MARQUARDT
Medizintechnik

VITUS-PF
Proximal Femoral Nailing System

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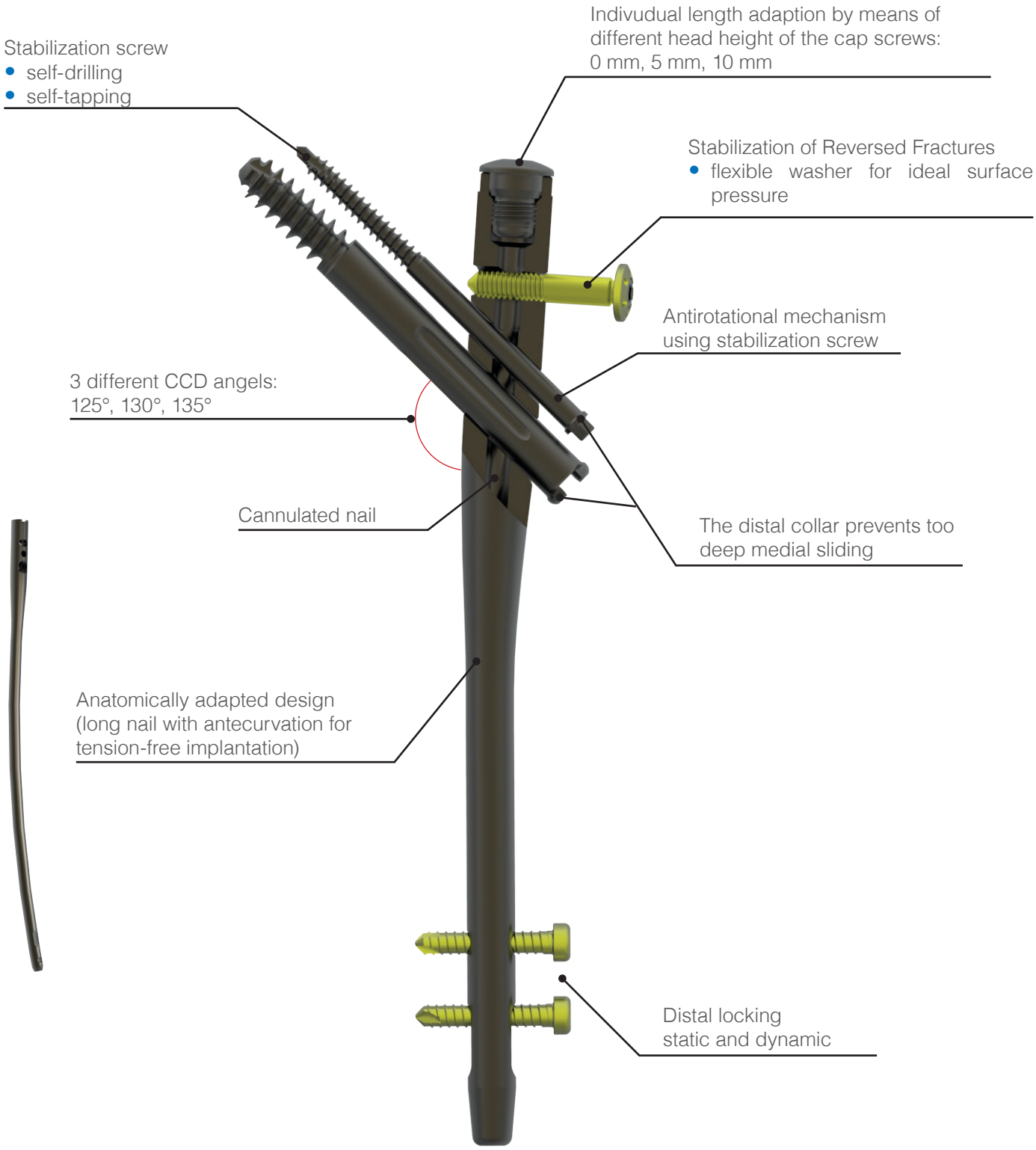
Note:

The surgery instructions outlined below reflect the surgical procedure usually chosen by the clinical consultant. However, each surgeon must decide individually which course of action offers the best chance of success in the individual case.

Introduction

VITUS-PF Product Specifications

VITUS-PF using Hip Screw, Stabilization Screw, Reversed-Fracture Screw as well as Locking Screw



VITUS-PF using Hip Screw as well as Blocking Screw

1. Indications for the short VITUS-PF Femoral Nail

- Fractures of the trochanteric region (Type 31A1-3 according to the AO classification)
- Transcervical femoral neck fractures
- High subtrochanteric fractues

Fracture zone

2. Contraindications

- Low subtrochanteric fractures
- Fractures of the femoral shaft
- Isolated medial femoral neck fractures

1. Indications for the long VITUS-PF Femoral Nail

- Low and extensive subtrochanteric fractures
- Combined fractures of the trochanteric area and the femoral shaft
- Pathological fractures

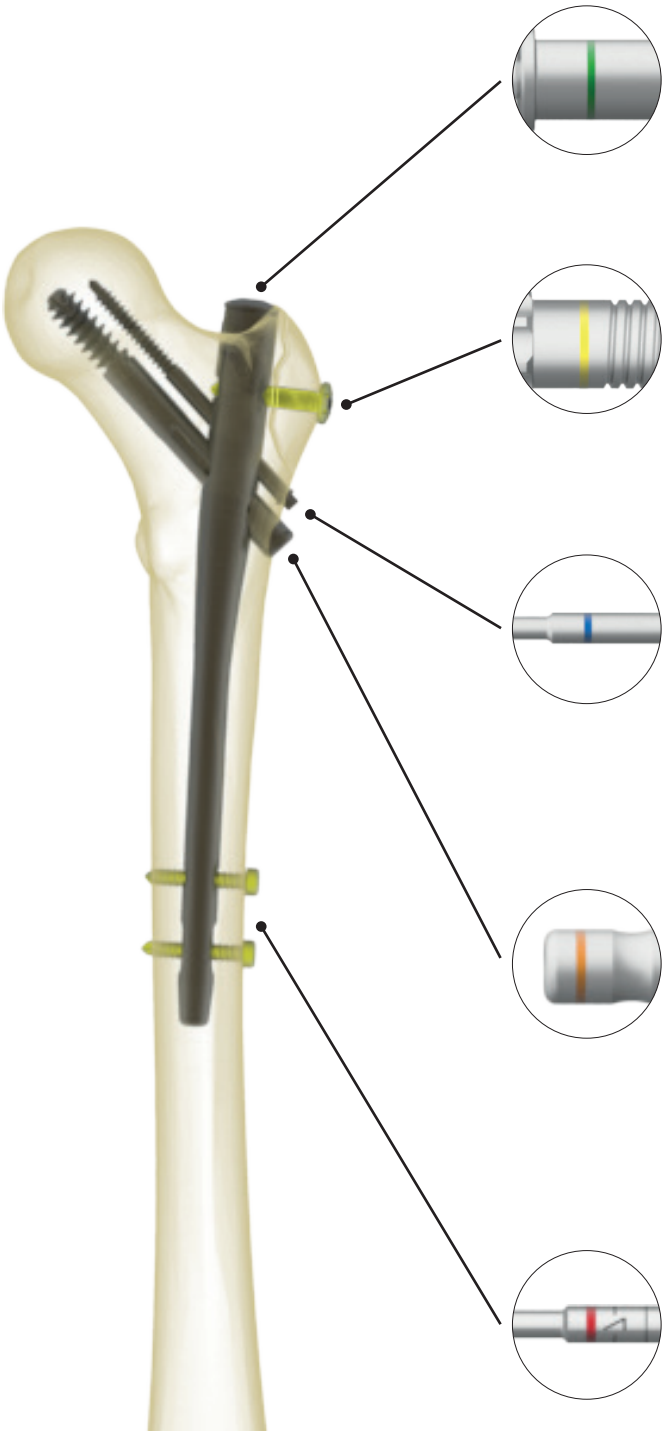
Fracture zone

2. Contraindications

- Isolated or combined medial femoral neck fractures
- Condylar fractures

VITUS-PF Colour coding

The colour coding of the VITUS-PF System distinguishes the different operation steps in order to ensure a faster identification of the instruments during the surgery.



Access and opening of the trochanter (GREEN):

- Medullary Drill Ø 15.5 mm
- Trocar Ø 15.5 mm
- Protection Sleeve

Insertion of the Reversed Fracture Screw (YELLOW):

- Guide Sleeve
- Fixation Screw
- Trocar Ø 12.0 mm
- Length Determination Device
- Screwdriver, hex 3.5 mm

Insertion of the Stabilization Screw (BLUE):

- Drill Bit for Stabilization Screws
- Assembling Screw
- Inserter for Stabilization Screws
- Wrench
- Double Drill Sleeve

Insertion of the Hip Screw (ORANGE):

- Trocar Ø 12.0 mm
- Centering Sleeve Ø 3.2 mm
- Compression Sleeve
- Length Determination Device for Guide Wires
- Coupling Screw for Hip Screws
- Step Reamer for Hip Screws
- Wrench for Hip Screws
- Double Drill Sleeve

Distal Locking (RED):

- Protection Sleeve
- Drill Sleeve
- Trocar Ø 4.35 mm
- Drill Bit for Distal Locking
- Screwdriver, hex 3.5 mm

Surgical Technique

Repositioning of the Fracture and Positioning of the Patient

- The patient is positioned in the extended supine position with 10 - 15° adduction on an X-Ray transparent operation table.
- Closed manual fracture repositioning by pulling should be primarily attempted until approximately full repositioning is achieved.
- Fracture repositioning must be verified by X-ray fluoroscopy in two planes.
- In the event that a correct manual fracture repositioning by pulling is impossible, open repositioning is recommended.
- The healthy leg should be placed in a cushioned leg rest in abduction and outer rotation. Thus, an optimal imaging by the mobile image transducer can be achieved in both axial and A-P directions.

Positioning of the Image Transducer

- The image transducer should be placed whenever possible in such a way that by uncomplicated rotation by 90° the trochanteric region and the femoral neck can be visualised in two planes.
- The femoral neck of the leg that is about to undergo the operation can be used as reference line for the rotation axis of the image transducer.

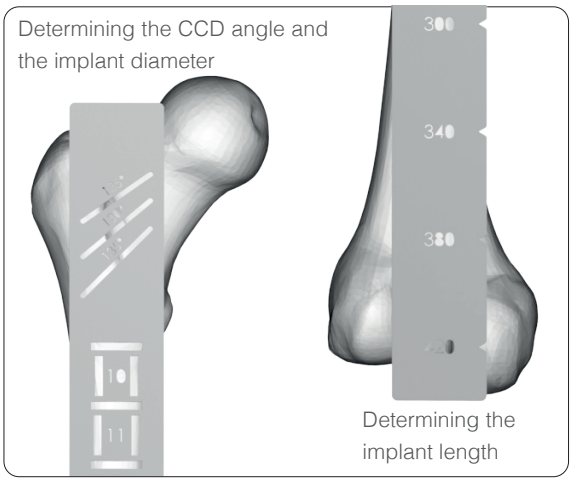
Note:
The proximal and distal end of the nail should be displayed without interference.

Implant Selection

Instruments

REF 09.20010.480 *X-Ray Template*

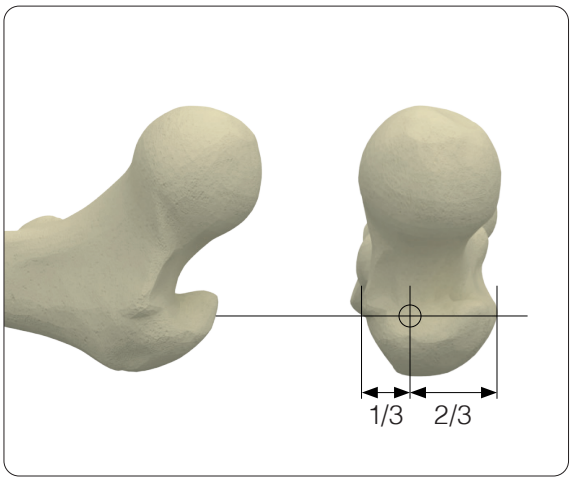
- The CCD angle, the diameter as well as the length of the VITUS-PF nail can be determined by means of the X-Ray template.

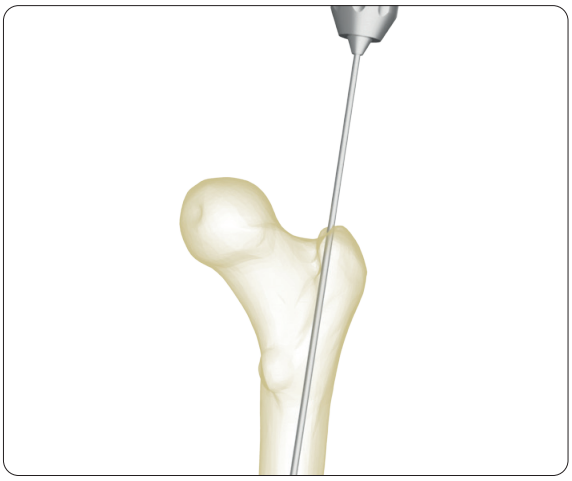


Access

- A 4.5 cm long longitudinal incision proximally to the trochanter major, pointing cranially.
- Sharp penetration down to the fascia lata, longitudinal splitting of the fascia.
- The middle gluteus muscle is bluntly pushed aside along the course of its fibres until the apex of the trochanter major can be felt.

Note:
In adipose patients, the skin incision must sometimes be enlarged.





Access to the Medullary Cavity (Entry Point of the Nail):

Instruments

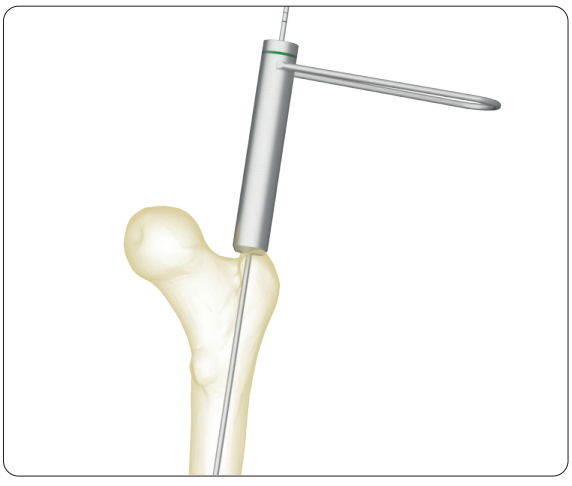
REF 06.20050.045 *Universal Chuck*
REF 09.20120.012S *Guide Wire Ø 3.2 mm*

- Using imaging control in both planes, the point of entry for the nail should be first determined by the guide wire.
- The guide wire is inserted 150 mm deep into the medullary cavity and, thus, the fractured segments are threaded.

Note:

In order to avoid a varus misalignment, special attention must be paid, particularly in multi-fragment fractures, that the cortical entry is properly drilled.

- The correct point of entry is located centrally above the highest point of the trochanter major at the border line between the anterior third and the posterior trochanteric region.
- If the guide wire is falsely placed, it should be replaced on the trochanteric apex and drilled into the medullary cavity .



Opening of the Trochanter major

Variant I: Opening using the Medullary Drill

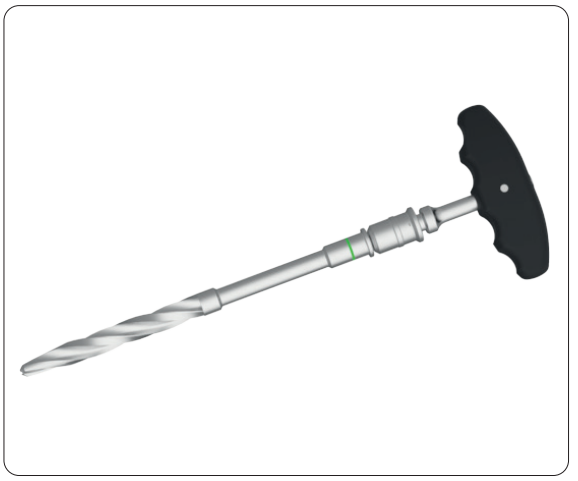
Instruments

REF 09.20010.245 *Protection Sleeve*
REF 09.20010.257 *Trocar Ø 15.5 mm*

- The trocar is inserted into the protection sleeve of the 15.5 mm medullary drill.
- The assembled instrument is inserted through the soft tissue coating onto the trochanteric apex using the guide wire.
- Subsequently, the trocar is removed.

Instruments

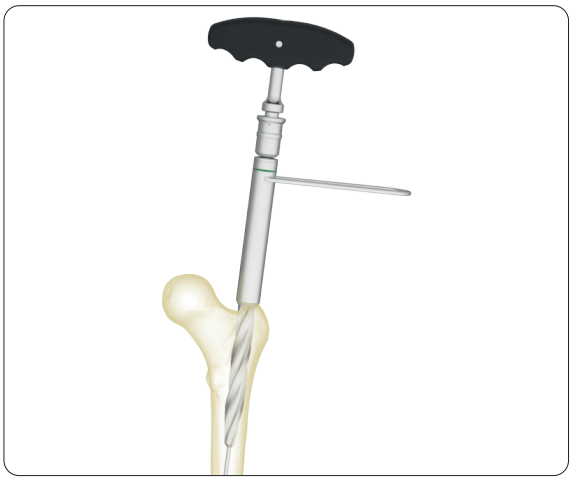
REF 09.20010.235 *Medullary Drill Ø 15.5 mm*
REF 09.20010.270 *T-Handle*



- The T-Handle is assembled with the medullary drill.
- The medullary drill is then inserted over the guide wire through the protection sleeve.
- The opening of the trochanter is performed manually using moderate pressure by rotating the drill clockwise.
- The drilling procedure is continued until the stopper of the drill bit touches the protection sleeve.
- By the conical shape of the medullary drill, the bone canal for the nail is prepared in the proximal part of the femur.

Note:

Because of the very long infeed of the medullary drill, it is recommended to always perform the opening of the trochanter major manually.



- After opening the medullary cavity, the medullary drill and the protection sleeve can be removed.
- The guide wire stays in the medullary cavity.

Note:

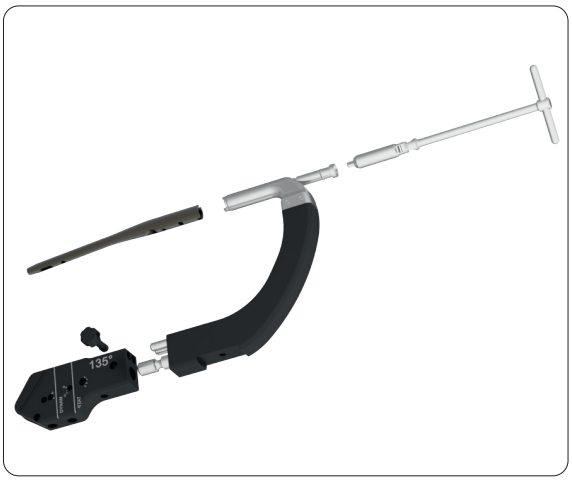
If the distal portion of the medullary cavity is smaller than or equal to the ø 10 mm VITUS-PF nail, it is recommended to further drill the distal medullary cavity by means of commercially available medullary drills, whereby tension, which could cause fractures of the distal cortical bone, can be avoided.

Variant II: Opening by Awl

Instruments

REF 09.20010.401 *Awl*

- The trochanter can also be opened using the awl located on the tray, followed by distal medullary cavity drilling.



Assembling the Targeting Device

Assembling the Targeting Device with the Targeting Module:

Instruments

REF 09.20010.100	*Targeting Device*
REF 09.20010.110	*Targeting Module125°*
REF 09.20010.120	*Targeting Module130°*
REF 09.20010.130	*Targeting Module135°*
REF 09.20010.150	*Fixation Eccenter for Targeting Modules*

- The choice of the nail as planned prior to the operation is compared with the intraoperative data. The implant is determined by the femoral neck angle to be reconstructed and by the nail diameter. .
- After choosing the appropriate nail, the targeting module (CCD angle 125° / 130° / 135°) envisioned for the nail is adapted onto the targeting device and fixed by means of the fixation eccenter.

Note:

The fixation eccenter should only be fastened manually.

Assembling the Targeting Device with the VITUS-PF Nail:

Instruments

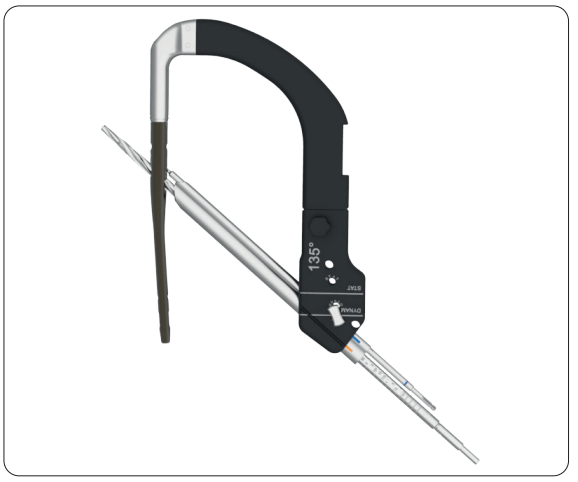
REF 09.20010.141	*Coupling Screw for Nails*
REF 09.20010.230	*Socket Wrench with Cardan Joint*

- The coupling screw for adapting the nail is initially screwed into the targeting device. Thus, it can be warranted that the screw cannot loosen and fall while the nail is fixed on the targeting device.
- The nail is brought to its proper position over the grooves and the coupling screw is screwed into the targeting device by means of the socket wrench.

Note:

For fixing, the nail can be screwed onto the coupling screw by one or two full turns performed by hand before it is finally positioned in the grooves of the targeting device.

Verifying the Compatibility between Nail and Targeting Module



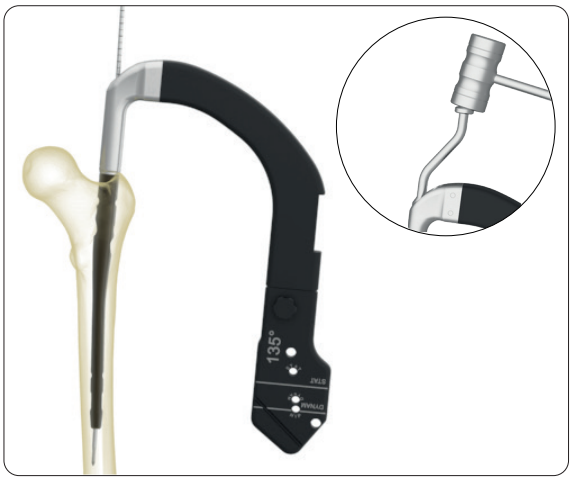
Instruments

REF 09.20010.200 *Double Drill Sleeve*
REF 09.20010.265 *Step Reamer for Hip Screws*
REF 09.20010.280 *Drill Bit for Stabilization Screws*

- Prior to the implantation of the nail, it should be verified that the nail and the targeting module are mutually compatible.
- The test is performed using the step reamer for hip screws and the drill bit for stabilization screws.
- For this purpose, the double drill sleeve is mounted onto the targeting module and both drills are gradually inserted into the appropriate drill sleeves of the double drill sleeve.
- The drills must pass the nail holes without resistance. Only then it is secured that the selected femoral neck angle of the targeting module is consistent with the nail.

Implanting the VITUS-PF Nails

Inserting the VITUS-PF Nail in the Proximal Femur



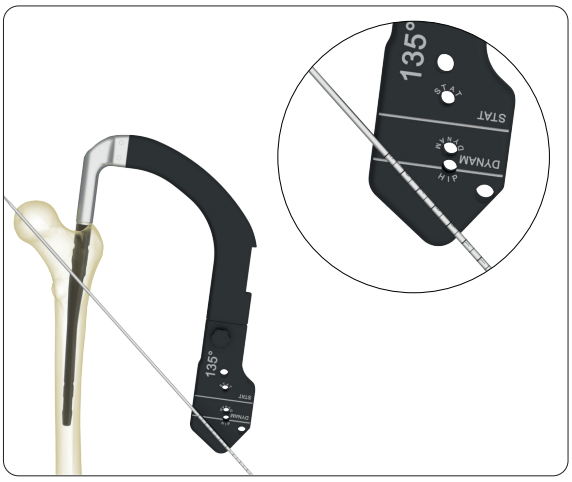
Instruments

REF 09.20010.390 *Impactor*

- The VITUS-PF nail is inserted into the femoral bone with fluoroscopic monitoring via the Ø 3.2 mm guide wire.
- The insertion is performed with slight rotational movements from proximal to distal.
- Alternatively, the impactor can be inserted into the targeting device in order to punch in the nail by gentle taps. For this purpose, the guide wire via which the nail has been inserted must be removed.

Note:
It must be verified that the nail can be inserted into the medullary cavity without tension. By no means should the nail be inserted by strokes on the targeting device.
In the event that tension is present while inserting the nail, further drilling of the medullary cavity is strongly recommended.

Note:
Prior to undertaking the next operative steps, the Ø 3.2 mm guide wire must be removed.

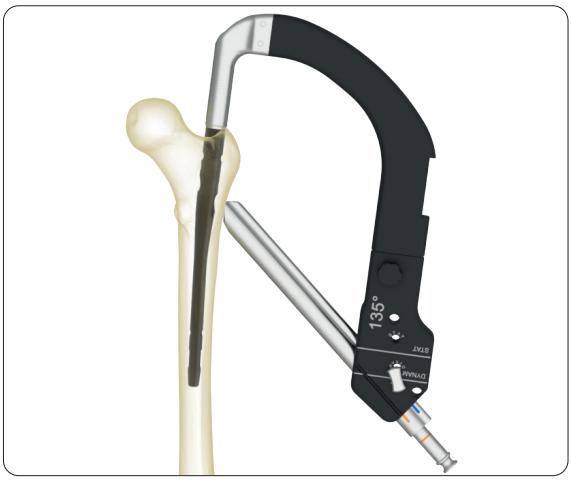


Using the Double Drill Sleeve

Instruments

REF 09.20120.012S *Guide Wire Ø 3.2 mm*

- The groove in the targeting module is designated to help the surgeon in determining the optimal position of the nail by placing the Ø 3.2 mm guide wire.
- This step is performed with fluoroscopic monitoring.

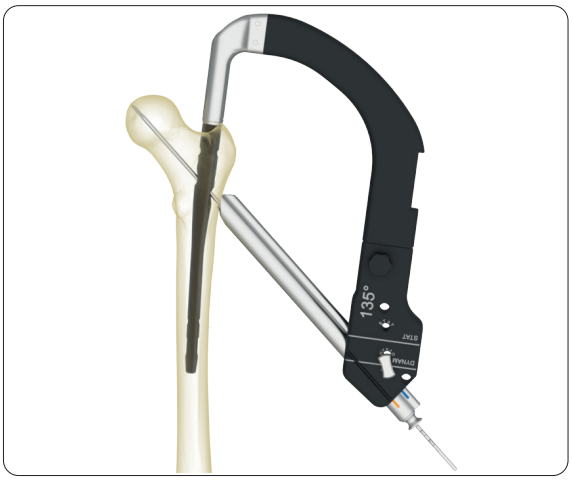


Inserting the Double Drill Sleeve

Instruments

REF 09.20010.200	*Double Drill Sleeve*
REF 09.20010.205	*Trocar Ø 12.0 mm*
REF 09.20010.160	*Fixation Eccenter for Drill Sleeves*
REF 09.20010.210	*Centering Sleeve Ø 3.2 mm*

- The double drill sleeve with the appropriate trocar is inserted under fluoroscopic control over the targeting module through a 4 cm incision into the lateral cortical bone.
- The double drill sleeve is locked in this position, in tight contact with the bone, by fastening the fixation eccenter.
- Subsequently, the trocar is removed and replaced by the centering sleeve.

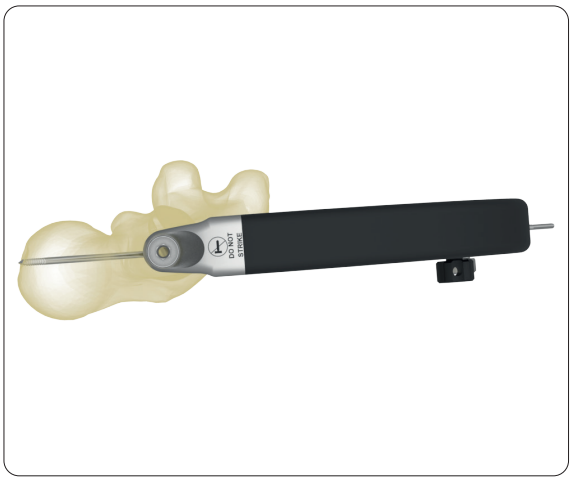


Inserting the Guide Wire

- The Ø 3.2 mm guide wire is inserted through the centering sleeve into the subchondral area of the femoral head under fluoroscopic monitoring using the image transducer in two planes.
- The guide wire can be placed in an area lying in the A-P beam path between the femoral calcar serving as caudal border and the middle of the femoral head as cranial border. In the axial beam path the wire should lie centrally. Positioning of the guide wire in the anterior or superior quadrant of the femoral head should be avoided to prevent the protrusion of the screws from the femoral head.
- At the end of the guide sleeve, the length of the femoral neck can be measured by the scale on the guide wire.

  Whereby: 8 = 80 mm, 10 = 100 mm etc.

Note:
In the event that the guide wire is not correctly placed in the femoral neck or if it was bent during the insertion, it must be repositioned. The guide wire should be removed and the nail position corrected concerning height or rotation.

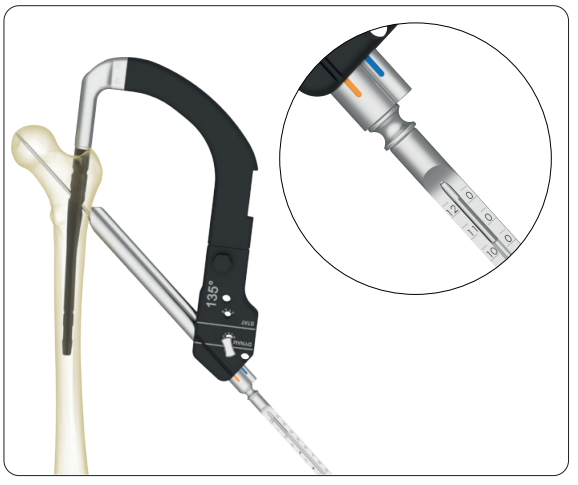


Determination of the Hip Screw Length

Instruments

REF 09.20010.350 *Length Determination Device for Guide Wires*

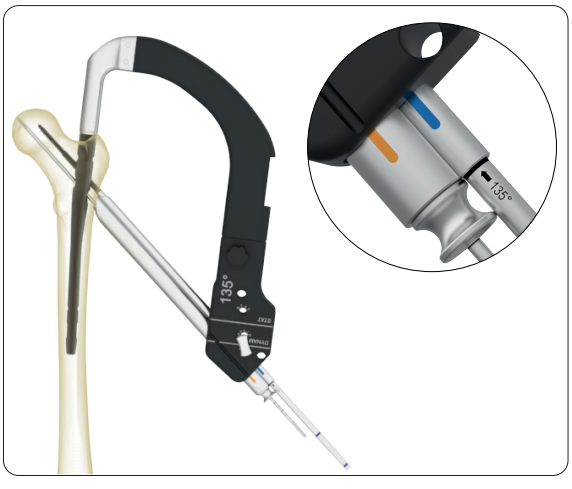
- In a similar manner, the length can be also measured on the length determination device.
- The length determination device is inserted over the Ø 3.2 mm guide wire and advanced until the guide sleeve.
- The length of the guide wire introduced into the bone can be read on the length determination device at the end of the guide wire.



Note:
The hip screw to be implanted should be, if possible, always by 10 mm shorter than the measured length.

The stabilization screw to be implanted depends on the length of the hip screw and its chosen length should be usually by 10 to 20 mm shorter than that of the hip screw.

Note:
For the correct length reading, attention should be paid that the double drill sleeve touches the bone.



Note:
The wrench must be used only for removing the inserter for stabilization screws.

Inserting the Stabilization Screw

Instruments

REF 09.20010.280	*Drill Bit for Stabilization Screws*
REF 09.20010.290	*Coupling Screw*
REF 09.20010.295	*Inserter for Stabilization Screws*
REF 09.20010.410	*Screwdriver, hex 3.5*

The stabilization screw is designed for additional securing the femoral head rotation in unstable fractures.

- At first, the cortical bone layer entry is opened using the drill bit through the double drill sleeve.
- Importantly, the depth of the drill depends on the selected nail and on the femoral neck angulation.
- For CCD angles of 125° or 130°, the first mark on the drill bit should be accepted as orientation line. The second mark serves as orientation for the CCD angle of 135°.
- The stabilization screw envisioned for use is connected with the inserter and with the coupling screw.

Note:
The connection of the stabilization screw with the inserter is performed by the screwdriver.

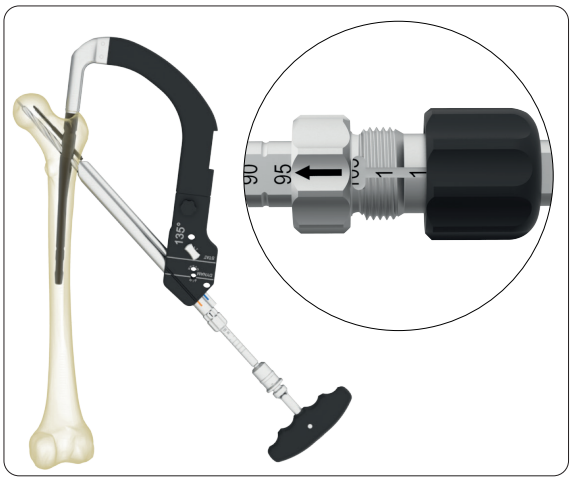
Instruments

REF 09.20010.300	*Wrench*

- The stabilization screw is screwed onto the femoral neck down to the appropriate mark through the double drill sleeve.
- It is important to note that the insertion depth of the stabilization screw depends on the nail selection and on the femoral neck angle.
- For CCD angles of 125° or 130°, the first mark on the inserter should be used as the orientation line. The second mark serves as orientation for the CCD angle of 135°.
- When the stabilization screw is at its correct position and at the appropriate depth, the inserter and the coupling screw can be removed.
- For the removal of the inserter, the coupling screw is unscrewed from the stabilization screw by means of the screwdriver.
- The wrench is used as counterholder.

Inserting the Hip Screw

Drilling the Hip Screw Hole



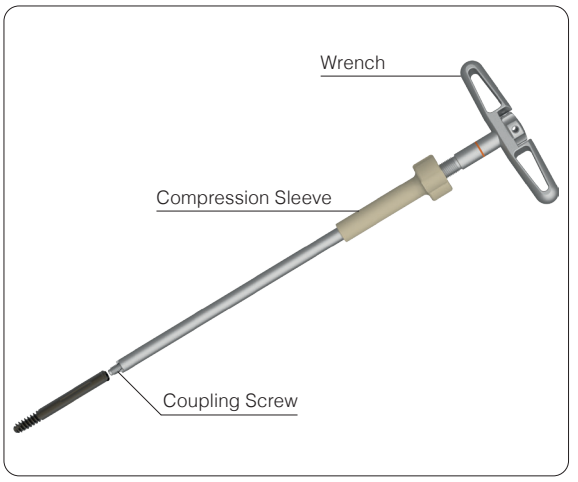
Instruments

REF 09.20010.265	*Step Reamer for Hip Screws*
REF 09.20010.325	*Collet*
REF 09.20010.330	*Nut*
REF 09.20010.270	*T-Handle*

- The selected length of the hip screw is adapted by the stopper onto the step reamer.
- For this purpose, first the collet is mounted on the step reamer in the arrow direction and advanced up to the selected length.
- Subsequently, the collet is fixed with the nut.
- After removing the guide sleeve, the step drill is connected with the T-Handle or the drilling machine.
- Next, the step reamer is advanced through the double drill sleeve over the guide wire and the drilling is performed until stop.
- Due to the self-tapping hip screw, tapping is not necessary.

Note:
In the event that the guide wire is strongly bent, it must be removed and replaced by a new wire placed in a correct position.

Inserting the Hip Screw



Instruments

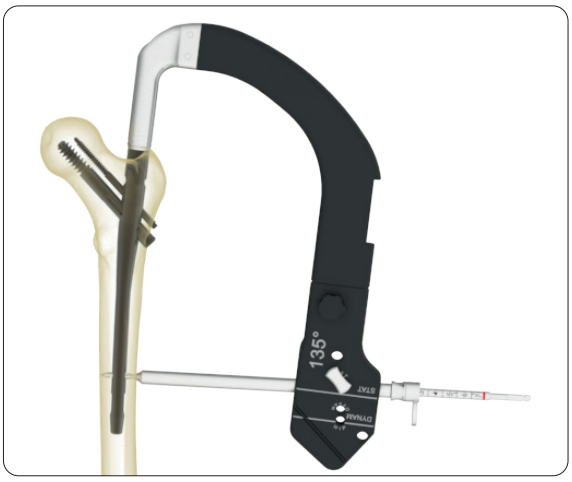
REF 09.20010.370	*Wrench for Hip Screws*
REF 09.20010.368	*Coupling Screw for Hip Screws*
REF 09.20010.360	*Compression Sleeve*

- The selected hip screw is screwed upon the wrench.
- For this purpose, the coupling screw is placed in the wrench and the selected hip screw is screwed on the coupling screw in such manner that the grooves and pins stably fit to each other.
- The compression sleeve is screwed upon the wrench for hip screws as far as the stopper allows.
- The hip screw is screwed over the guide wire through the double drill sleeve up to the mark into the femoral neck.

Fracture Compression

- After correct positioning of the hip screw, it is possible to generate an interfragmentary compression with the compression sleeve.
- By turning clockwise the femoral head is compressed against the femur.
- Please note that a 360° turn corresponds to a compression of 1 mm.

Note:
A too tight compression can cause torsion of the targeting device and thus false drilling at the distal locking.



Distal Locking

Instruments

REF 09.20010.220	*Protection Sleeve*
REF 09.20010.221	*Drill Sleeve*
REF 09.20010.225	*Trocar Ø 4.35 mm*
REF 09.20010.160	*Fixation Eccenter for Drill Sleeves*
REF 09.20010.310	*Drill Bit for Distal Locking*

- Static and dynamic distal locking can be achieved by means of the targeting module.
- A protection sleeve with a trocar for distal locking is advanced through a puncture incision and through the targeting module down to the bone and held in place by the fixation eccenter.

Note:
Static and dynamic locking or both can be chosen.
In high subtrochanteric fractures, static and dynamic distal locking must always be choosen.

- After the protection sleeve has been advanced to the cortical bone layer, the trocar is removed.
- The bone is drilled through the guide sleeve by the drill bit until the opposite cortical layer.
- The required screw length can be read directly from the scale on the drill at the end of the drill sleeve.
- It is important to note that the drill bit has clearly passed the opposite cortical layer.

  For instance: 4 = 40 mm

Instruments

REF 09.20010.340 *Length Determination Device for Screws up to 90 mm*

- Optionally, the screw length can be determined also by the length determination device.

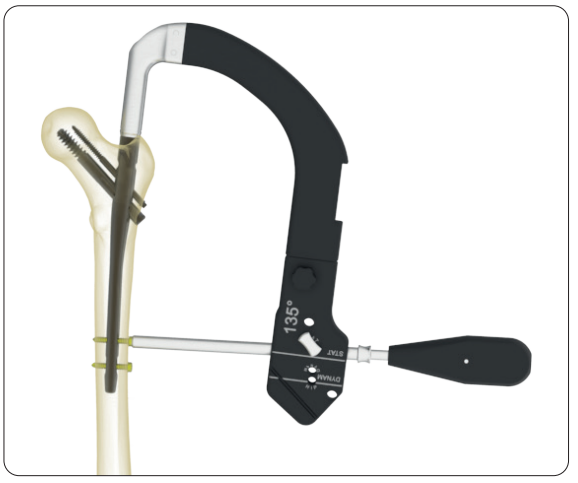
Note:

Because the measurement renders exactly the length of the drilling hole, it is recommended to select a screw, which is longer by 2 mm, whereby a secure fixation of the screw in the opposite cortical layer is guaranteed.

Instruments

REF 09.20010.410 *Screwdriver, hex 3.5 mm*

- The fixation of the locking screw is performed by the screwdriver through the guide sleeve.

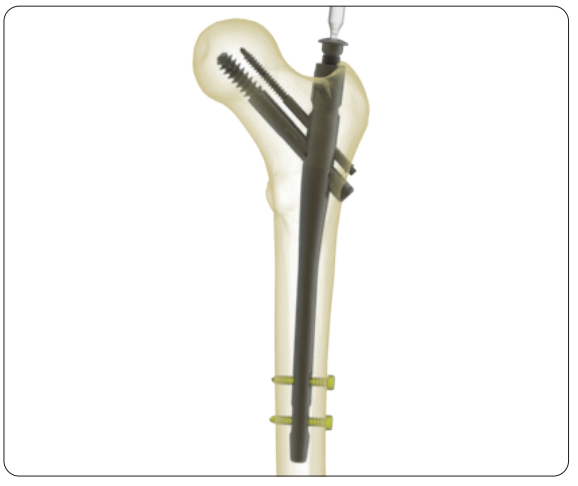


Inserting the Cap Screw

Instruments

REF 09.20010.410 *Screwdriver, hex 3.5 mm*
REF 09.20010.230 *Socket Wrench with Cardan Joint*

- Once the targeting device has been removed completely, the cap screw is fixed by means of the screwdriver.



Note:

Optionally, the cap screw can be inserted by means of the socket wrench with cardan joint.

- If the proximal end of the nail is fully inserted into the bone, cap screws with elongated caps can be used.
- This results in a nail extension of 5 and 10 mm, respectively, and raising the nail end into the cortical layer.

Surgical Technique using the Blocking Screw

Drilling the Hip Screw

Instruments

REF 09.20010.265	*Step Reamer for Hip Screws*
REF 09.20010.325	*Collet*
REF 09.20010.330	*Nut*
REF 09.20010.270	*T-Handle*

Note:
Before inserting the hip screw the previously descirbed operation steps must be performed.

- Set the required length of the hip screw with the help of the drill stop on the step reamer.
- To do so, first mount the collet on the step reamer in the direction indicated by the arrow and move until reaching the desired length.
- Then fix the collet with the nut.
- After removing the guide sleeve, connect the step reamer to the T-Handle or to the drilling machine.
- Then slide the step reamer through the double drill sleeve over the guide wire and drill up to the stop.
- Since the hip screw is a self-tapping screw, no tapping is needed.

Note:
Should the guide wire be strongly bent, it must be removed and replaced by a new wire in the correct position.

Inserting the Hip Screw

Instruments

REF 09.20010.370	*Wrench for Hip Screws*
REF 09.20010.368	*Coupling Screw for Hip Screws*
REF 09.20010.360	*Compression Sleeve*

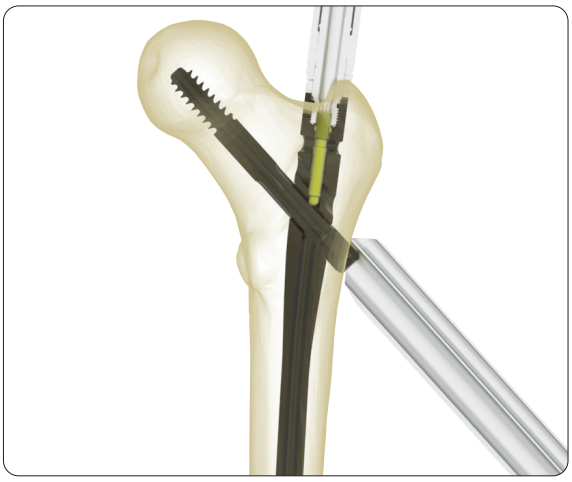
- Mount the selected hip screw onto the wrench.
- For this purpose, place the coupling screw in the wrench and screw the selected hip screw onto the coupling screw in such a way that the pins fit into the grooves.
- Tighten the compression sleeve on the wrench for hip screws up to the stop.
- The hip screw is then screwed over the guide wire through the double drill sleeve up to the mark into the femoral neck.

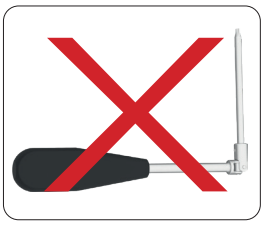
Note:
In order to make sure that the blocking screw fits into the grooves in the hip screw, it is absolutely necessary that the T-handle is either in the horizontal or in vertical position.

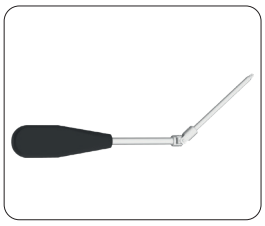
Fracture Compression

- After correct positioning of the hip screw, it is possible to generate an interfragmentary compression with the compression sleeve.
- By turning clockwise the femoral head is compressed against the femur.
- Please note that a 360° turn corresponds to a compression of 1 mm.

Note:
Excessive compression can cause torsion of the targeting device and thus incorrect drilling during distal locking.







Blocking Screw

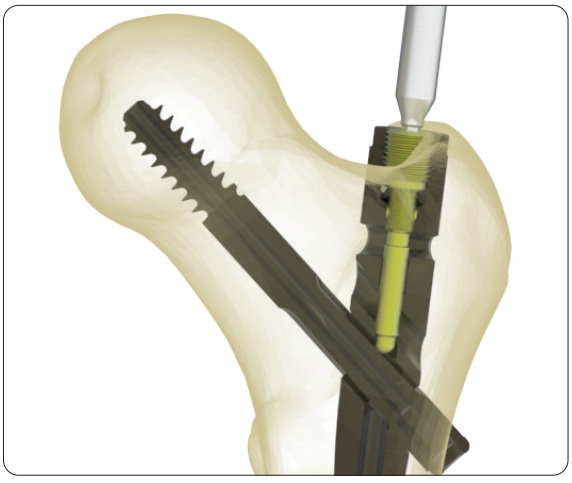
Instruments

REF 09.20010.460 *Socket Wrench for Blocking Screws*

- Once the hip screw is in its final position, the position of the T-handle must be checked again.
- Then the blocking screw is inserted with the socket wrench by means of the targeting device.
- To ensure dynamization of the hip screw, it is necessary to turn back the blocking screw half a turn (by 180°). Otherwise the system is statically locked and allows no dynamization.

Note:

It is not allowed to bend the socket wrench when inserting the blocking screw. The blocking screw must be inserted along the screwdriver axis.



Cap Screw

- The use of a cap screw is optional in order to prevent the bone from growing into the nail.

Preliminary Remarks regarding Reversed Fractures

When treating a reversed fracture, it is important to reposition all fragments with fluoroscopic monitoring and, if necessary, by open repositioning.

While inserting the intramedullary guide wire for the nail, it is important to pay attention that the lateral trochanter fragment is accessed by a separate puncture incision at the distal fragment edge, repositioned and held in place, for instance, by a bone-holding rod with a blund round tip. By this measure, a correct placement of the intramedullary guide wire at the trochanteric apex can be achieved without tilting a fragment. Only thus, a correct cutting of the trochanter and of the additional trochanteric fragment by means of the ø 15.5 mm medullary drill is possible.
The trochanteric fragment must be held fix by the bone holding rod until the nail is inserted. Thereafter the lateral trochanteric fragment is repositioned on the shaft by means of the double drill sleeve and the guide sleeve for reversed fracture treatment and then fixed by a fixation screw in order to enable the proper preparation of the lateral trochanteric segment with the step reamer.

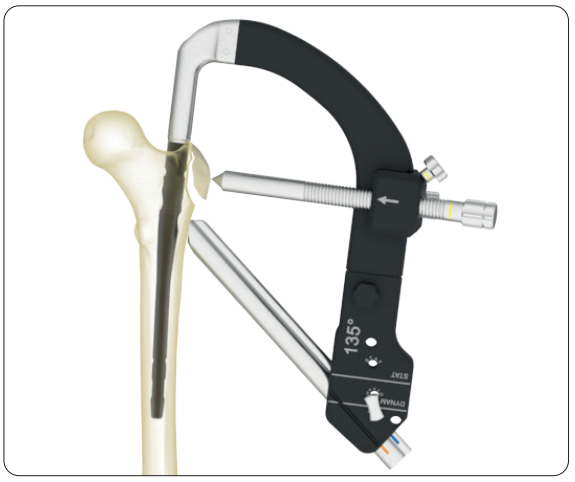
Note:
The reversed fracture screw can only be placed in combination with the stabilization screw. A treatment using the blocking screw is not possible.

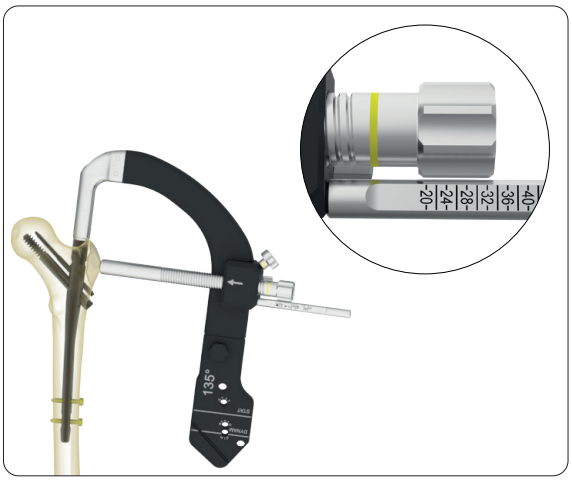
Reversed Fractures

Instruments

REF 09.20010.090	*Targeting Device for Reversed Fractures*
REF 09.20010.095	*Assembling Screw*
REF 09.20010.180	*Guide Sleeve*
REF 09.20010.185	*Trocar Ø 12.0 mm*
REF 09.20010.170	*Fixation Screw*

- In the event of a reversed fracture, the targeting device with two proximal drilling holes is used. These drilling holes, one of them running from the ventral direction and the other one from dorsal, enable an additional fixation of the trochanter according to the line of fracture.
- The targeting device for reversed fractues is fixed by the assembling screw at the provided site of the targeting device.
- The guide sleeve is pushed with the trocar into the targeting device for reversed fractues and advanced until contact is established between the guide sleeve and the bone.
- Subsequently, the insertion of the fixation screw is performed through the targeting device for reversed fractures for the fixation of the guide sleeve.
- The fixation screw should be only fixed as far as the guide sleeve can still be rotated round the bone over the screw thread.
- By further advancement or fastening the guide sleeve, the trochanter major is more compressed.
- The fixing screw is only then to be fixed.



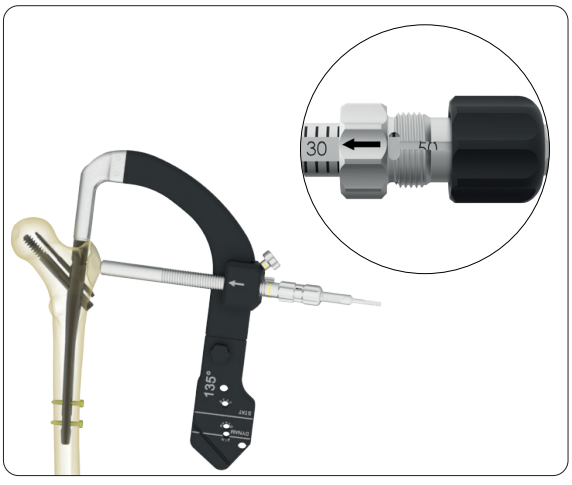


Length Determination

Instruments

REF 09.20010.190 *Length Determination Device*

- The length determination device is inserted into the bore hole in the targeting device until it locks.
- The length of the reversed fracture screw can now be read on the length determination device at the end of the guide sleeve.

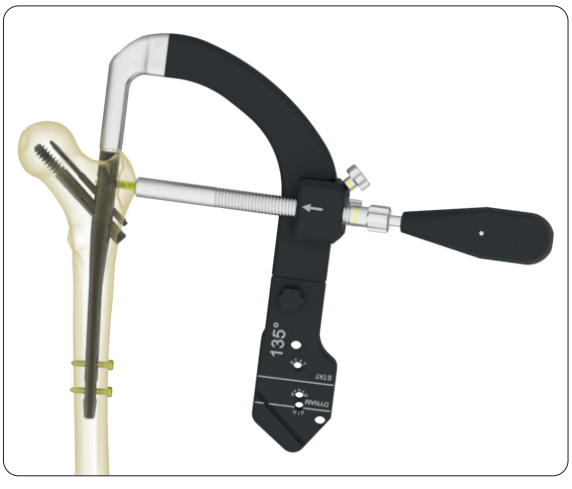


Drilling

Instruments

REF 09.20010.320 *Drill Bit for Reversed Fractures*
REF 09.20010.325 *Collet*
REF 09.20010.330 *Nut*

- The measured drill length is adjusted on the drill bit by mounting the collet on the drill up to the desired length mark and securing it by a nut.
- The drilling can now be performed through the guide sleeve for the distance limited by the stopping device of the collet.



Insertion

Instruments

REF 09.20010.410 *Screwdriver, hex 3.5 mm*

- The reversed fracture screw is tightened by the screwdriver through the guide sleeve and secures the fragment in an angle stable position by an additional thread of the nail.

Note:
The inserted reversed fracture screw can also serve for suspension and restraint of the gluteal muscles on the femoral shaft at open reduction.

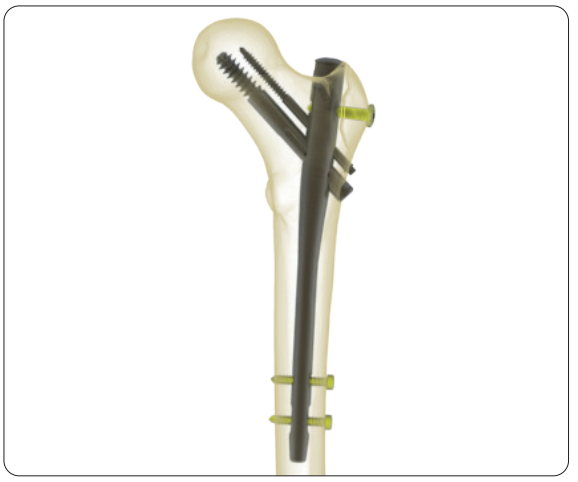
Locking the Nail

Instruments

REF 09.20010.230 *Socket Wrench with Cardan Joint*
REF 09.20010.410 *Screwdriver, hex 3.5 mm*

- After the removal of the complete targeting device the next step is tightening the cap screw by the screwdriver.
- If the proximal end of the nail is fully inserted into the bone, cap screws with elongated caps can be used.
- This results in a nail extension of 5 and 10 mm, respectively, and raising the nail end into the cortical layer.

Note:
Optionally, the cap screw can be inserted by means of the socket wrench with cardan joint.



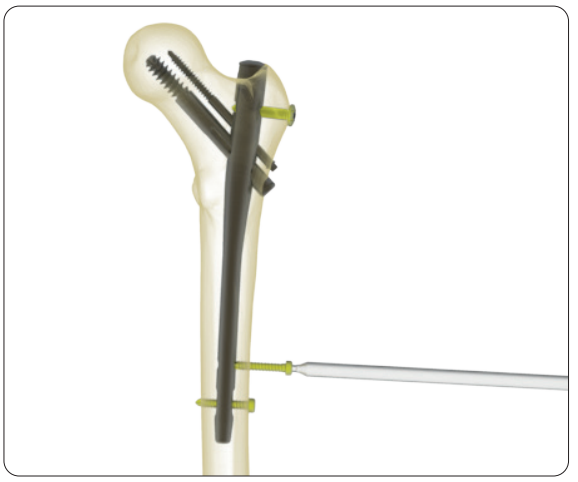
Removal of the VITUS-PF Nail

Removal of the Distal Locking Screws

Instruments

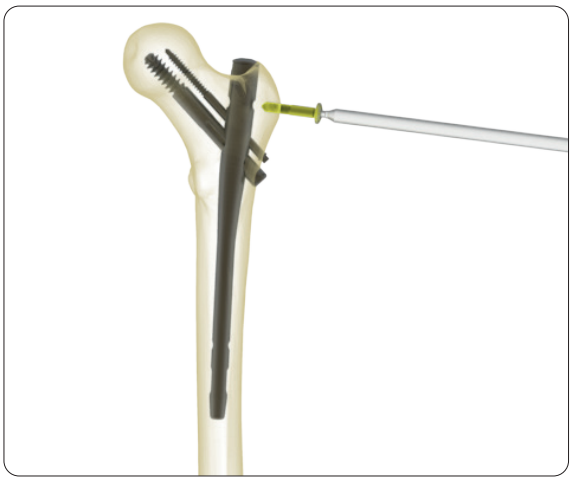
REF 09.20010.410 *Screwdriver, hex 3.5 mm*

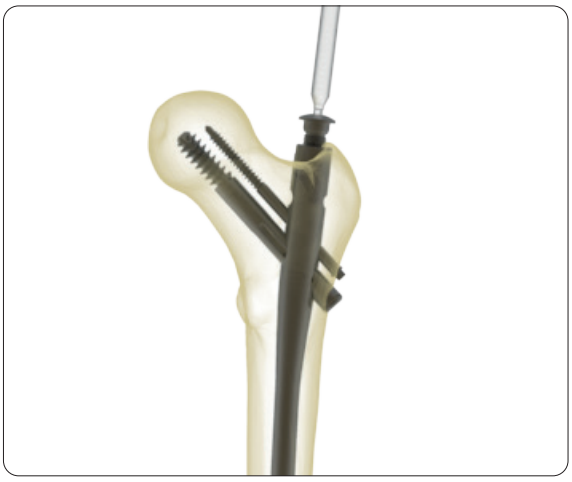
- Following the X-ray localisation of the distal locking screws, they are removed through a puncture incision by means of the screwdriver.



Removal of the Reversed Fracture Screw

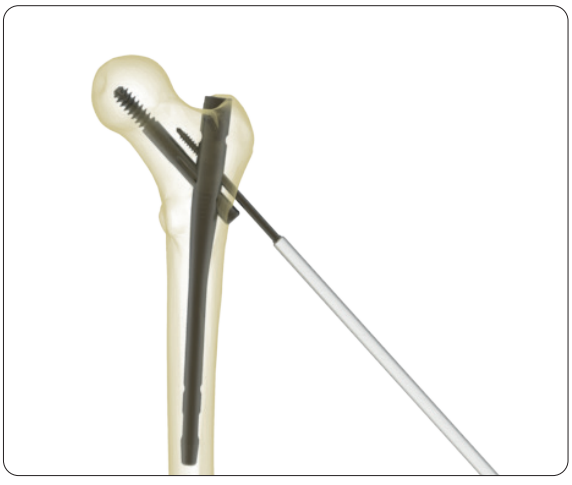
- Following the X-ray localisation, the reversed fracture screw is removed through a small skin incision by means of the screwdriver.





Removal of the Cap Screw

- After exposure of the proximal nail end, the cap screw is removed by means of the screwdriver.

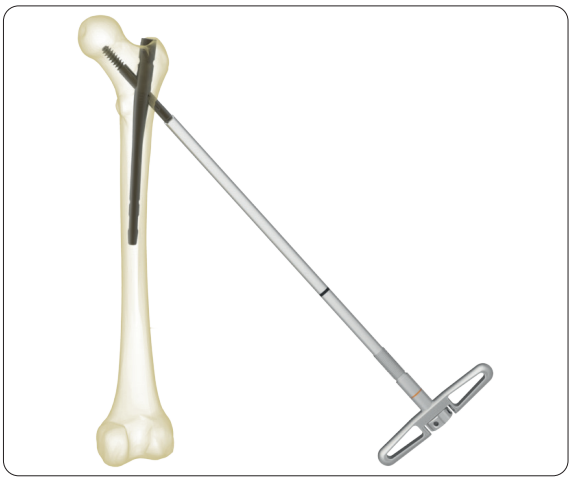


Removal of the Stabilization Screw

Instructions

REF 09.20010.420 *Extractor for Stabilization Screws*

- Following the X-ray localisation of the stabilization screw and hip screw, the stabilization screw is removed through a puncture incision by means of the extractor.



Removal of the Hip Screw

Instructions

REF 09.20010.370 *Wrench for Hip Screws*
REF 09.20010.368 *Coupling Screw for Hip Screw*

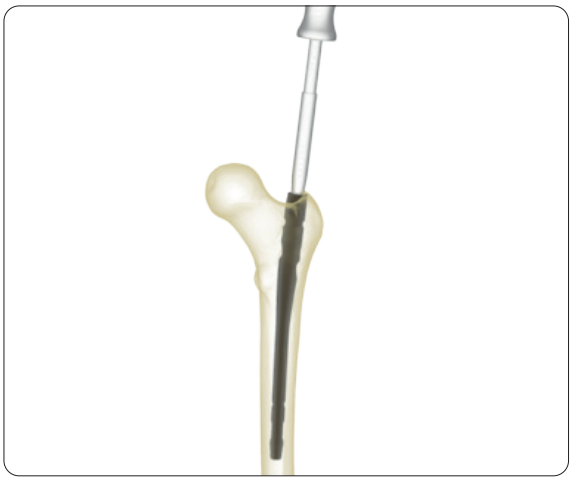
- The wrench is connected with the corresponding coupling screw.
- Subsequently, the wrench is placed in the grooves of the hip screw and the coupling screw is fastened in the hip screw.
- The hip screw can then be removed.
- It is recommended to insert first the Ø 3.2 mm guide wire into the hip screw as guide for the wrench.

Removal of the VITUS-PF Nail

Instruments

REF 09.20010.445 *Extractor for Nails*

- The proximal nail end is visualised by a skin incision and the extractor is fastened onto the proximal femoral nail.
- The nail is extracted by means of gentle controlled taps.



Product Information

Implants

VITUS-PF Femoral Nail, long

- Lengths: 280, 300, 320, 340, 360, 380, 400, 420 mm
- Proximal diameter: 15.5 mm
- Distal diameter: 10.5 mm
- CCD angle: 125° / 130°
- Cannulation: 5 mm
- Mediolateral angle: 4°
- Material: Ti6Al4V

Article Number	CCD	Length	Orientation
09.33280.125S	125°	280 mm	Right
09.33300.125S	125°	300 mm	Right
09.33320.125S	125°	320 mm	Right
09.33340.125S	125°	340 mm	Right
09.33360.125S	125°	360 mm	Right
09.33380.125S	125°	380 mm	Right
09.33400.125S	125°	400 mm	Right
09.33420.125S	125°	420 mm	Right
09.33281.125S	125°	280 mm	Left
09.33301.125S	125°	300 mm	Left
09.33321.125S	125°	320 mm	Left
09.33341.125S	125°	340 mm	Left
09.33361.125S	125°	360 mm	Left
09.33381.125S	125°	380 mm	Left
09.33401.125S	125°	400 mm	Left
09.33421.125S	125°	420 mm	Left

Article Number	CCD	Length	Orientation
09.33280.130S	130°	280 mm	Right
09.33300.130S	130°	300 mm	Right
09.33320.130S	130°	320 mm	Right
09.33340.130S	130°	340 mm	Right
09.33360.130S	130°	360 mm	Right
09.33380.130S	130°	380 mm	Right
09.33400.130S	130°	400 mm	Right
09.33420.130S	130°	420 mm	Right
09.33281.130S	130°	280 mm	Left
09.33301.130S	130°	300 mm	Left
09.33321.130S	130°	320 mm	Left
09.33341.130S	130°	340 mm	Left
09.33361.130S	130°	360 mm	Left
09.33381.130S	130°	380 mm	Left
09.33401.130S	130°	400 mm	Left
09.33421.130S	130°	420 mm	Left

Article Number	CCD	Diameter
09.33010.125S	125°	10 / 15.5 mm
09.33010.130S	130°	10 / 15.5 mm
09.33010.135S	135°	10 / 15.5 mm
09.33011.125S	125°	11 / 15.5 mm
09.33011.130S	130°	11 / 15.5 mm
09.33011.135S	135°	11 / 15.5 mm

VITUS-PF Femoral Nail, short

- Length: 200 mm
- Proximal diameter: 15.5 mm
- Distal diameter: 10 / 11 mm
- CCD angle: 125° / 130° / 135°
- Cannulation: 5 mm
- Mediolateral angle: 4°
- Material: Ti6Al4V

Article Number	Length	Article Number	Length
09.03100.070S	70 mm	09.03100.100S	100 mm
09.03100.075S	75 mm	09.03100.105S	105 mm
09.03100.080S	80 mm	09.03100.110S	110 mm
09.03100.085S	85 mm	09.03100.115S	115 mm
09.03100.090S	90 mm	09.03100.120S	120 mm
09.03100.095S	95 mm		

VITUS-PF Hip Screw

- Outer diameter: 10.0 mm
- Core diameter: 5.8 mm
- Lengths: 70 - 120 mm
- Cannulation: 3.5 mm
- Thread length: 28 mm
- Pitch: 3.0 mm
- Material: Ti6Al4V

Article Number	Length
09.03004.060S	60 mm
09.03004.070S	70 mm
09.03004.080S	80 mm
09.03004.090S	90 mm
09.03004.100S	100 mm

VITUS-PF Stabilization Screw

- Outer diameter: 5.0 mm
- Core diameter: 3.2 mm
- Lengths: 60 - 100 mm
- Outer hexagon: 4 mm
- Thread length: 30 - 35 mm
- Pitch: 1.75 mm
- Material: Ti6Al4V

Article Number	Length	Head Length
09.01015.195S	16 mm	0 mm
09.01015.245S	21 mm	5 mm
09.01015.295S	26 mm	10 mm

VITUS-PF Cap Screw

- Lengths: 16 / 21 / 26 mm
- Head height: 0 / 5 / 10 mm
- Cannulation: 3.4 mm
- Inner hexagon: 3.5 mm
- Material: Ti6Al4V

VITUS-PF Blocking Screw

- Hexalobe socket: T20
- Material: Ti6Al4V

Article Number
09.01102.000S

VITUS-PF Cap Screw

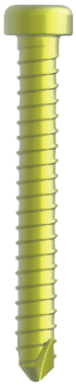
- Inner hexagon: 3.5 mm
- Material: Ti6Al4V

Article Number
09.01103.000S

VITUS-PF Reversed Fracture Screw

- Lengths: 22 mm - 38 mm
- Thread diameter: M6
- Core diameter: 4.77 mm
- Head diameter: 12 mm
- Pitch: 1.0 mm
- Inner hexagon: 3.5 mm
- Material: Ti6Al4V

Article Number	Length
09.01960.022S	22 mm
09.01960.024S	24 mm
09.01960.026S	26 mm
09.01960.028S	28 mm
09.01960.030S	30 mm
09.01960.032S	32 mm
09.01960.034S	34 mm
09.01960.036S	36 mm
09.01960.038S	38 mm



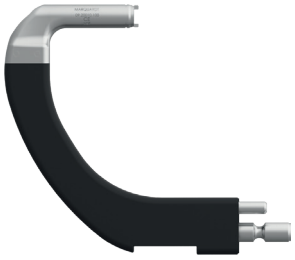
VITUS-PF Locking Screw

- Lengths: 25 mm - 100 mm
- Thread diameter: 4.9 mm
- Core diameter: 4.3 mm
- Head diameter: 8 mm
- Pitch: 1.75 mm
- Inner hexagon: 3.5 mm
- Material: Ti6Al4V

Article Number	Length	Article Number	Length
09.03849.025S	25 mm	09.03849.054S	54 mm
09.03849.030S	30 mm	09.03849.056S	56 mm
09.03849.032S	32 mm	09.03849.058S	58 mm
09.03849.034S	34 mm	09.03849.060S	60 mm
09.03849.036S	36 mm	09.03849.065S	65 mm
09.03849.038S	38 mm	09.03849.070S	70 mm
09.03849.040S	40 mm	09.03849.075S	75 mm
09.03849.042S	42 mm	09.03849.080S	80 mm
09.03849.044S	44 mm	09.03849.085S	85 mm
09.03849.046S	46 mm	09.03849.090S	90 mm
09.03849.048S	48 mm	09.03849.095S	95 mm
09.03849.050S	50 mm	09.03849.100S	100 mm
09.03849.052S	52 mm		

Instruments

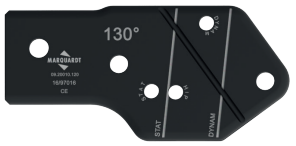
09.20010.100 VITUS-PF Targeting Device



09.20010.090 VITUS-PF Targeting Device for Reversed Fractures

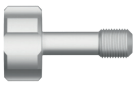
09.20010.110 VITUS-PF Targeting Module 125°

09.20010.120 VITUS-PF Targeting Module 130°



09.20010.130 VITUS-PF Targeting Module 135°

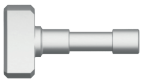
09.20010.095 VITUS-PF Assembling Screw for REF 09.20010.090



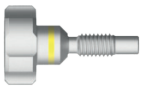
09.20010.141 VITUS-PF Coupling Screw for Nails Ø 15.5 mm

09.20010.150 VITUS-PF Fixation Eccenter for Targeting Modules

09.20010.160 VITUS-PF Fixation Eccenter for Drill Sleeves



09.20010.170 VITUS-PF Fixation Screw for REF 09.20010.180



09.20010.180 VITUS-PF Guide Sleeve for REF 09.20010.090

09.20010.185 VITUS-PF Trocar Ø 12.0 mm for REF 09.20010.180

09.20010.190 VITUS-PF Length Determination Device for REF 09.20010.090

09.20010.200 VITUS-PF Double Drill Sleeve

09.20010.205 VITUS-PF Trocar Ø 12.0 mm

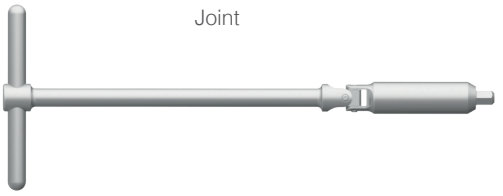
09.20010.210 VITUS-PF Centering Sleeve Ø 3.2 mm

09.20010.220 VITUS-PF Protection Sleeve for Distal Locking

09.20010.221 VITUS-PF Drill Sleeve for REF 09.20010.220

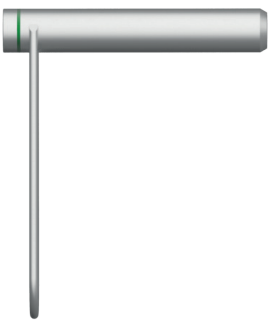
09.20010.225 VITUS-PF Trocar Ø 4.35 mm for REF 09.20010.221

09.20010.230 VITUS-PF Socket Wrench with Cardan Joint



09.20010.235 VITUS-PF Medullary Drill Ø 15.5 mm

09.20010.245 VITUS-PF Protection Sleeve for REF 09.20010.235



09.20010.257 VITUS-PF Trocar Ø 15.5 mm for REF 09.20010.245

09.20010.265 VITUS-PF Step Reamer for Hip Screws, cannulated, scaled, Quick Coupling

09.20010.270 T-Handle with Quick Coupling

09.20010.280 VITUS-PF Drill Bit for Stabilization Screws, AO Coupling

09.20010.290 VITUS-PF Coupling Screw for REF 09.20010.295

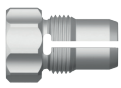
09.20010.295 VITUS-PF Inserter for Stabilization Screws

09.20010.300 VITUS-PF Wrench for REF 09.20010.295

09.20010.310 VITUS-PF Drill Bit for Distal Locking, scaled, AO Coupling

09.20010.320 VITUS-PF Drill Bit for Reversed Fractures, scaled, AO Coupling

09.20010.325 VITUS-PF Collet for REF 09.20010.260 / 265 / 320



09.20010.330 VITUS-PF Nut for REF 09.20010.325

09.20010.340 VITUS-PF Length Determination Device for Screws, up to 90 mm

09.20010.350 VITUS-PF Length Determination Device for Guide Wires Ø 3.2 mm x 390 mm

09.20010.360 VITUS-PF Compression Sleeve for REF 09.20010.370

09.20010.368 VITUS-PF Coupling Screw for Hip Screws Ø 10.0 mm

09.20010.370 VITUS-PF Wrench for Hip Screws

09.20010.380 Pin Wrench

09.20010.390 VITUS-PF Impactor for REF 09.20010.100

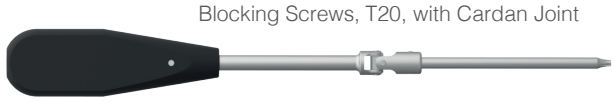
09.20010.401 Awl, cannulated Ø 4.8 mm

09.20010.410 VITUS-PF Screwdriver, twisted, hex 3.5 mm

09.20010.420 VITUS-PF Extractor for Stabilization Screws

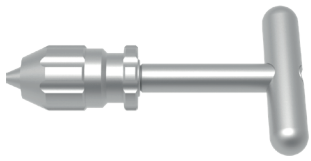
09.20010.445 VITUS-PF Extractor for Nails

09.20010.460 VITUS-PF Socket Wrench for Blocking Screws, T20, with Cardan Joint



09.20010.480 VITUS-PF X-Ray Template

06.20050.045 Universal Chuck, T-Handle, Cannulated



09.20120.012S Guide Wire Ø 3.2 mm, Trocar Tip, L 390 mm, stainless steel, sterile

MRI Safety Information

Non-clinical testing has demonstrated that the Intramedullary Nails range from Marquardt Medizintechnik is MR Conditional in accordance with the ASTM F2503 standard definitions. A patient with this device can be safely scanned in an MR system meeting the following conditions:

- Cylindrical-bore
- Horizontal magnetic field (B_0)
- Spatial field gradient lower than or equal to
  - **1.5 T:** 23.45 T/m (2345 G/cm)
  - **3.0 T:** 11.75 T/m (1175 G/cm)
- Radiofrequency (RF) field exposure:
  - RF excitation: Circularly Polarized (CP)
  - RF transmit coil: whole-body transmit coil
  - RF receive coil type: whole-body receive coil
  - Maximum permitted whole-body averaged specific absorption rate (SAR): Normal Operating Mode, 2 W/kg.
  - Scan duration and wait time:

    1.5 T: 2 W/kg whole-body average SAR for **10min and 55s** of continuous RF (a sequence or back-to-back series/scan without breaks) followed by a wait time of **10min and 55s** if this limit is reached.

    3.0 T: 2 W/kg whole-body average SAR for **7min and 54s** of continuous RF (a sequence or back-to-back series/scan without breaks) followed by a wait time of **7min and 54s** if this limit is reached.
- The Intramedullary Nails are expected to produce a maximum temperature rise of 6.2 °C at 1.5 T and 6.5 °C at 3 T both after the scanning periods presented above.
- The presence of this implant may produce an image artifact. Some manipulation of scan parameters may be needed to compensate for the artifact. In non-clinical testing, the image artifact caused by the device extends approximately 83 mm from the device edge when imaged with a spin echo pulse sequence and 65 mm with a gradient echo, both at 1.5 T.
- Patients with uncompromised thermoregulation and under uncontrolled conditions or patients with compromised thermoregulation (all persons with impaired systemic or reduced local thermoregulation) and under controlled conditions (a medical doctor or a dedicated trained person can respond instantly to heat induced physiological stress).

Note:

Undergoing an MRI scan, there is a potential risk for patients with a metallic implant. The electromagnetic field created by an MRI scanner can interact with the metallic implant, resulting in displacement of the implant, heating of the tissue near the implant, or other undesirable effects.

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MARQUARDT
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