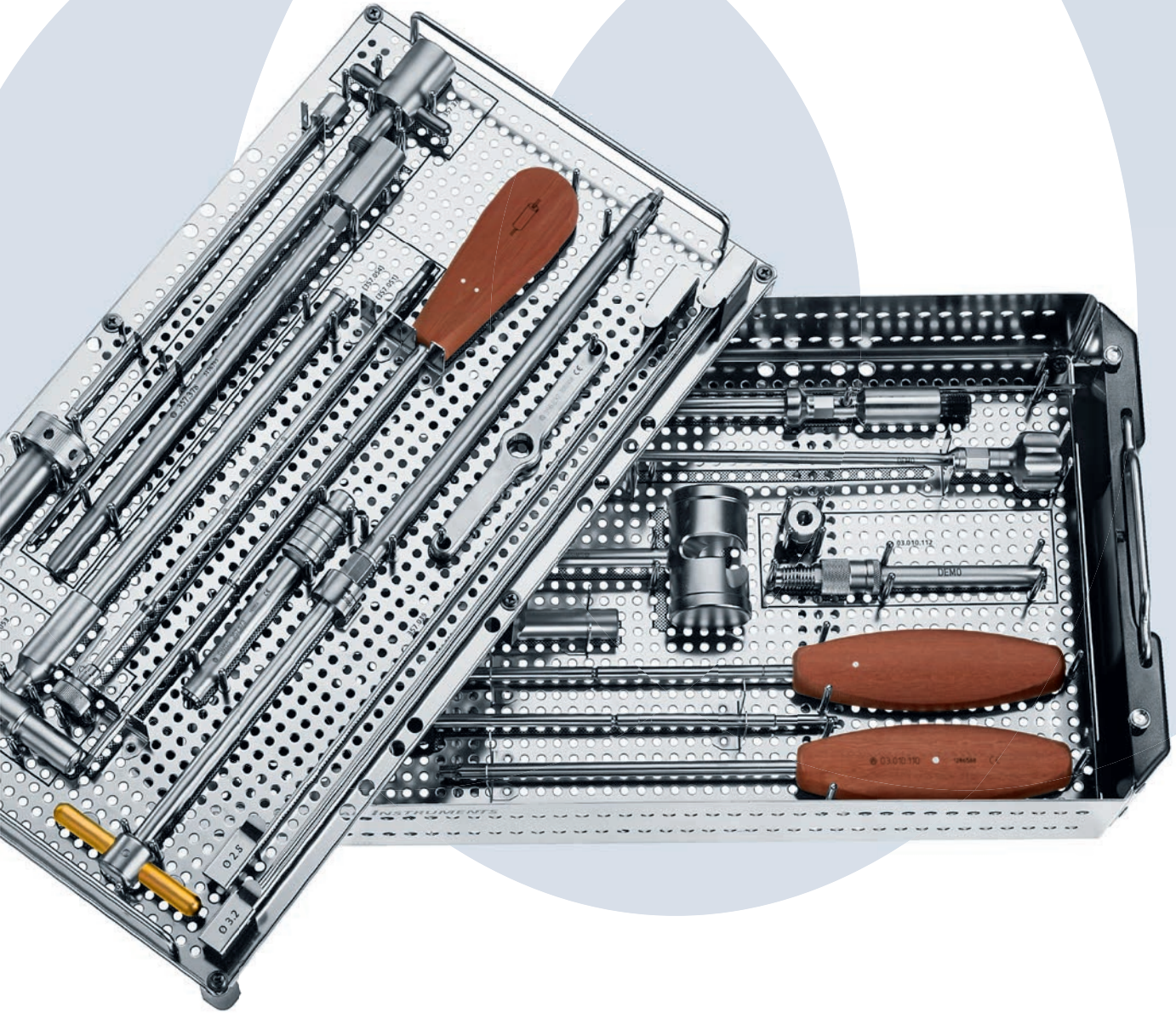
DePuy Synthes

PART OF THE Johnson & Johnson FAMILY OF COMPANIES

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.

SURGICAL TECHNIQUE

Image intensifier control

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.depuysynthes.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.depuysynthes.com/hcp/reprocessing-care-maintenance

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REMOVAL OF IMPLANTS

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

Rüedi TP et al (2007): Implant removal.
AO Principles of Fracture Management, Volume 1 – Principles: 729–731

Müller-Färber J (2003): Die Metallentfernung nach Osteosynthesen. In: Der Orthopäde, Book 11:1039–1058

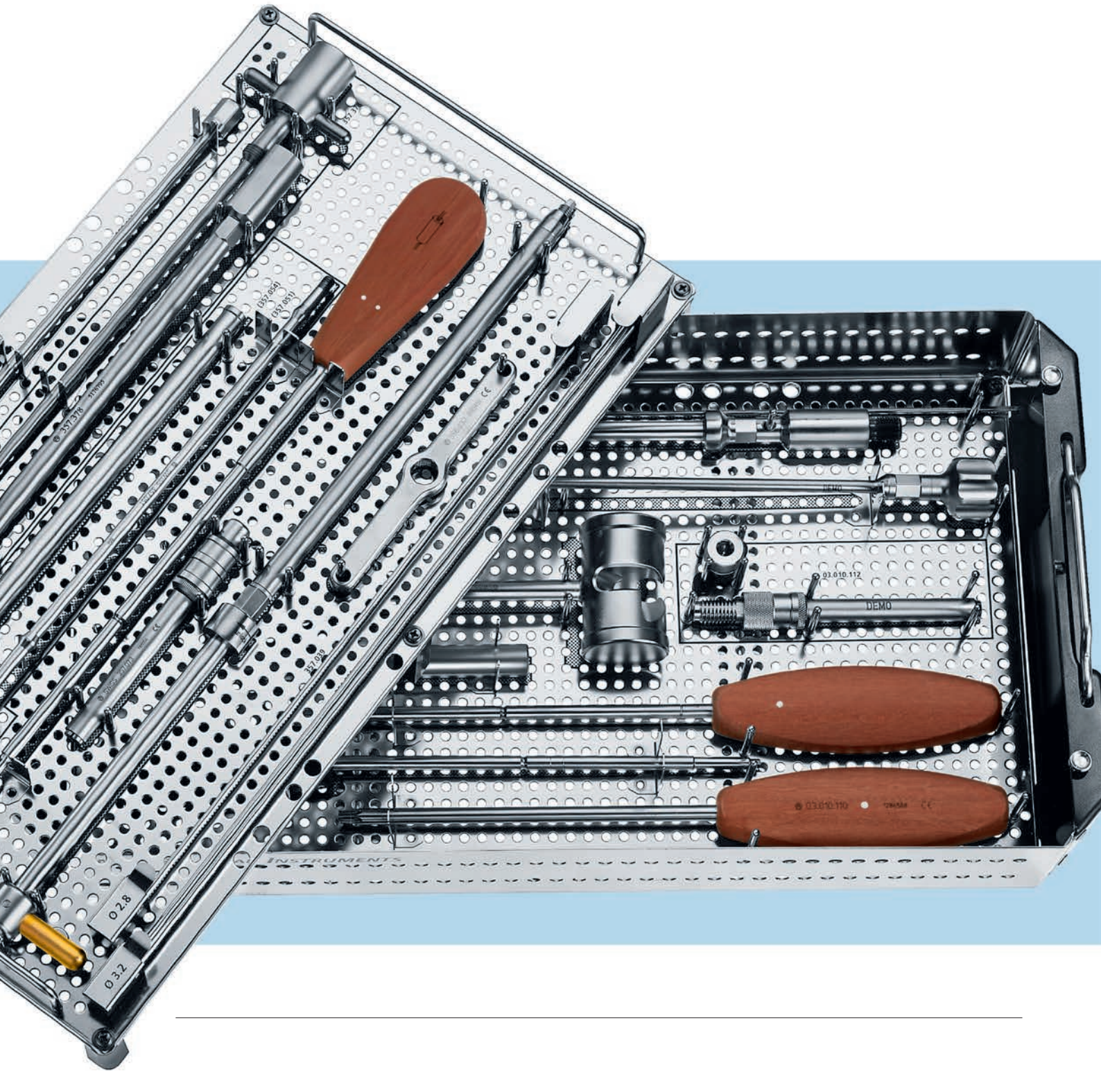
PROXIMAL FEMORAL NAIL REMOVAL SET

for PFN, TFN and PFNA/PFNA-II

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, screwdrivers) 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

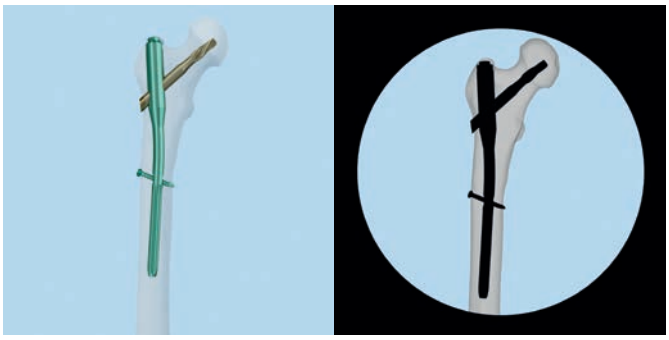
- TFN
  short, standard and long titanium trochanteric fixation nail
- PFN
  extra small, small, standard and long proximal femoral nail
- PFNA
  extra small, small, standard and long proximal femoral nail antirotation
- PFNA-II
  extra small, small, standard and long proximal femoral nail antirotation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

PREOPERATIVE PLANNING

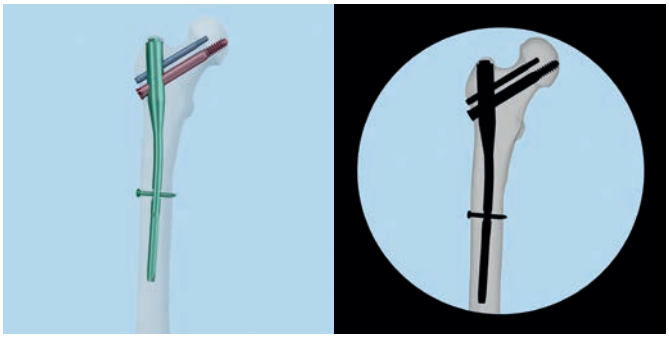
Identification of nailing system

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), 10/11/12 (extra-small)
- Lengths: 170 mm (small), 235 mm (standard), 300–460 mm with 20 mm increments (long)



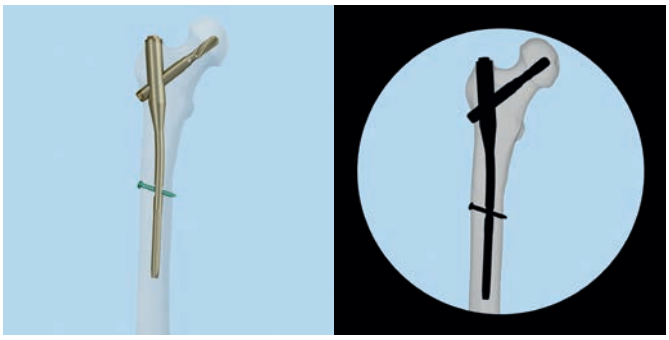
PFN – Proximal Femoral Nail
Specific characteristics:
- Femoral neck screw (∅ 11 mm) and hip pin (∅ 6.5 mm) for proximal locking
- 6° lateral angle and 17.0 mm proximal diameter of the nail
- Distal diameters: 10/11/12 (xs), 10/11 mm (small), 10/11/12 mm (standard), 10/12/14 mm (long)
- Lengths: 170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



PFNA – Proximal Femoral Nail Antirotation

Specific characteristics:

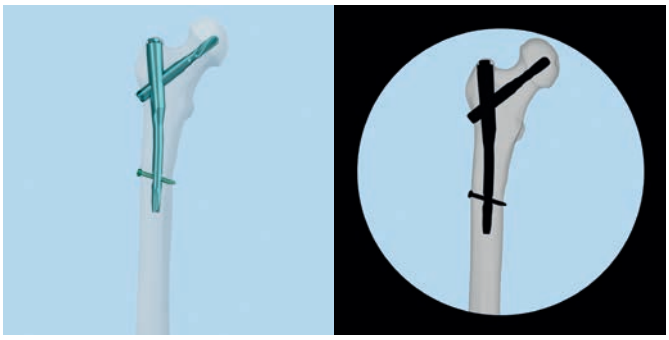
- Helical blade for proximal locking
- 6° lateral angle and 16,5 mm (xs/small), 17.0 mm (standard/long) proximal diameter of the nail
- Distal diameters: 9/10/11/12 mm (short), 9/10/12/14 mm (long)
- Lengths: 170 mm (xs), 200 mm (small), 240 mm (standard), 300–420 mm with 20 mm increments (long)



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)



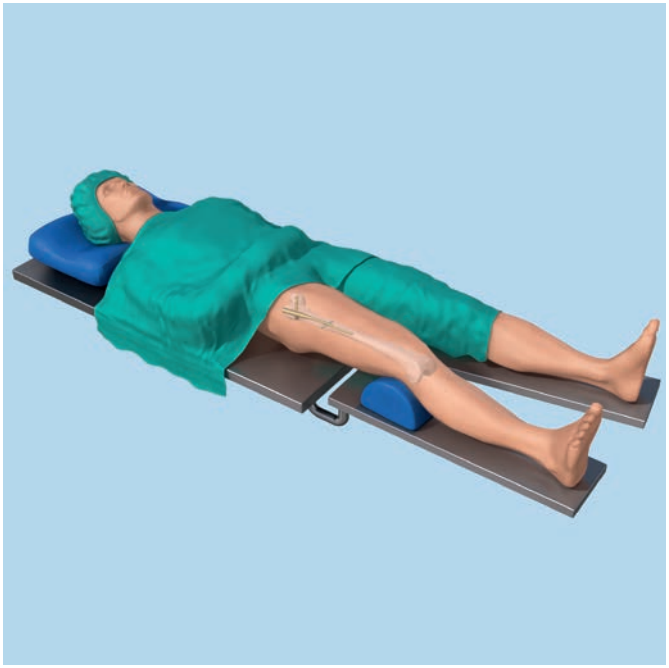
PATIENT POSITIONING

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.

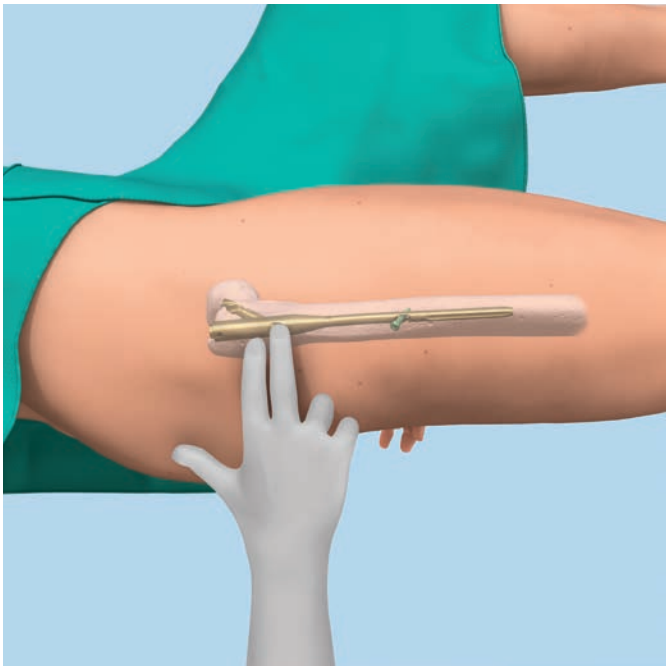
For an unimpeded access to the medullary cavity, abduct the upper body by about 10–15° to the unaffected side (or adduct the affected leg by 10–15°).

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.



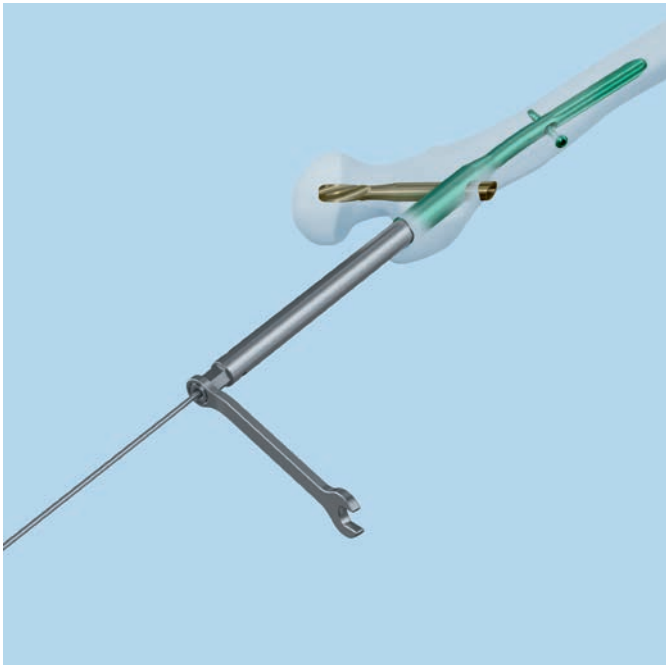
TFN IMPLANT REMOVAL

1
Remove end cap

Instruments	
356.717	Guide Wire ∅ 2.8 mm, length 460 mm, with Hook
356.715	Socket, hexagonal ∅ 11.0/11.0 mm, cannulated, for AFN
321.160	Combination Wrench ∅ 11.0 mm

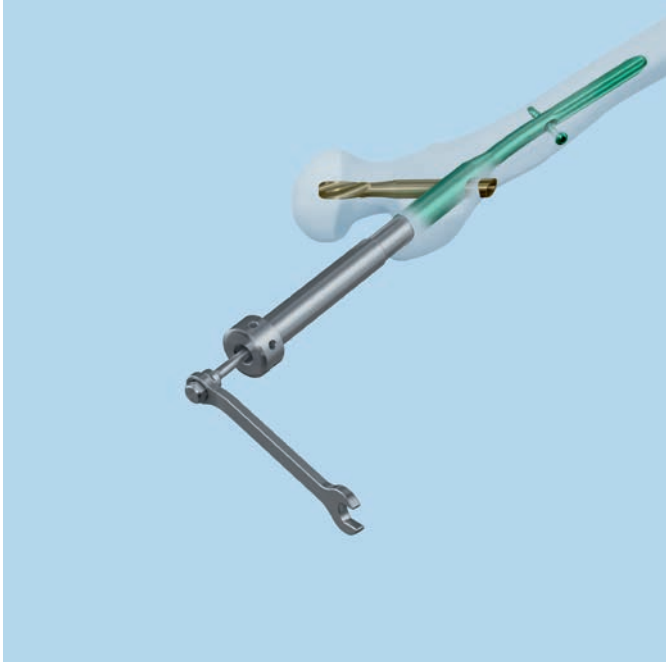
Insert the hook of the guide wire with through the end cap. Guide the cannulated hexagonal socket over the guide wire to the end cap.

Remove the end cap with the combination wrench.



2
Disengage the locking mechanism

Instruments	
357.396	Extraction Screw for TFN
357.415	Shaft, hexagonal ∅ 5.0 mm, length 210 mm
321.160	Combination Wrench ∅ 11.0 mm



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.**

3

Option A
Remove the helical blade and locking bolt/screw

Instruments	
357.378	Extraction Instrument for Helical Blade for TFN
03.010.170	Hammer Guide
03.010.124	Combined Hammer 500 g, can be mounted, for No. 357.117
314.260	Screwdriver, hexagonal, large, ∅ 3.5 mm, with Groove, length 300 mm
03.010.112	Holding Sleeve, with Locking Device

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.

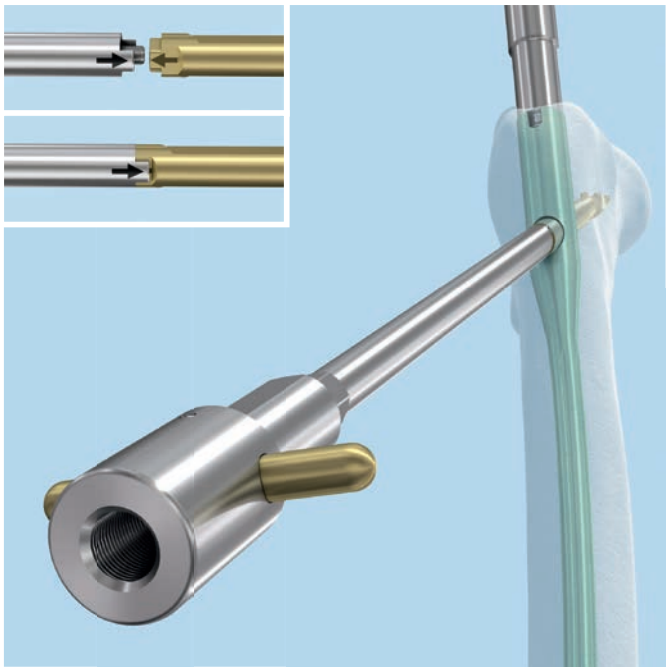
Note: **To detach the blade from the bone use light hammer blows to slightly drive in the blade before removal of the blade.**

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	
357.377	Connecting Screw for Helical Blade for TFN
357.428	Inserter/Extractor for TFN Femoral Neck Screw
314.260	Screwdriver, hexagonal, large, ∅ 3.5 mm, with Groove, length 300 mm



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.

PFN IMPLANT REMOVAL

1
Remove end cap

Instruments	
356.717	Guide Wire ∅ 2.8 mm, length 460 mm, with Hook
356.715	Socket, hexagonal ∅ 11.0/11.0 mm, cannulated, for AFN
321.160	Combination Wrench ∅ 11.0 mm

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.

2
Remove femoral neck screw and hip pin

Instruments	
357.039	Guide Wire 2.8 mm with threaded tip with trocar, length 350 mm
03.010.000	Extraction Screw, for Tibial and Femoral Nails
357.051	Coupling Screw, for Nos. 357.053 and 357.048
357.053	Wrench for Femoral Neck Screw, complete
357.054	T-Handle, for No. 357.053
357.055	Screwdriver, hexagonal, cannulated, for PFN
357.073	Extraction Holding Sleeve for Hip Pin
314.260	Screwdriver, hexagonal, large, ∅ 3.5 mm, with Groove, length 300 mm
03.010.112	Holding Sleeve, with Locking Device

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

Instruments	
03.010.170	Hammer Guide
03.010.124	Combined Hammer 500 g, can be mounted, for No. 357.117
321.170	Pin Wrench ∅ 4.5 mm, length 120 mm

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.

PFNA/PFNA-II IMPLANT REMOVAL

1
Remove PFNA/PFNA-II blade

Instruments	
356.830	Guide Wire ∅ 3.2 mm, for PFNA Blade
03.010.411	Extraction Screw for PFNA Blade
03.010.124	Combined Hammer 500 g, can be mounted, for No. 357.117
356.832	Key for PFNA Blade

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 anti-clockwise 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.

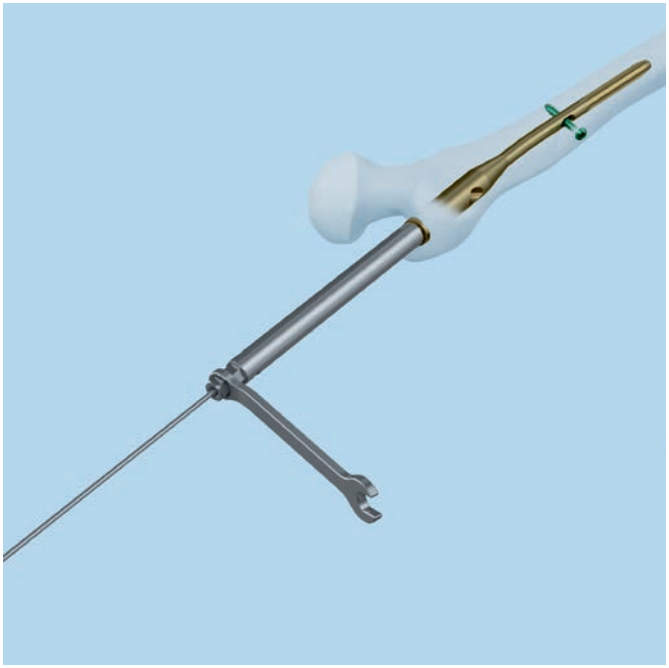
Note: If the removal of the PFNA/PFNA-II blade is not possible with the standard instruments use the special instruments from the PNFA/PFNA-II Blade Extraction Set and the corresponding surgical technique (DSEM/TRM/0816/0727).

2
Remove end cap

Instruments	
356.717	Guide Wire ∅ 2.8 mm, length 460 mm, with Hook
356.715	Socket, hexagonal ∅ 11.0/11.0 mm, cannulated, for AFN
321.160	Combination Wrench ∅ 11.0 mm

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	
03.010.000	Extraction Screw, for Tibial and Femoral Nails
03.010.170	Hammer Guide
314.260	Screwdriver, hexagonal, large, ∅ 3.5 mm, with Groove, length 300 mm
03.010.112	Holding Sleeve, with Locking Device
03.010.124	Combined Hammer 500 g, can be mounted, for No. 357.117

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.

BROKEN NAIL REMOVAL

Alternative Technique – Extraction Hook

For removal of broken nail

Instruments	
355.399*	Extraction Hook ∅ 3.7 mm, for Cannulated Nails
393.100	Universal Chuck with T-Handle
or	
393.105	Universal Chuck, small, with T-Handle

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.

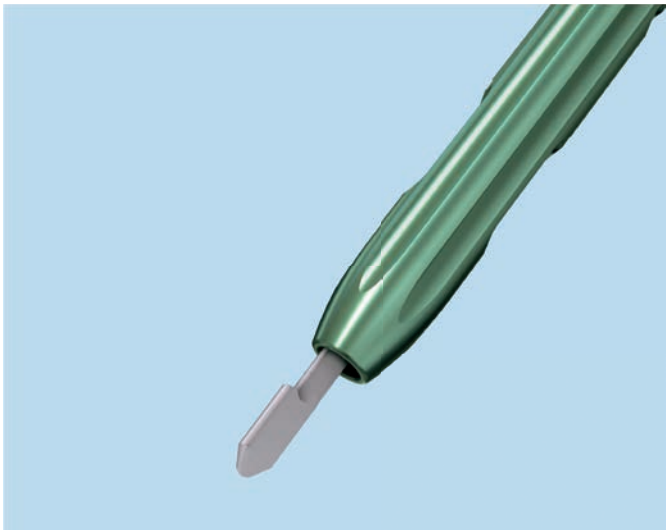
3
Align extraction hook

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.**

INSTRUMENTS

General Instruments

03.010.000	Extraction Screw, for Tibial and Femoral Nails	
03.010.112	Holding Sleeve, with Locking Device	
03.010.124	Combined Hammer 500 g, can be mounted, for No. 357.117	
03.010.170	Hammer Guide	
314.260	Screwdriver, hexagonal, large, ∅ 3.5 mm, with Groove, length 300 mm	
321.160	Combination Wrench ∅ 11.0 mm	
356.715	Socket, hexagonal ∅ 11.0/11.0 mm, cannulated, for AFN	
356.717	Guide Wire ∅ 2.8 mm, length 460 mm, with Hook	
356.830	Guide Wire ∅ 3.2 mm, for PFNA Blade	

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 ∅ 5.0 mm, length 210 mm	

Instruments for TFN Removal

321.170	Pin Wrench ∅ 4.5 mm, length 120 mm	
357.039	Guide Wire ∅ 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	

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	

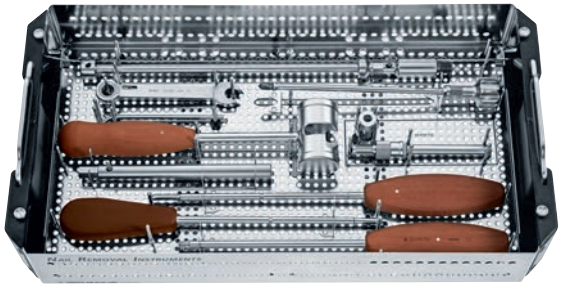
Instrument for Broken Nail Removal

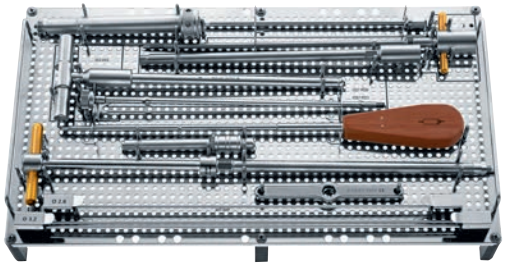
355.399	Extraction Hook ∅ 3.7 mm, for Cannulated Nails	
393.100	Universal Chuck with T-Handle	
393.105	Universal Chuck, small, with T-Handle	

SETS

Optional Instruments

03.010.107	Screwdriver Stardrive, T25, length 330 mm
03.010.110	Screwdriver Stardrive, T40, cannulated, length 300 mm
321.200	Ratchet Wrench for Nut, hexagonal, 11.0 mm
356.830S	Guide Wire ∅ 3.2 mm, for PFNA Blade, sterile
68.010.180	Vario Case for Instruments for Removal of Proximal Femoral Nails
68.010.180.01	Bottom, size 1/1, for Vario Case No. 68.010.180
68.010.180.02	Insert, size 1/1, for Vario Case No. 68.010.180





DePuy Synthes
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