PROXIMAL FEMORAL NAIL REMOVAL SET

for PFN, TFN and PFNA/PFNA-II

Instruments and Implants approved by the AO Foundation.
This publication is not intended for distribution in the USA.
This description alone does not provide sufficient background for direct use of DePuy Synthes products. Instruction by a surgeon experienced in handling these products is highly recommended.

**Processing, Reprocessing, Care and Maintenance**
For general guidelines, function control and dismantling of multi-part instruments, as well as processing guidelines for implants, please contact your local sales representative or refer to:
http://emea.depuy.synthes.com/hcp/reprocessing-care-maintenance
For general information about reprocessing, care and maintenance of Synthes reusable devices, instrument trays and cases, as well as processing of Synthes non-sterile implants, please consult the Important Information leaflet (SE_023827) or refer to:
http://emea.depuy.synthes.com/hcp/reprocessing-care-maintenance
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For many patients, implant removal often represents the true completion of fracture treatment. While giving due concern to the patient’s own wishes, the expense, utility, and risks of removal of the implants must be weighed. The implications of leaving the implant in place should always be explained to the patient.

As a matter of principle, implants can be removed once the fracture has healed and the load capacity has been re-established.

In the case of implant removal, complications may arise for a variety of reasons and it is important that the surgeon should be prepared for this. In addition to extraction instruments such as screwdrivers, instruments to extract damaged and broken implants should also be readily available.

The Synthes Proximal Femoral Nail Removal Set is a special set containing general instruments for implant removal as well as all system specific removal instruments for the different proximal femoral nails.

**Recommended literature**

The Synthes Proximal Femoral Nails (PFN, TFN, PFNA and PFNA-II) are to be removed with the standard instrumentation (as described in the applicable) technique guide. Due to the incompatibility of the different implant systems, the correct instruments are mandatory for removal.

System description

The Synthes Proximal Femoral Nails (PFN, TFN, PFNA and PFNA-II) are to be removed with the standard instrumentation (as described in the applicable) technique guide. Due to the incompatibility of the different implant systems, the correct instruments are mandatory for removal.

The Proximal Femoral Nail Removal Set contains general instruments for implant removal (e.g. hammer, screw-drivers) as well as all system specific removal instruments for the different proximal femoral nails.
All Instruments available in one set

The Synthes nailing systems for the proximal femur can be removed with the instruments supplied with the Proximal Femoral Nail Removal Set.

This prevents abort of surgery due to wrong set order or wrong identification of nailing system and avoids delays caused by missing or incorrect instruments.

Implant removal according to standard procedure

- TFN short, standard and long titanium trochanteric fixation nail
- PFN extra small, small, standard and long proximal femoral nail
- PFNA extra small, small, standard and long proximal femoral nail antirotation
- PFNA-II extra small, small, standard and long proximal femoral nail antirotation II
Identification of nailing system

It is important to identify the appropriate nailing system in order to follow the right surgical technique and to choose the suitable instruments for implant removal.

TFN – Titanium Trochanteric Fixation Nail
Specific characteristics:
• Helical blade for proximal locking
• Anatomically flattened end of the blade
• 6° lateral angle and 17.0 mm proximal diameter of the nail
• Distal diameters: 10/11/12 mm (short and standard), 10/11/12/14 (long), 10/11 (extra-small)
• Lengths: 170 mm (small), 235 mm (standard), 300–460 mm with 20 mm increments (long)

PFN – Proximal Femoral Nail
Specific characteristics:
• Femoral neck screw (Ø 11 mm) and hip pin (Ø 6.5 mm) for proximal locking
• 6° lateral angle and 17.0 mm proximal diameter of the nail
• Distal diameters: 10/11/12 (xs), 10/11 mm (small), 10/11/12 mm (standard), 10/12/14 mm (long)
• Lengths: 170 mm (extra-small), 200 mm (small), 240 mm (standard), 340–420 mm with 20 mm increments (long)
PFNA – Proximal Femoral Nail Antirotation
Specific characteristics:
• Helical blade for proximal locking
• 6° lateral angle and 16.5 mm (xs/small),
  17.0 mm (standard/long) proximal diameter of the nail
• Distal diameters: 9/10/11/12 mm (short), 9/10/12/14 mm
  (long)
• Lengths: 170 mm (xs), 200 mm (small), 240 mm
  (standard), 300–420 mm with 20 mm increments (long)

PFNA-II – Proximal Femoral Nail Antirotation II
Specific characteristics:
• Helical blade for proximal locking
• Lateral flattened cross-section
• 5° lateral angle and 16.5 mm proximal diameter of
  the nail
• Distal diameters: 9/10/11/12 mm (xs, small, and
  standard), 9/10 mm (long)
• Lengths: 170 mm (xs), 200 mm (small),
  240 mm (standard), 260–420 mm with 40 mm
  increments (long)
1
**Position patient**

Position the patient supine on an extension table or a radiolucent operating table. Abduct the unaffected leg as far as possible and place it on a leg support, so that it does allows free fluoroscopic examinations. This should be tested preoperatively.

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

**Precautions:**
- Instruments and screws may have sharp edges or moving joints that may pinch or tear user's glove or skin.
- Handle devices with care and dispose worn bone cutting instruments in an approved sharps container.

2
**Approach**

After an incision through the old scars, locate the blade/screws by palpation or under image intensification.
TFN IMPLANT REMOVAL

1
Remove end cap

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>356.717</td>
<td>Guide Wire Ø 2.8 mm, length 460 mm, with Hook</td>
</tr>
<tr>
<td>356.715</td>
<td>Socket, hexagonal Ø 11.0/11.0 mm, cannulated, for AFN</td>
</tr>
<tr>
<td>321.160</td>
<td>Combination Wrench Ø 11.0 mm</td>
</tr>
</tbody>
</table>

Insert the hook of the guide wire with through the end cap. Guide the cannulated hexagonal socket over the guide wire to the end cap.

Remove the end cap with the combination wrench.
2
Disengage the locking mechanism

<table>
<thead>
<tr>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>357.396 Extraction Screw for TFN</td>
</tr>
<tr>
<td>357.415 Shaft, hexagonal Ø 5.0 mm, length 210 mm</td>
</tr>
<tr>
<td>321.160 Combination Wrench Ø 11.0 mm</td>
</tr>
</tbody>
</table>

Thread the extraction screw into the top of the nail. Pass the hexagonal shaft through the extraction screw and engage the hex in the locking mechanism.

Turn the locking mechanism counterclockwise with the combination wrench until it stops.

The locking mechanism is now disengaged.

Note: It may be easier to align the extraction screw with the top of the nail if the hexagonal shaft is passed through the extraction screw first and then both instruments placed in the top of the nail.

Precaution: Do not attempt to extract the nail at this point.
Option A
Remove the helical blade and locking bolt/screw

Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>357.378</td>
<td>Extraction Instrument for Helical Blade for TFN</td>
</tr>
<tr>
<td>03.010.170</td>
<td>Hammer Guide</td>
</tr>
<tr>
<td>03.010.124</td>
<td>Combined Hammer 500 g, can be mounted, for No. 357.117</td>
</tr>
<tr>
<td>314.260</td>
<td>Screwdriver, hexagonal, large, Ø 3.5 mm, with Groove, length 300 mm</td>
</tr>
<tr>
<td>03.010.112</td>
<td>Holding Sleeve, with Locking Device</td>
</tr>
</tbody>
</table>

Thread the extraction instrument into the helical blade. Align the shaft of the extraction instrument with the notch in the helical blade. The extraction instrument is aligned when the flat points toward the patients head.

Thread the hammer guide into the back end of the extraction instrument and pass the combined hammer over the hammer guide.

Hold onto the shaft of the extraction instrument and use light blows of the combined hammer to remove the helical blade.

**Note:** To detach the blade from the bone use light hammer blows to slightly drive in the blade before removal of the blade.

Remove the locking bolt/screw using the hexagonal screwdriver and the holding sleeve.

**Note:** If removal of the locking bolt is not possible and/or in case of broken locking bolts the Screw Extraction Set and the corresponding handling technique DSEM/TRM/0614/0104 is recommended.
Option B
Remove screw and locking bolt

**Instruments**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>357.377</td>
<td>Connecting Screw for Helical Blade for TFN</td>
</tr>
<tr>
<td>357.428</td>
<td>Inserter/Extractor for TFN Femoral Neck Screw</td>
</tr>
<tr>
<td>314.260</td>
<td>Screwdriver, hexagonal, large, $\varnothing$ 3.5 mm, with Groove, length 300 mm</td>
</tr>
</tbody>
</table>

Align the inserter/extractor with the back end of the screw. The inserter is aligned when the tabs on the inserter mate with the flats on the screw. Insert the connecting screw. Extract the screw by turning the inserter/extractor counterclockwise.

Remove the locking bolt using the 3.5 mm hexagonal screwdriver.
1 Remove end cap

Instruments

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>356.717</td>
<td>Guide Wire $\varnothing$ 2.8 mm, length 460 mm, with Hook</td>
</tr>
<tr>
<td>356.715</td>
<td>Socket, hexagonal $\varnothing$ 11.0/11.0 mm, cannulated, for AFN</td>
</tr>
<tr>
<td>321.160</td>
<td>Combination Wrench $\varnothing$ 11.0 mm</td>
</tr>
</tbody>
</table>

Insert the hook of the guide wire with hook through the end cap. Guide the cannulated hexagonal socket over the guide wire to the end cap.

Remove the end cap with the combination wrench.
## PFN Implant Removal

### Remove femoral neck screw and hip pin

#### Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>357.039</td>
<td>Guide Wire 2.8 mm with threaded tip with trocar, length 350 mm</td>
</tr>
<tr>
<td>03.010.000</td>
<td>Extraction Screw, for Tibial and Femoral Nails</td>
</tr>
<tr>
<td>357.051</td>
<td>Coupling Screw, for Nos. 357.053 and 357.048</td>
</tr>
<tr>
<td>357.053</td>
<td>Wrench for Femoral Neck Screw, complete</td>
</tr>
<tr>
<td>357.054</td>
<td>T-Handle, for No. 357.053</td>
</tr>
<tr>
<td>357.055</td>
<td>Screwdriver, hexagonal, cannulated, for PFN</td>
</tr>
<tr>
<td>357.073</td>
<td>Extraction Holding Sleeve for Hip Pin</td>
</tr>
<tr>
<td>314.260</td>
<td>Screwdriver, hexagonal, large, Ø 3.5 mm, with Groove, length 300 mm</td>
</tr>
<tr>
<td>03.010.112</td>
<td>Holding Sleeve, with Locking Device</td>
</tr>
</tbody>
</table>

**Note:** In some cases, the instruments have a better grip on the screws if a guide wire is inserted.

Insert the extraction screw into the proximal nail end.

Assemble the wrench for femoral neck screw consisting of the coupling screw and the T-handle. Remove the femoral neck screw with the wrench.
Mount the extraction holding sleeve onto the hexagonal, cannulated screwdriver for PFN and remove the hip pin.

**Precaution:** If the soft tissue situation is difficult, the extraction screw for nail extraction can be mounted after removal of all but one locking bolt in order to prevent nail rotation in the medullary cavity. Remove the last locking bolt.

Remove the locking bolt using the hexagonal screwdriver and the holding sleeve.

**Note:** If removal of the locking bolt is not possible and/or in case of broken locking bolts the Screw Extraction Set and the corresponding handling technique (036.000.918) is recommended.
3

Extract nail

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03.010.170</td>
<td>Hammer Guide</td>
</tr>
<tr>
<td>03.010.124</td>
<td>Combined Hammer 500 g, can be mounted, for No. 357.117</td>
</tr>
<tr>
<td>321.170</td>
<td>Pin Wrench Ø 4.5 mm, length 120 mm</td>
</tr>
</tbody>
</table>

Screw the hammer guide into the extraction screw.

Mount the combined hammer onto the hammer guide. Ensure that the extraction screw is firmly seated in the nail; the pin wrench may be used for this purpose.

Extract the nail by applying gentle blows with the combined hammer.
1
Remove PFNA/PFNA-II blade

**Instruments**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>356.830</td>
<td>Guide Wire Ø 3.2 mm, for PFNA Blade</td>
</tr>
<tr>
<td>03.010.411</td>
<td>Extraction Screw for PFNA Blade</td>
</tr>
<tr>
<td>03.010.124</td>
<td>Combined Hammer 500 g, can be mounted, for No. 357.117</td>
</tr>
<tr>
<td>356.832</td>
<td>Key for PFNA Blade</td>
</tr>
</tbody>
</table>

Insert the guide wire trough the cannulated PFNA/PFNA-II blade. Push the extraction screw over the guide wire and use gentle pressure to screw it anticlockwise into the PFNA/PFNA-II blade (note “unlock” marking on the extraction screw shaft).

Extract the PFNA/PFNA-II blade by applying gentle blows with the combined hammer.

**Notes:**

- If the extraction of the PFNA/PFNA-II blade is difficult, remove the locking bolt and the end cap and mobilize the nail to loosen the nail-blade connection.
- To detach the blade from the bone use light hammer blows to slightly drive in the blade before removal of the blade.

Use the key for PFNA blade to detach the blade from the extraction screw if necessary.

**Note:** If the removal of the PFNA/PFNA-II blade is not possible with the standard instruments use the special instruments from the PNFA/PFNA-II Blade Extraction Set and the corresponding surgical technique (DSEM/TRM/0816/0727).
2

Remove end cap

**Instruments**

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<thead>
<tr>
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<tbody>
<tr>
<td>356.717</td>
<td>Guide Wire Ø 2.8 mm, length 460 mm, with Hook</td>
</tr>
<tr>
<td>356.715</td>
<td>Socket, hexagonal Ø 11.0/11.0 mm, cannulated, for AFN</td>
</tr>
<tr>
<td>321.160</td>
<td>Combination Wrench Ø 11.0 mm</td>
</tr>
</tbody>
</table>

Insert the hook of the guide wire with hook through the end cap. Guide the cannulated hexagonal socket over the guide wire to the end cap.

Remove the end cap with the combination wrench.
3

Remove locking bolt and nail

Instruments

<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>03.010.000</td>
<td>Extraction Screw, for Tibial and Femoral Nails</td>
</tr>
<tr>
<td>03.010.170</td>
<td>Hammer Guide</td>
</tr>
<tr>
<td>314.260</td>
<td>Screwdriver, hexagonal, large, Ø 3.5 mm, with Groove, length 300 mm</td>
</tr>
<tr>
<td>03.010.112</td>
<td>Holding Sleeve, with Locking Device</td>
</tr>
<tr>
<td>03.010.124</td>
<td>Combined Hammer 500 g, can be mounted, for No. 357.117</td>
</tr>
</tbody>
</table>

Before removing the locking bolt, screw the extraction screw into the proximal end of the PFNA/PFNA-II nail and tighten it. Then screw the hammer guide into the extraction screw.

Remove the locking bolt with the hexagonal screwdriver. Mount the holding sleeve onto the hexagonal screwdriver to facilitate removal of the locking bolt.

**Note:** If removal of the locking bolt is not possible and/or in case of broken locking bolts the Screw Extraction Set and the corresponding handling technique (036.000.918) is recommended.

Extract the nail by applying gentle blows with the combined hammer.

**Note:** Remove the locking bolt after screwing the hammer guide into the PFNA/PFNA-II. Thereby a rotation of the PFNA/PFNA-II in the bone will be avoided.
Alternative Technique – Extraction Hook

For removal of broken nail

<table>
<thead>
<tr>
<th>Instruments</th>
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</tr>
</thead>
<tbody>
<tr>
<td>355.399* Extraction Hook</td>
<td>Extraction Hook Ø 3.7 mm, for Cannulated Nails</td>
</tr>
<tr>
<td>393.100 or 393.105 Universal Chuck</td>
<td>Universal Chuck with T-Handle</td>
</tr>
<tr>
<td>or Universal Chuck, small,</td>
<td>with T-Handle</td>
</tr>
<tr>
<td>with T-Handle</td>
<td></td>
</tr>
</tbody>
</table>

Begin with Steps 1 and 2 of Implant Removal, then remove the extraction screw from the nail.

* Available nonsterile or sterile-packed. Add "S" to catalog number to order sterile product.
Option 1

1
Assemble extraction hook and universal chuck

Insert the extraction hook into the universal chuck with T-handle. The hook should be parallel with the T-handle. This facilitates visualization of the hook position in the bone.

2
Insert extraction hook through nail

Pass the extraction hook through the cannula of the nail, including the distant fragment.

Note: Under image intensification, verify that the hook has passed through and engaged the distant end of the nail.

3
Extract nail

Extract both nail fragments.

Note: Keep the patient's limb restrained to increase the efficiency of the extraction force.
Option 2

1  
Remove near nail fragment

Attach the appropriate extraction bolt or extraction screw to the nail. Remove the near nail fragment using the extraction bolt or extraction screw.

**Note:** The extraction hook can be used as an alternative to extraction instrumentation.

2  
Ream canal

Ream the medullary canal 1 mm larger than the nail diameter to clear a path for the distant nail fragment.

3  
Align extraction hook

Insert the extraction hook and explanted near nail fragment into the medullary canal. The near nail fragment aligns the extraction hook with the cannulation of the distant nail fragment.
4 Engage distant fragment

Pass the extraction hook through the cannula of the distant nail fragment.

**Note:** Under image intensification, verify that the hook has passed through and engaged the distant end of the nail.

5 Extract nail

Extract both nail fragments.

**Note:** Keep the patient's limb restrained to increase the efficiency of the extraction force.
### General Instruments

<table>
<thead>
<tr>
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<tr>
<td>03.010.000</td>
<td>Extraction Screw, for Tibial and Femoral Nails</td>
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<td>Holding Sleeve, with Locking Device</td>
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<td>Hammer Guide</td>
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<td>314.260</td>
<td>Screwdriver, hexagonal, large, Ø 3.5 mm, with Groove, length 300 mm</td>
</tr>
<tr>
<td>321.160</td>
<td>Combination Wrench Ø 11.0 mm</td>
</tr>
<tr>
<td>356.715</td>
<td>Socket, hexagonal Ø 11.0/11.0 mm, cannulated, for AFN</td>
</tr>
<tr>
<td>356.717</td>
<td>Guide Wire Ø 2.8 mm, length 460 mm, with Hook</td>
</tr>
<tr>
<td>356.830</td>
<td>Guide Wire Ø 3.2 mm, for PFNA Blade</td>
</tr>
</tbody>
</table>
Instruments for PFN Removal

- **357.051** Coupling Screw, for Nos. 357.053 and 357.048
- **357.054** T-Handle, for No. 357.053

Instruments for TFN Removal

- **357.378** Extraction Instrument for Helical Blade for TFN
- **357.396** Extraction Screw for TFN
- **357.415** Shaft, hexagonal Ø 5.0 mm, length 210 mm

Instruments for TFN Removal

- **321.170** Pin Wrench Ø 4.5 mm, length 120 mm
- **357.039** Guide Wire Ø 2.8 mm with threaded tip with trocar, length 350 mm
- **357.053** Wrench for Femoral Neck Screw, complete
- **357.055** Screwdriver, hexagonal, cannulated, for PFN
Instruments

357.073 Extraction Holding Sleeve for Hip Pin

357.377 Connecting Screw for Helical Blade for TFN

357.428 Inserter/Extractor for TFN Femoral Neck Screw

Instruments for PFNA/PFNA-II Removal

356.832 Key for PFNA Blade

03.010.411 Extraction Screw for PFNA Blade

Instrument for Broken Nail Removal

355.399 Extraction Hook Ø 3.7 mm, for Cannulated Nails

393.100 Universal Chuck with T-Handle

393.105 Universal Chuck, small, with T-Handle
### Optional Instruments

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>03.010.107</td>
<td>Screwdriver Stardrive, T25, length 330 mm</td>
</tr>
<tr>
<td>03.010.110</td>
<td>Screwdriver Stardrive, T40, cannulated, length 300 mm</td>
</tr>
<tr>
<td>321.200</td>
<td>Ratchet Wrench for Nut, hexagonal, 11.0 mm</td>
</tr>
<tr>
<td>356.830S</td>
<td>Guide Wire Ø 3.2 mm, for PFNA Blade, sterile</td>
</tr>
<tr>
<td>68.010.180</td>
<td>Vario Case for Instruments for Removal of Proximal Femoral Nails</td>
</tr>
<tr>
<td>68.010.180.01</td>
<td>Bottom, size 1/1, for Vario Case No. 68.010.180</td>
</tr>
<tr>
<td>68.010.180.02</td>
<td>Insert, size 1/1, for Vario Case No. 68.010.180</td>
</tr>
</tbody>
</table>