 mm Cannulated Drill Bit (357.005) through the protection sleeve 20.0/17.0 over the guide wire and ream manually with the Universal Chuck with T-Handle (393.100) as far as the stop on the protection sleeve.
- Remove protection sleeve and guide wire. Dispose of the guide wire, do not re-use.

Warning

Particularly careful drilling is required with unstable multifragment fractures. Specifically, avoid varus displacement of the medial fragment by making sure that the hole is drilled both in the medial fragment and the lateral part of the femur.
Option: open with reverse awl
Open the femur or enlarge the entry point with the Reverse Awl (357.008). Use the Tissue Protector (351.050) to spare the soft tissues. Drive the awl over the guide wire into the femur until the marking on the awl shaft is level with the trochanter tip.

2
Assemble instruments
Guide the Connecting Screw (357.021) through the Insertion Handle (357.012) and secure the nail tightly to the insertion handle using the Hexagonal Wrench (357.023). The nail diameter has already been determined during preparations for surgery.
Ensure that the connection is tight to avoid deviations when inserting the screws through the aiming arm. Do not attach the aiming arm yet.
4

Insert standard/short proximal femoral nail

Carefully insert the nail manually as far as possible into the femoral opening. Slight twisting hand movements help insertion. If the nail cannot be inserted, select a smaller size nail diameter.

Insertion can be supported by light blows with the synthetic Hammer (399.505) on the mounted protection shield of the insertion handle.

The correct nail insertion depth is reached if the future position of the femoral neck screw is just above the calcar in the distal half of the femoral neck. The future position of the femoral neck screw can be assessed on the AP view by means of the proximal holes in the nail. Ensure that sufficient space is also available for the hip pin.

Warning
- If the medullary canal is too narrow, it should be reamed to at least 10 mm.
- Make sure that the nail is tightly screwed to the insertion handle before inserting the nail.
- Tap gently on the insertion handle. The use of excessive force will result in loss of reduction or bone fracture. Apply taps only to the protection plate.
- An excessively cranial or caudal nail position will result in incorrect placement of the screws and should therefore be avoided at all costs.

5

Prepare insertion of femoral neck screw and hip pin

Secure the corresponding Aiming Arm (357.105/125°, 357.106/130°, 357.107/135° for standard PFN and 357.104/130° for short PFN) tightly to the insertion handle.

Select the screw and the colour-coded drill sleeve system consisting of protection sleeve, drill sleeve and trocar.

Note: The position of the nail can now be checked on the AP view by positioning a guide wire over the insertion handle.
6

Insert guide wire for femoral neck screw

Make a stab incision and insert the pink Drill Sleeve System (357.031/357.032/357.033) through the aiming arm until the bone is reached. Mark the femur and remove the trocar.

Insert a new 2.8 mm Guide Wire (357.039) through the drill sleeve, check direction and position under the image intensifier in AP and lateral views. The correct position of the femoral neck screw tip (A) on the AP image is at a distance of 5 to 10 mm from the subchondral bone. The guide wire will therefore need to be inserted to the subchondral bone or up to a maximum distance of 5 mm away. In the lateral view the wire should be located in the centre of the femoral neck.

Note: If the guide wire is not in the desired position or if it is bent it must be reinserted. Remove the guide wire and the drill sleeve system. The nail must be repositioned by means of rotation, deeper insertion or slight retraction. Reset the drill sleeve system and introduce a new guide wire.

Warning

Make sure the handle is not moved before inserting the hip pin guide wire. Drilling over a bent guide wire can result in drill breakage or damaging of the nail itself.
Insert guide wire for hip pin

Insert the blue Drill Sleeve System (357.036 / 357.037 / 357.038) through the blue drill hole on the aiming arm to the bone. Then remove the trocar and insert a second, new 2.8 mm guide wire through the drill sleeve into the bone. The insertion depth of the guide wire should be 10 mm less than the insertion depth of the femoral neck screw guide wire. This ensures that the hip pin will not take weight load but only fulfill the anti-rotary function.

**Note:** Verify that the guide wires are parallel in both planes and that their tips form a horizontal line on the AP view.
8

Remove drill sleeve

The blue drill sleeve (357.037) must be carefully removed without moving the guide wires from their original positions.

Before the length measurement, recheck the position of the guide wires on the AP view.

9

Measure length of hip pin

In order to prevent possible rotation of the medial fragment when inserting the femoral neck screw, prior insertion of the hip pin is recommended.

Guide the Direct Measuring Device (357.042) through the protection sleeve 8.0/7.0 to the bone and determine the required length of the hip pin. The length of this pin is indicated on the measuring device and is calculated to end 5 mm before the tip of the guide wire.
10

Drill hole for hip pin

Advance the 6.5 mm Cannulated Drill Bit (357.047) over the 2.8 mm guide wire. Drill completely to the stop (maximum reaming depth: 45 mm). As the tip of the hip pin is self-tapping, usually no further drilling and tapping is needed.

11

Procedure with hard bone

With hard bone, further drilling and tapping with the 6.5 mm Calibrated Tap (311.720) is recommended up to the length of the hip pin previously measured.
12

Insert hip pin

Using the Cannulated Hexagonal Screwdriver (357.055), insert the selected hip pin over the guide wire completely to the stop. Remove and discard the 2.8 mm guide wire of the hip pin.

Warning

Do not insert the hip pin with undue force. Ensure that the lateral end of the hip pin clearly protrudes from the lateral cortex and is not inserted into it.

13

Measure length of femoral neck screw

Guide the Direct Measuring Device (357.042) over the second 2.8 mm guide wire through the pink protection sleeve 14.0/11.0 until it touches the bone and determine the required length of the femoral neck screw. The correct screw length is indicated on the measuring device and is calculated to end approx. 5 mm before the tip of the guide wire.

Now set the measured length on the 11.0 mm Reamer (357.045) by securing the Fixation Sleeve (357.046) in the appropriate position. The correct length is indicated on the side of the fixation sleeve facing the reamer tip.
14

Drill hole for femoral neck screw

Advance 11 mm reamer (357.044) over the 2.8 mm guide wire. Drill until the stop. Further drilling is prevented by the fixation sleeve. Tapping is not required due to the self-tapping tip of the femoral neck screw.

Note: If the guide wire has been bent slightly during insertion, the drill can be guided over it using careful forward and backward movements.

If the wire has been bent to a greater extent, it should be reinserted or replaced by a new guide wire, otherwise the tip of the drill may break.

15

Insert femoral neck screw

Assemble the Wrench for Femoral Neck Screw (357.053 consisting of: 357.054/357.051) and secure it tightly to the selected femoral neck screw.

Insert the femoral neck screw over the 2.8 mm guide wire up to the stop.

Remove the wrench for the femoral neck screw, if necessary using the Hexagonal Wrench (357.023).

Remove and discard the 2.8 mm guide wire of the femoral neck screw. Finally, remove both protection sleeves from the aiming arm.

Check under image intensifier that femoral neck screw is not inserted behind the lateral cortex.
Option: Use of wrench for femoral neck screws with compression device

Assemble the Wrench for Femoral Neck Screw (357.048 consisting of: 357.050/357.051/357.052) and secure it tightly to the selected femoral neck screw. The Compression Nut (357.052) must be completely unscrewed in the lateral direction.

Insert the femoral neck screw over the 2.8 mm guide wire up to the stop.

If required, the Compression Nut (357.052) may be used to compress the fracture over the femoral neck screw. This should be performed with great caution to prevent the screw from cutting out. Do not compress in osteoporotic bone.
Drill hole for distal locking

Distal locking is usually performed with a single locking bolt. For static interlocking use the cranial locking hole only; for dynamic interlocking use the caudal locking hole. Subtrochanteric fractures may be double-locked. Secondary dynamization is possible by postoperative removal of the static locking bolt.

Make a stab incision and insert the green Drill Sleeve System (357.061/357.063/357.065) through the locking hole selected in the aiming arm until the bone is reached.

Remove the 4.0 mm Trocar (357.065) and drill through both cortices using the 4.0 mm Drill Bit (357.068).

Read off the length of the required locking bolt directly from the drill marking. Ensure that the drill sleeve 8.0/4.0 has good bone contact.

Warning

– Before distal locking, ensure that no diastasis has occurred intraoperatively. Healing may be delayed if the distal locking bolts are secured despite the presence of diastasis.
– Ensure that all connections between the nail, insertion handle and aiming arm are still secure, otherwise the nail itself may be damaged during drilling of the distal locking holes.

Alternative method of measuring length

Remove the drill sleeve 8.0/4.0 and determine bolt length with the Depth Gauge for Locking Bolts (357.791). Add 2 to 4 mm to the reading to ensure that the thread engages the far cortex.
17

Insert locking bolt

Insert the locking bolt through the protection sleeve using the Large Hexagonal Screwdriver (314.260).
Remove the protection sleeve and the aiming arm. Then remove the insertion handle using the Hexagonal Wrench (357.023).

18

Insert end cap

Align the end cap with the nail axis using the hexagonal screwdriver in order to prevent tilting. Screw the end cap completely onto the nail until its collar touches the proximal end of the nail.

In order to avoid losing the end cap and to facilitate insertion, the end cap can also be inserted through the Protection Sleeve 20.0/17.0 (357.001).
Long Proximal Femoral Nail

Implants

- End Cap (273/473.150)

- Proximal diameter 17.0 mm

- Self-tapping Hip Pin Ø 6.5 mm (234/434.072–110)
  - Lengths 60–110 mm (<5 mm>)
  - For true rotational stability
  - Featuring insertion safety stop

- Self-tapping Femoral Neck Screw Ø 11.0 mm (273/473.080–120)
  - Lengths 80–120 mm (<5 mm>)
  - Featuring insertion safety stop

- Anatomical 6° ML angle

- Anatomical 1.5 m radius (antecurvature)

- Distal diameters of 10, 12 and 14 mm

- Cannulated nail

- Total length: 340–440 mm (<20 mm>)

- Distal Locking Bolt Ø 4.9 mm (259/459.260–960)
  - Lengths 26–100 mm (<2 mm) from 26 to 60 mm,
    <4 mm> from 60 to 80 mm,
    <5 mm> from 80 to 100 mm)
  - A choice of static or dynamic interlocking
    (dynamization: 10 mm)

The Long PFN is available in titanium alloy (Ti-6Al-7Nb) and stainless steel. Grooves, where necessary, ensure flexibility of the Long PFN.
Detailed surgical technique

This surgical technique is based on the PFN surgical technique for Standard/Short PFN. In order to follow the correct procedure, please refer to the respective steps in the standard technique. This part only shows the steps regarding insertion and distal interlocking of the Long PFN which differ from the standard technique.

Usually, the 130° nail is suitable for most indications. In some cases, however, the use of a 125° nail may be indicated.

Patient positioning

Please refer to the PFN standard surgical technique.

Determine CCD angle

Please refer to the PFN standard surgical technique.

Reduce fracture

Please refer to the PFN standard surgical technique. However, the special conditions of the very different fracture types have to be considered.

Determine nail length

Position the image intensifier for an AP view of the proximal femur (1). With a long forceps, hold the Radiographic Ruler (357.590) alongside the lateral aspect of the thigh parallel to and at the same level as the femur. Adjust the C-arm so the beam is centred between the femur and ruler; this will reduce magnification errors. Adjust the ruler until the top is level with the tip of the greater trochanter. Mark the skin at the top of the ruler.

Move the image intensifier to the distal femur (2), place the proximal end of the ruler at the skin mark, and take an AP image of the distal femur. Verify fracture reduction. Read nail length directly from the ruler image, selecting the measurement that is at or just proximal to the physeal scar, or at the chosen insertion depth.

Consider the nail range of 340, 360, 380, 400, 420 and 440 mm.

Determine nail diameter

Please refer to the PFN standard surgical technique.
Long Proximal Femoral Nail

Surgical Technique

1

Determine nail insertion point and insert guide wire

In the AP view, the nail insertion point is normally found on the tip or slightly lateral to the tip of the greater trochanter in the curved extension of the medullary cavity.

The mediolateral angle of the implant is 6°. This means that the 2.8 mm Guide Wire (357.039) must be inserted laterally at an angle of 6° to the shaft. The guide wire can be inserted either manually with the Universal Chuck with T-Handle (393.100) or with a Compact™ Air Drive and with the quick coupling for Kirschner wires.

In a lateral view, place the guide wire in the centre of the cavity.

2

Open femur

Guide the 17.0 mm Cannulated Drill Bit (357.005) through the Protection Sleeve 20.0/17.0 (357.001) over the guide wire or guide rod and ream manually with the Universal Chuck with T-Handle (393.100) as far as the stop on the protection sleeve.

Remove protection sleeve and guide wire. Do not re-use the guide wire.

Warning

Particularly careful drilling is required with unstable multi-fragment fractures. Specifically, avoid varus displacement of the medial fragment by making sure that the hole is drilled both in the medial fragment and the lateral part of the femur.

Optional opening with reverse awl: See standard technique.
3

Ream medullary cavity with SynReam (Option)

1 Assemble reduction system

Assemble the reduction system of the SynReam Intramedullary Reaming System (189.060): Attach the T-Handle (351.150) at the rear of the SynReam Flexible Shaft (352.040) and a Reduction Head (352.050 or 352.055) at the front.
2 Reduce fracture

To secure the reduction head, insert the SynReam Reaming Rod Ø 2.5 mm (352.032, length 950 mm or 352.033, length 1150 mm) in a retrograde direction up to the olive. The olive must be located in the reduction head throughout reduction. Insert the assembled reduction system with the SynReam reaming rod into the medullary cavity and reduce the distal fragments under image intensifier control.

Note: Always reduce with the reaming rod, since secure fixation can only be ensured if the reduction system is used in conjunction with the reaming rod. Using the reduction system without the reaming rod entails the risk of losing the reduction head in the medullary canal.

3 Remove reduction instruments

After completing the reduction, remove the reduction instruments with the exception of the reaming rod, which must remain in the medullary cavity.

4 Assemble the reaming system

Connect the SynReam Flexible Shaft (352.040) to the drill and pick up the first SynReam Medullary Reamer Head (352.085). The reamer heads can be picked up directly, without hand contact, from the insert for medullary reamer heads using the SynReam flexible shaft.

Start with the smallest reamer head (Ø 8.5 mm, 352.085) and then increase in 0.5 mm increments using the larger reamer heads (352.090–190). The reaming depth should be identical to the chosen nail length.
5 Insert reaming system

Insert the assembled reaming system, without rotating it, over the SynReam reaming rod into the medullary canal. Use the Tissue Protector (351.050) to spare the soft tissues.

6 Ream medullary canal

Ream the medullary canal according to the standard procedure. Advance the reamer slowly and steadily at maximum drill speed. Secure the SynReam reaming rod with the Holding Forceps for SynReam Reaming Rod (351.782) to prevent it from rotating during reaming.

**Note:** Only ream over the SynReam Reaming Rod Ø 2.5 mm (352.032, length 950 mm or 352.033, length 1150 mm), since the rod ensures that a secure connection is maintained between the reamer and the flexible shaft.

7 Change reamer head

Having reamed the medullary cavity along its full length, retract the SynReam flexible shaft with the first reamer head until the whole reamer head is visible. Grasp the reaming rod with the Holding Forceps for SynReam Reaming Rod (351.782) immediately above the bone insertion point and hold in situ to avoid loss of reduction. Draw the SynReam flexible shaft through the slot of the Insert with Removing Device for SynReam Medullary Reamers (689.063) so as to remove the used reamer head without touching it.

The reamer head of the next size up can be picked up directly, without hand contact, from the insert for medullary reamer heads using the SynReam flexible shaft.
8 Complete medullary reaming

Repeat steps 5 to 7 for each additional reamer head (352.090–190) until the medullary canal is reamed to the desired diameter. Reaming is usually performed with increments of 0.5 mm.

**Note:** Only ream over the SynReam Reaming Rod ☻ 2.5 mm (352.032 or 352.033), since the rod ensures that a secure connection is maintained between the reamer head and the flexible shaft.

Loosen blocked medullary reamer heads with left-right turns or with gentle hammer taps to the Holding Forceps for SynReam Reaming Rod (351.782) fastened to the SynReam Reaming Rod ☻ 2.5 mm (352.032 or 352.033).
4

Assemble instruments

Please refer to the PFN standard surgical technique.

Note: Choose the corresponding nail for left or right leg.

5

Insert long proximal femoral nail

If no reaming has been performed, the guide rod may help the insertion, but is usually not necessary.

Carefully insert the nail manually (be it directly over the SynReam Reaming Rod Ø 2,5 mm [352.032 or 352.033] or not) as far as possible into the femoral opening. Slight twisting hand movements help insertion.

If the SynReam reaming rod is used, it does not need to be replaced by the guide wire for nails.

If necessary, insertion can be supported by light hammering blows. For this, insert the Thread Gland (357.013) into the insertion handle. Then mount the Hammer Guide (357.071), which is also used for nail extraction, through the protection plate firmly into the gland. Make sure the connection is very firm. Then use the Slide Hammer (357.026) to support the insertion carefully. Then remove the guide rod.

Alternative

Insertion can be supported by light hammer blows with the Synthetic Hammer (399.505) directly on the mounted protection plate.

Warning

Avoid unnecessary use of force and only hit the hammer guide or the protection plate. Do not hit the most proximal end of the hammer guide.

If too much force is needed for insertion, the nail should be removed and the femoral shaft should be reamed again.

It is important that the nail is always tightly connected to the insertion handle. This has to be checked especially after hammering.
6

Insert hip pin and femoral neck screw

Please refer to the PFN standard surgical technique and choose the 125° or 130° Aiming Arm (357.105 or 357.106) for the corresponding CCD-angle of the chosen nail.

7

Distal locking

Distal locking is usually performed with two locking bolts. For static interlocking, the caudal bolt is positioned at the proximal end of the locking slot, for dynamic interlocking it is positioned at the distal end of the locking slot. If immediate dynamization is required, only use the caudal locking slot. For secondary dynamization insert both locking bolts as described above and remove the static bolt at a later date.

Reconfirm reduction/alignment of the distal fragment.

Then use the Radiolucent Drive (511.300).

Align the image intensifier with the cranial hole in the nail until a perfect circle is visible in the centre of the screen. Make a stab incision at the incision point.
Under image intensification, insert the tip of the 4.0 mm Drill Bit (511.417) into the incision and place the bit oblique to the X-ray beam until the tip is centred in the locking slot.

Tilt the drive until the drill bit is in line with the beam and appears as a radiopaque solid circle in the centre of the outer ring. The drill bit will nearly fill in the locking hole image. Hold the drill in this position and drill through both cortices.

Measure the needed locking bolt length using the Depth Gauge (357.791), adding 2–4 mm to the reading to ensure thread engagement in the far cortex.

Insert the bolt using the Large Hexagonal Screwdriver (314.260).

Then proceed the same way for the second distal locking bolt. For static interlocking place the caudal locking bolt in the proximal position of the locking slot, for dynamic interlocking in the distal position to allow dynamization.

**Note:** If the Radiolucent Drive (511.300) is not available, perform distal interlocking in standard freehand technique using the 4.0 mm Drill Bit (357.068).

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**8**

Insert end cap

Please refer to the PFN standard surgical technique.
1

Remove femoral neck screw and hip pin

Having made an incision through the old scar, the screws may be localized using palpation or the image intensifier. In some cases, the instruments have a better grip on the screws if a \( \Phi 2.8 \text{ mm Guide Wire (357.039) is inserted.} \) First remove the end cap and insert the Hammer Guide (357.071) into the proximal nail end. Only then may the femoral neck screw, the hip pin and the locking bolt be removed by using the insertion instruments. To extract the hip pin, the Extraction Holding Sleeve for Hip Pin (357.073) is required additionally.

Note: If soft tissue situation is difficult, the guide rod for nail extraction can be mounted after removal of all but one locking bolt in order to prevent nail rotation in the medullary cavity.
Extract proximal femoral nail
To remove the nail, clip the Slide Hammer (357.026) on to the hammer guide. Ensure that the guide rod is firmly seated in the nail; the 4.5 mm Pin Wrench (321.170) may be used to this purpose. Now extract the nail with slight hammer blows.
Intraoperative and postoperative cleaning

The cannulations of the instruments must be cleaned intraoperatively using the Ø 2.8 mm Cleaning Stylet for Cannulated Instruments (319.460) or the long Cleaning Stylet (357.009/length 450 mm).

Postoperatively the instruments are cleaned with the Cleaning Stylet (319.460) and the Ø 2.9 mm Cleaning Brush for Cannulated Instruments (319.240).