Aesculap Orthopaedics

Targon® FN

Head Preserving Solution
for Medial and Lateral Femoral Neck Fractures

Dynamic Fixation with Stability

B BRAUN
SHARING EXPERTISE

Targon® FN

Dynamic Fixation with Stability

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A fracture of the hip is the commonest reason for an elderly patient to be admitted to an acute orthopaedic ward. Half of these fractures are intracapsular.

This particular fracture has been termed the 'unsolved fracture', because of this continuing controversy between preserving the femoral head using internal fixation or replacing the head with a prosthesis.
Internal fixation is clearly indicated for all undisplaced fractures and for those aged less than about 60-70 years with a displaced intracapsular fracture in which preservation of the femoral head is desired.

Displacement of the fracture is the main complication associated with fixation of an intracapsular fracture. This occurs in about 5% of undisplaced fractures and up to 30% of displaced fractures that have been treated by reduction and fixation.

This complication is essentially mechanical, with the traditional implants failing to hold the fracture in a stable configuration. Multiple parallel screws have inadequate purchase on the lateral femoral cortex so that the forces acting around the hip cause the fracture to tilt into a varus position, and the fixation fails.

Further problems with this method of fixation are that the screws back out laterally as the fracture consolidates, causing irritation of the local tissues.
The sliding hip screw may also be used to fix this fracture. Whilst this implant has good lateral fixation and allows the fracture to consolidate by collapsing along the line of the femoral neck, it lacks rotational stability.

The Targon® FN has been designed with these specific problems in mind. The TeleScrews allow a controlled collapse of the fracture along the line of the femoral neck without any backing out of the screws into the soft tissues. Linking these distal and proximal screws with a locking plate gives a much more stable construction with superior rotational stability than would be found with either method of fixation.
Specific instruments have been designed to make the procedure easier to undertake using minimally invasive surgery.
The surgical technique allows the surgeon to achieve an easy optimum fixation whilst at the same time avoid potential complications such a bending of the guide wires or pushing of the guide wires into the pelvis.
Our initial positive experience with the Targon® FN suggests this implant may be a major advance in the management of the intracapsular fracture and a possible solution to the dilemma of the 'unsolved fracture'.

September, 2007

Dynamic Fixation with Stability

Targon® FN – The System

- Minimally invasive surgery
- Simple surgical technique
- Rotationally stable proximal fixation
- Solid distal fixation
- Early mobilisation
- Very promising first clinical results

Implant material:
Titanium alloy Ti6Al4V

TeleScrews

- 6.5 mm cancellous screws
- Sliding capacity within the screw
- 10 mm minimum sliding capacity
- Extension to maximum 20 mm slide

Femoral Neck Plate

- Anatomically shaped
- Angled locking side plate
- Up to 4 proximal screw sites for TeleScrews
- 130 degree angle for TeleScrews
- Two distal screw sites

Locking Screws

- 4.5 mm bicortical screws
- Self tapping
- Angle-stable locked into the side plate

- No lateral backing out because of angle stable TeleScrew fixation to the plate.

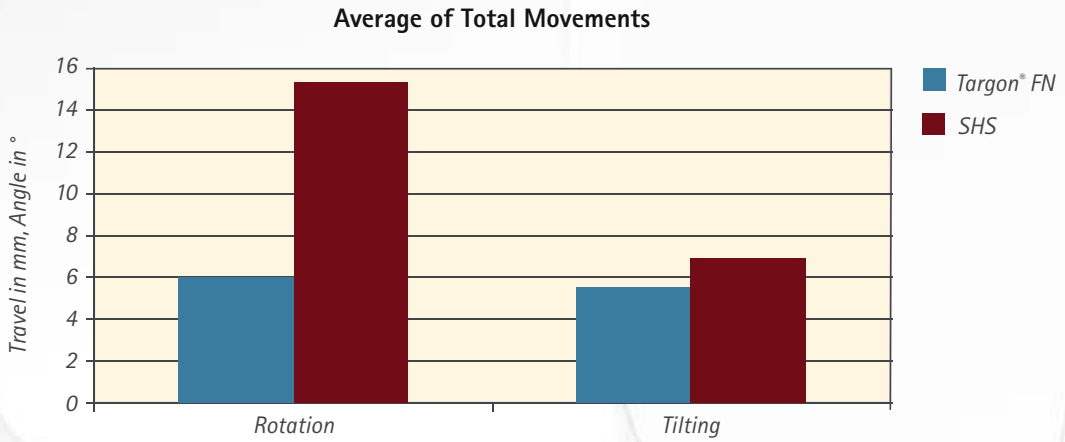
- Controlled TeleScrew sliding prevents cranial migration.
- 10 mm standard slide preset.

- Adjustable slide to maximum 20 mm.

Targon® FN – Biomechanics

Comparison Targon® FN vs. SHS (Sliding Hip Screw)

Measurement of stability of fracture fixation in a simulated lateral femoral neck fracture (osteotomy).



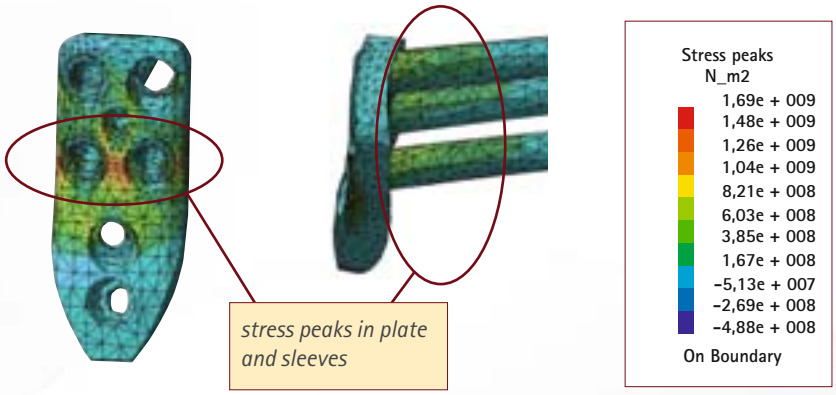
Results:

- Targon® FN showing superior rotational stability than SHS
- Targon® FN with less tilting of the proximal head fragment under cyclic load than SHS

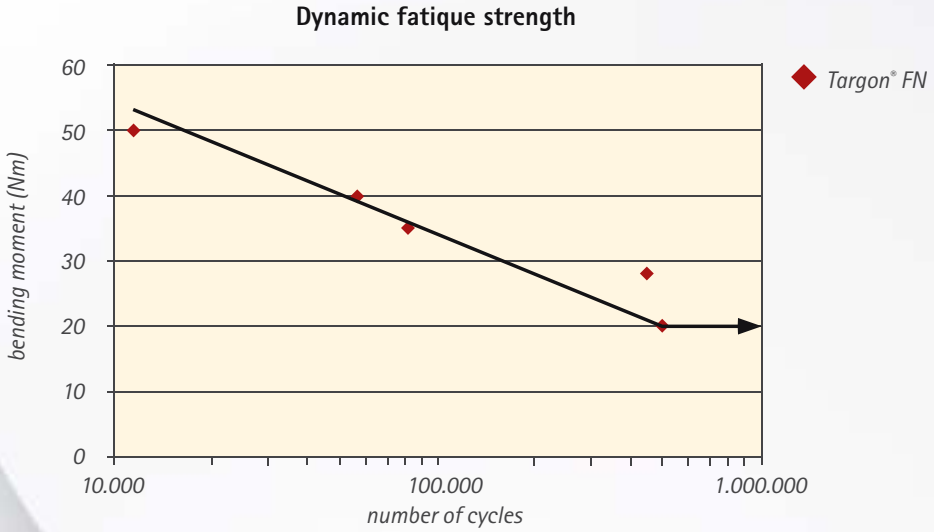
Set-up for biomechanical Targon® FN lab testing

Literature: Lustenberger, A; Bekic, J.; Ganz, R.: Rotationsstabilität trochantärer Femurfrakturen fixiert mit der DHS; Unfallchirurg (1995) 98:514-517

Finite element analysis of Targon® FN (prototype) in view of testing and improving implant stability



Fatigue strength of Targon® FN in dynamic biomechanical testing



Advantages of Targon® FN Fixation

Dynamic Capacity

The proximal screws (TeleScrews) have a sliding capacity to allow for up to 20 mm of slide to occur within the screws. This allows for fracture consolidation to occur along the line of the femoral neck as the fracture heals. Because the sliding occurs within the screws there is no backing out of the implant laterally which would otherwise cause irritation of the soft tissues. The TeleScrews are secured to the plate and there is no risk of the screw migrating either medially or laterally.

Secure Distal Fixation

Two distal screws secure the side plate to the distal femur. These utilise the locking plate concept to provide additional strength in the fixation.

Rotational Stability

The use of two, three or four proximal screws secured laterally to the plate provides a firm fixation on the femoral head with rotational stability. The screw tips can be inserted precisely within the femoral head to optimise hold onto the proximal side of the fracture.

Minimally Invasive Operation

The alignment jig with the Targon® FN enables fixation to be achieved with minimal exposure of the lateral femoral cortex just below the greater trochanter.
The jig guides the drilling for both of the proximal TeleScrews and two distal screws.

Reduced Radiation Exposure

Once the alignment jig and plate are in the required position, the drilling and insertion of both the proximal TeleScrews and distal screws can be undertaken using the jig and measuring devices with minimal radiographic exposure.

Safe and Quick Operating Technique

The kirschner guide wires are inserted through the jig. Once the correct position of these is achieved the plate can be secured to the femur. Drilling for the proximal TeleScrews is done sequentially without the need to drill over the guide wire, thereby avoiding any penetration of the guide wires medially into the hip joint.

Early Mobilisation After Surgery

Because of the improved stability of the fixation most patients should be allowed to mobilise, as soon as able after surgery, with no restriction on hip movements or weight bearing. Routine removal of the implant is not necessary.

MRI Compatible

The implant is constructed from titanium alloy and should the later fracture healing complications of fracture non-union or avascular necrosis be suspected, a MRI scan can be undertaken without removal of the implant.

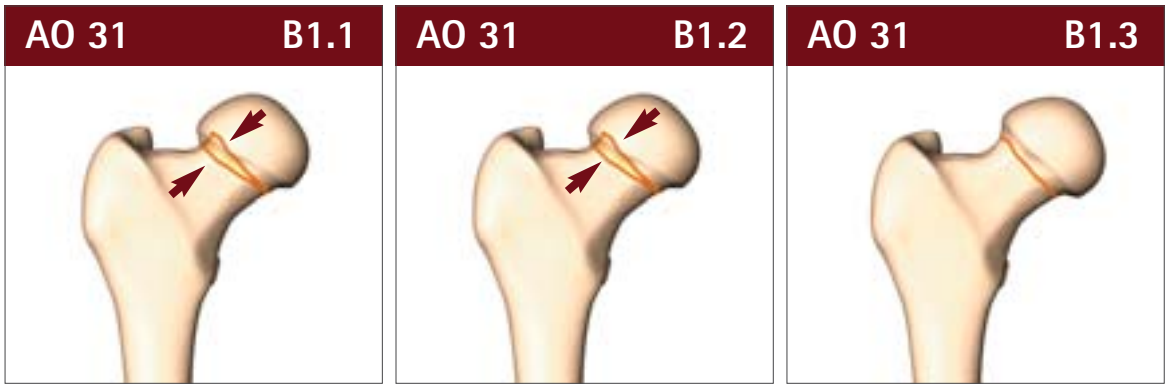
Indications

Indications for Targon® FN:

Undisplaced Intracapsular Fractures:

All undisplaced (impacted) intracapsular fractures should be considered for internal fixation with the Targon® FN. Conservative treatment of these fractures carries a high risk of fracture displacement and is generally not recommended.

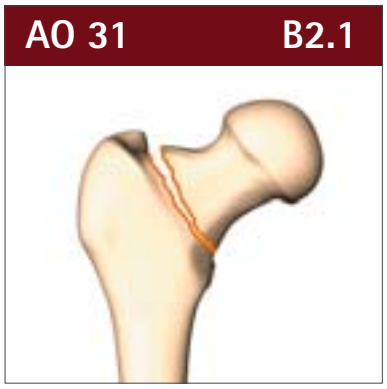
Replacement arthroplasty is a more extensive procedure with a higher risk of complications than that of fixation and is therefore inappropriate for this fracture.



Undisplaced intracapsular fractures:
- *AO 31B1.1, 31B1.2 and 31B1.3*
- *Garden classification grades 1 and 2*

Basicervial Fractures:

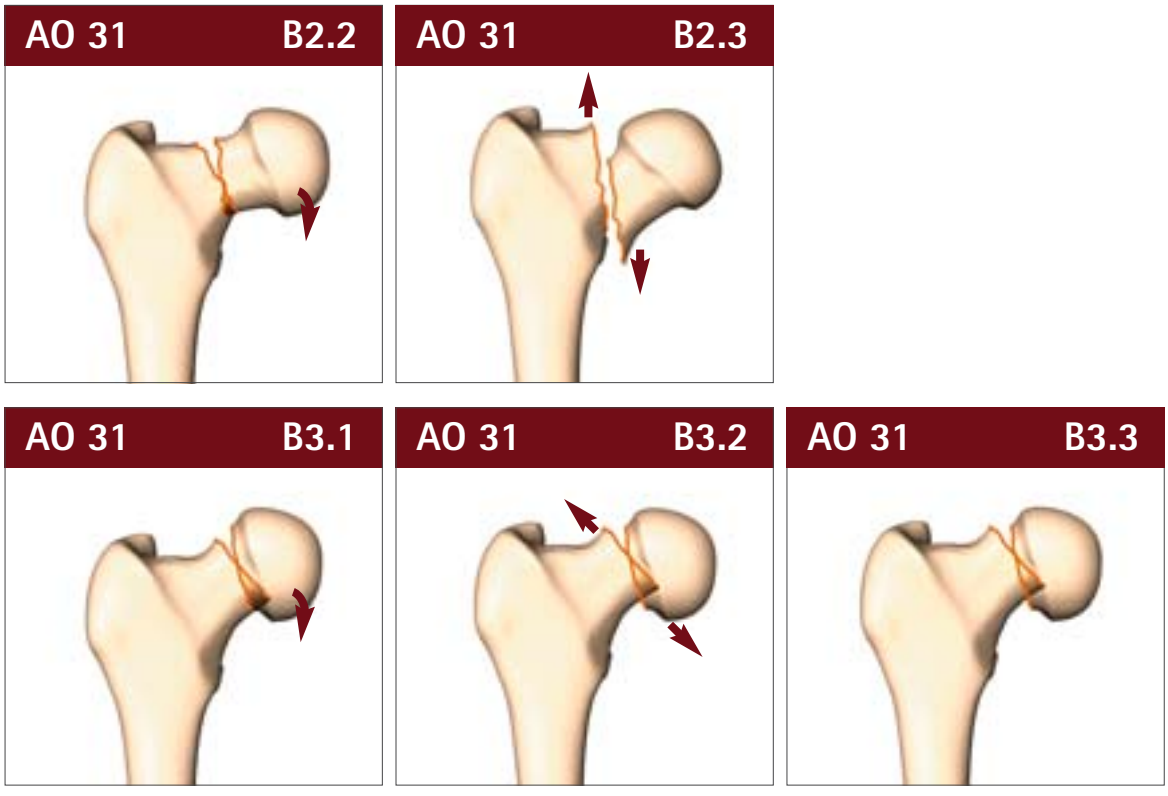
The Targon® FN may be used to fix basicervical fractures of the AO classification type 31B2.1.



Basicervical fractures:
- *AO 31B2.1*

Displaced Intracapsular Fractures:

Any displaced intracapsular fracture in which preservation of the femoral head is felt desirable should be considered for internal fixation with the Targon® FN. This includes younger patients in which preser vation of the femoral head is advantageous and those patients in which the more extensive procedure of arthroplasty needs to be avoided. Individual surgeons may also prefer to use the Targon® TF for displaced intracapsular fractures in the elderly as an acceptable alternative to replacement arthroplasty.



Displaced intracapsular fractures:

- *AO 31B2.2, 31B2.3,*
- *AO 31B3.1, 31B3.2, 31B3.3*
- *Garden classification grades 3 and 4*
- *Pauwels classification type 1-3*

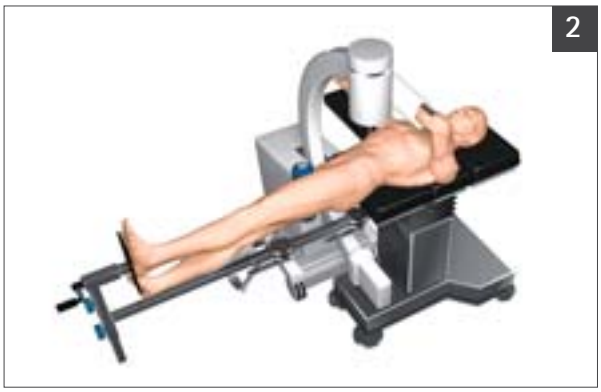
Operating Technique

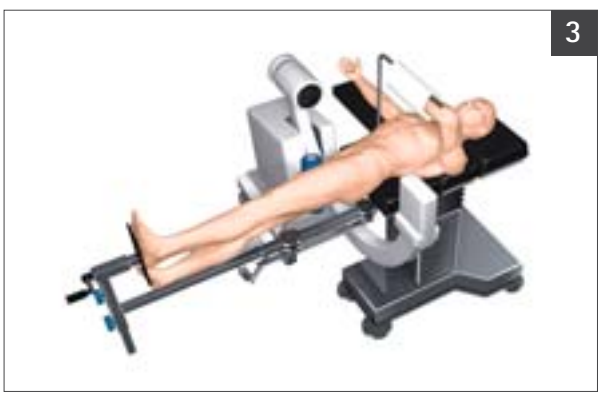
Patient Positioning

Positioning

Avoid sudden or excessive movements when positioning the patient because this might cause a disruption of the blood supply of the femoral head.

Fig. 2: Radiograph AP view
Fig. 3: Radiograph axial view





Preoperative Planning

Fracture Reduction

Undisplaced fractures and those fractures which are impacted on the AP radiograph and undisplaced on the lateral radiograph (Garden grade 1) require no reduction (Fig.1).

Displaced fractures (Fig. 2) are first reduced by applying gently longitudinally traction with the fracture table, whilst screening on the anterior-posterior (AP) radiograph to reduce the fracture. The aim should be to reduce the fracture to either an anatomical position or a slight valgus position as determined by the alignment of the trabeculae of the femoral head with the shaft of the femur.

Then the fracture is reduced on the axial (lateral) view by internal rotation of the limb (full internal rotation may be necessary for fully displaced fractures).

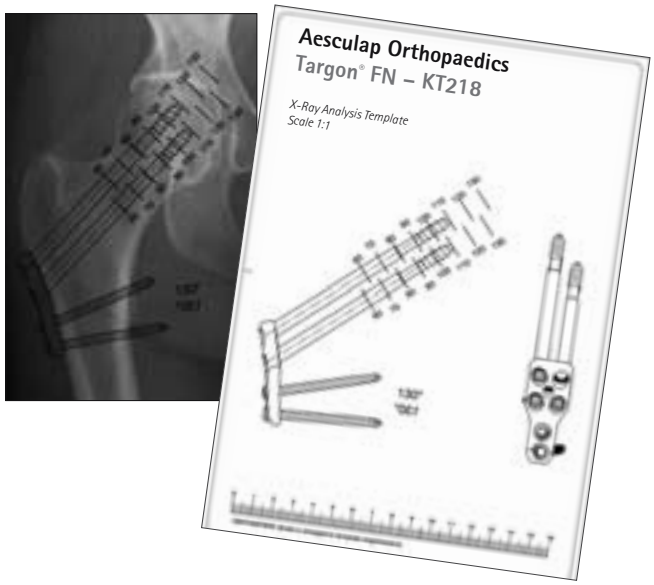
Fig. 1

Fig. 2

Targon® FN X-ray Template – KT218

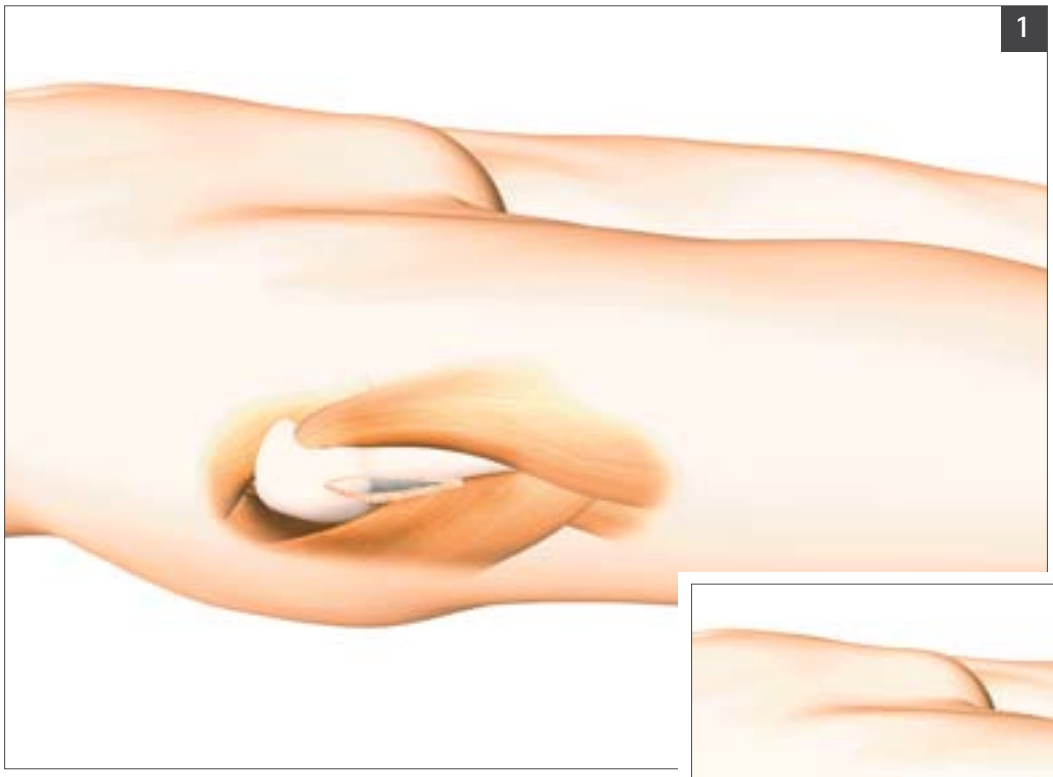
The x-ray template shows the implant in the real size and takes into consideration a magnification of 10 %. The x-rays should have the same magnification to match the templates.

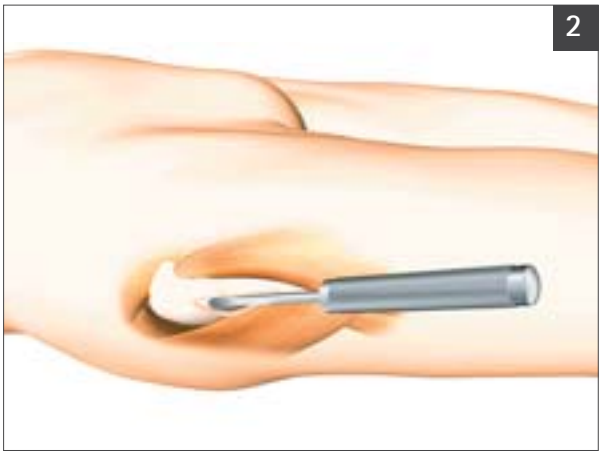
Please verify all measurements determined by this template intraoperatively to ensure a correct choice of your implant.



Operating Technique

1 Approach





▮ COBB Elevator – FK147R

A direct lateral approach to the lateral side of the proximal femur is made with an incision of about 5-6 cms in length.
The site for placement of the plate on the lateral femur is exposed. For displaced fractures this site will be in an anterior-lateral position on the femur.
Mark the cross point of AP and axial alignment on the skin.

Optional:
If necessary, a COBB elevator can be used to remove muscular tissue on the lateral tuberositas (Fig. 2).

2 Mounting the Aiming Jig

A – Fixing the Plate

- Targon® FN plate – KO802T
- Targeting device – KT220P
- Adaptor screw – KT221R
- Screw driver SW3.5 – KT226R

The Targon® FN plate is fastened to the targeting device by means of the plate adaptor screw. The plate adaptor screw occupies the central hole of the targeting device.

Operating Technique

B – Attaching the Handle

- Handle – KT219P
- Targeting device – KT220P
- Connection screw – KT228P

The connection screw is screwed into the handle (Fig. 1a).
Attach the handle to the targeting device so that the connection screw engages (Fig. 1b).
Fasten the connection screw by a firm rotation (Fig. 1c).

For adipose patients, the handle can be mounted on the opposite side of the targeting device (Fig. 2).

To dismante the handle, slightly unscrew the connection screw and then pull it out (Fig. 3).

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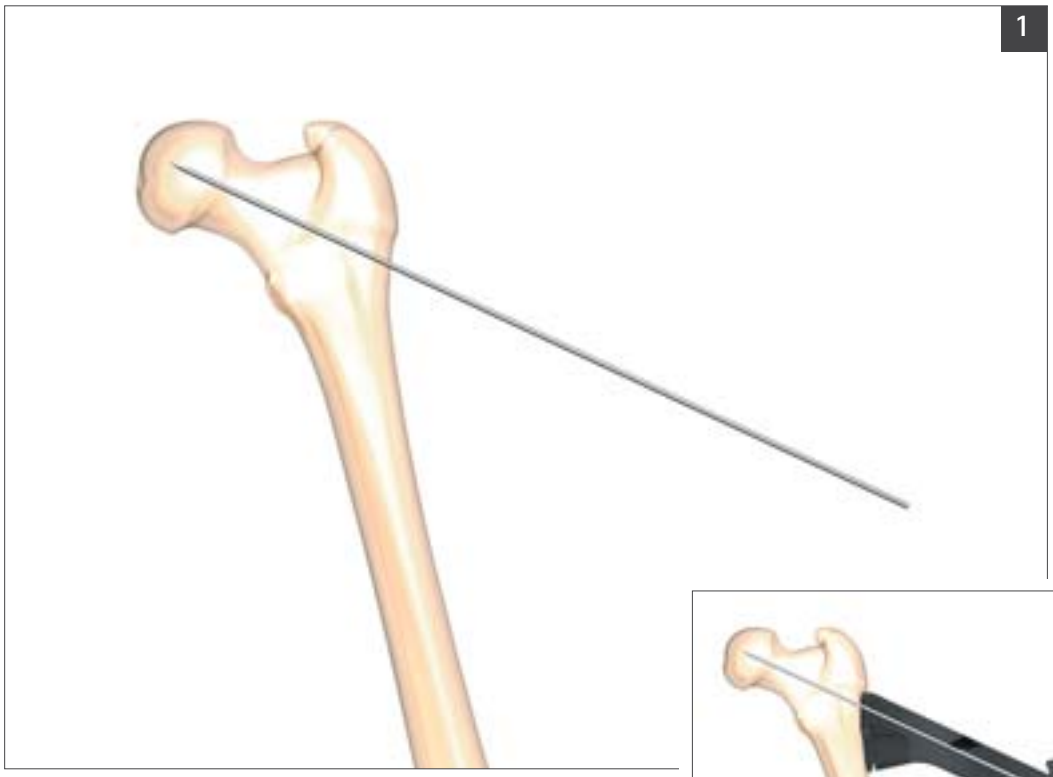
3 Implantation of the Targon® FN Plate

Placing the Central Guide Wire



- Guide wire Ø 2.5 x 310 mm – LX234S

Use the alignment jig with the attached plate. Position a guide wire centrally in the lateral femoral cortex to pass up the middle of the femoral neck to lie centrally in the femoral head on both the AP and axial radiographs. (Fig. 1)

This guide wire should be in the central hole of the alignment jig. (Fig. 2+3)

Attention:
Tilting of the targeting device is still possible.

Operating Technique

4 Implantation of the Targon® TeleScrews

A – Placing the Guide Wires

- Guide wire Ø 2.5 x 310 mm – KT234S
- Drill sleeve – KT223R

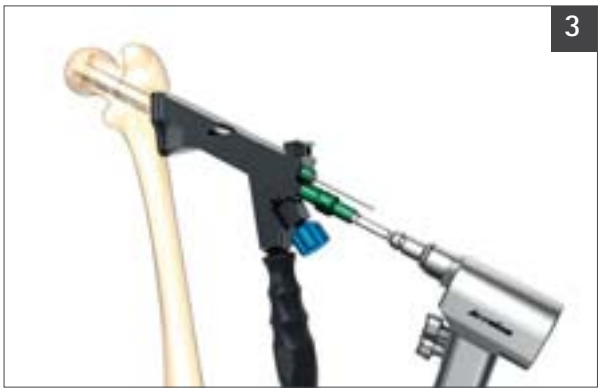
Insert the green drill sleeves into the alignment jig up to the stop and fix by firm rotation.

A sharp guide wire is drilled up to the cortex of the femoral head. Pass wires through the sleeves for up to four of the TeleScrew positions.

The position of these guide wires should be checked on the AP and axial views and adjusted so the guide wire tips are in the subchondral bone, about 5 mm from the joint line.

The lower guide wires should be just above the calcar on the AP view.
The guide wires might bend during insertion, this will, however, not impair the placement of the TeleScrews.

B – Measuring the Length and Drilling the Bone



- Screw scale – KT230R
- Stepped drill – KT224R
- Depth stop for drill KT224R – KT235P

Measure the length of the guide wires with the measuring scale by holding this against the drill sleeve (Fig. 1)

Attach the depth stop to the drill by turning it clockwise and adjust it to the measured length (Fig. 2).

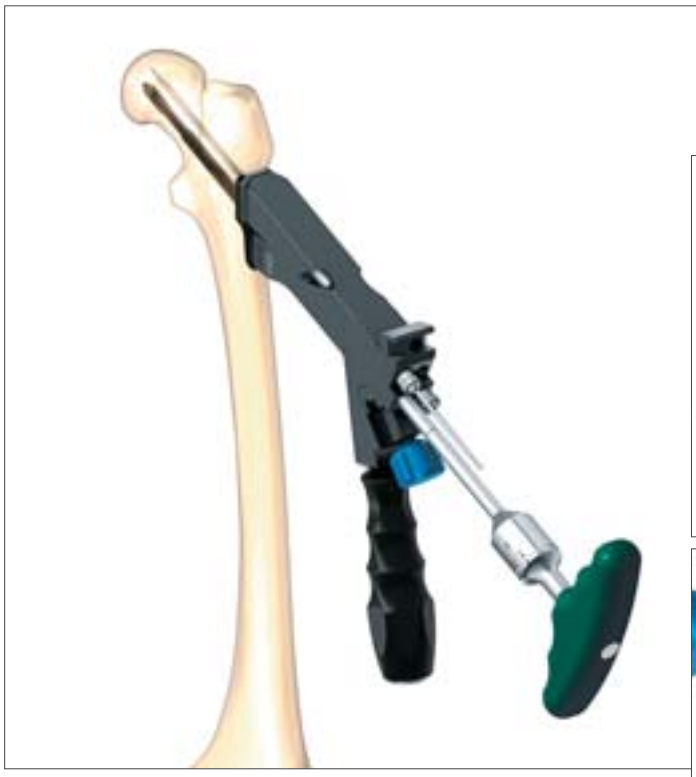
One of the drill sleeves and guide wires is removed and the bone is drilled to the measured distance using the stepped drill (Fig. 3).

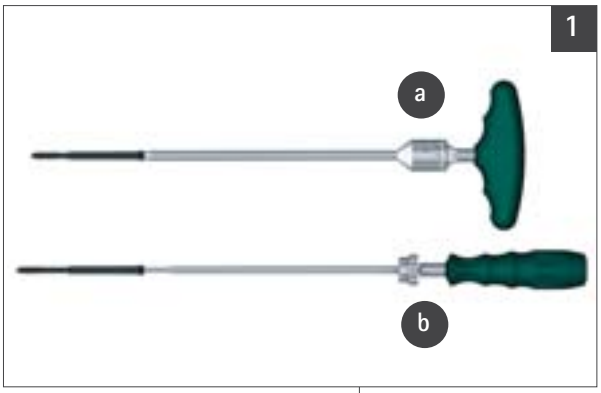
Attention:
Take care to introduce the stepped drill with depth stop only until the stop reaches the aiming jig with-out any additional force.

The TeleScrews are available from 70 mm, 80 mm, 90 mm, 100 mm and 110 mm sizes. Choose the size that is the same as or just smaller than the distance measured on the scale. For example, if the screw measures 96 mm, choose a TeleScrew of 90 mm.

Operating Technique

C – Inserting the TeleScrews





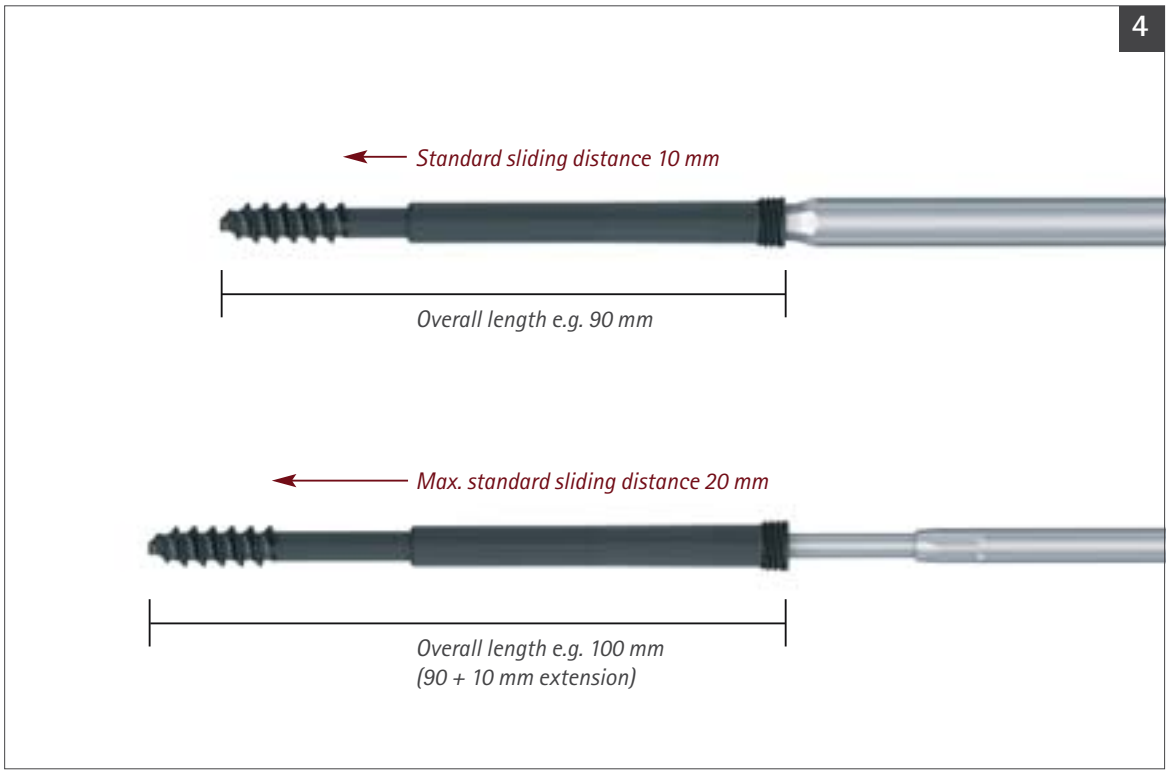
- Stepped screwdriver torque – KT225R (Fig.1a)
  only to be used to insert and fasten the TeleScrews

- Screwdriver Ø 3.5 mm – KT226R (Fig.1b)
  to fine adjust the length of the TeleScrews

Push the socket of the support screw on the small hexagon of the screwdriver KT225R. Connect the support sleeve and the large hexagon.
Insert the TeleScrew of the selected length using the green stepped screwdriver and tighten the screw to the correct torque as marked (8Nm) (Fig. 3).

Repeat this for the other TeleScrews to insert three or four TeleScrews.
A black ring on the stepped screwdriver marks the screwing distance in which the thread of the support sleeve connects to its counterpart on the plate.

Attention:
The stepped screwdriver KT225R is torque indicating, not limiting.



The TeleScrews may be extended by up to 10 mm using the Ø 3.5 mm green screwdriver KT226R.

Guided by the AP and axial X-ray, adjust each TeleScrew length so the tip of the screw is lying in the subchondral bone about 3 mm for the joint line.

The scale on the screwdriver indicates how much the screw has been advanced.

Attention:
Do not extend the screw past a maximum extension of 10 mm as this may reduce the strength of the fixation.
The measurement of the TeleScrews includes a safety distance of 10 mm.

Operating Technique

5 Insertion of Distal Screws

- Yellow tissue protection sleeve – KT231R
- Ø 4 mm yellow drill – KT229R
- Depth gauge – KH274R
- Ø 4.5 mm yellow screw driver – KT236R

Insert the yellow tissue sleeve and drill the femur using the Ø 4 mm yellow drill KT229R (Fig. 1).

Once the drill has just penetrated the second cortex of the femur, read the screw length off the scale on the drill or measure the required screw length using the depth gauge (Fig. 2+3).

Using the using Ø 4.5 mm yellow screw driver, insert a Ø 4.5 mm distal screw of the appropiate length to just penetrate the medial cortex of the femur.
The screw is passed through the tissue sleeve and tightened into the plate (Fig. 4)

Repeat for the second distal screw.

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Operating Technique

6 Completion

- Ø 3.5 mm green screw driver – KT226R

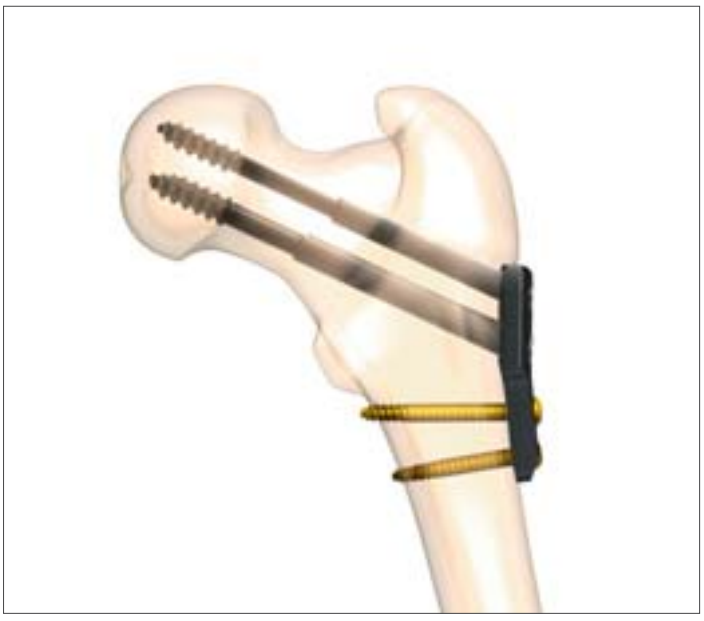
The green screwdriver Ø 3.5 mm is used to release the plate adapter screw and with it the targeting device from the plate (Fig. 1).

A completely implanted Targon® FN –system, showing the preferred 'L – arrangement ' of three TeleScrews.

7 Post-operative Care

Generally patients with an undisplaced intracapsular fracture should be allowed to mobilise without any restriction on weight bearing or hip movements.

For the displaced fracture that has been reduced and fixed, then some physicians may prefer a period of protected weight bearing to reduce the risk of fracture re-displacement.

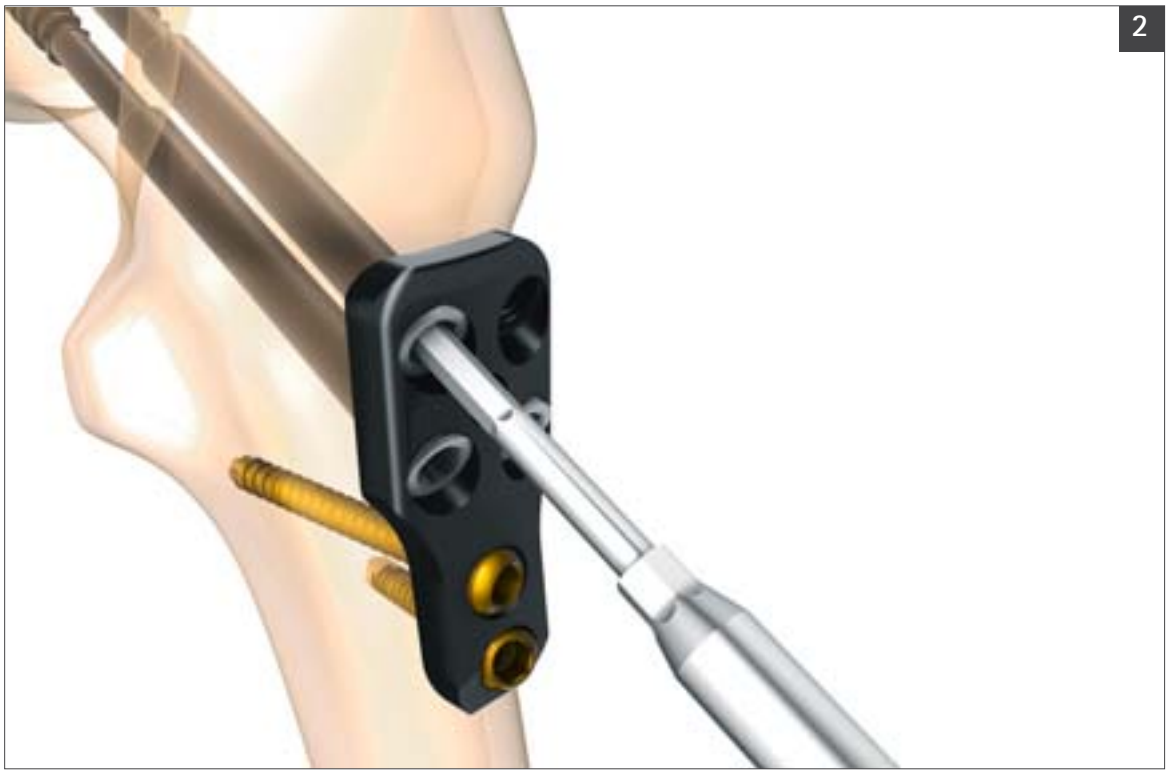


Operating Technique

8 Implant Removal

- Ø 3.5 mm green screw driver – KT226R
- Ø 5 mm red screw driver – KT227R
- Ø 4.5 mm yellow screw driver – KT236R

The red Ø 5 mm extraction screwdriver and green Ø 3.5 mm screwdriver are joint and inserted into the TeleScrew together to engage both the lag screw and the hexagon socket of the outer sleeve together.

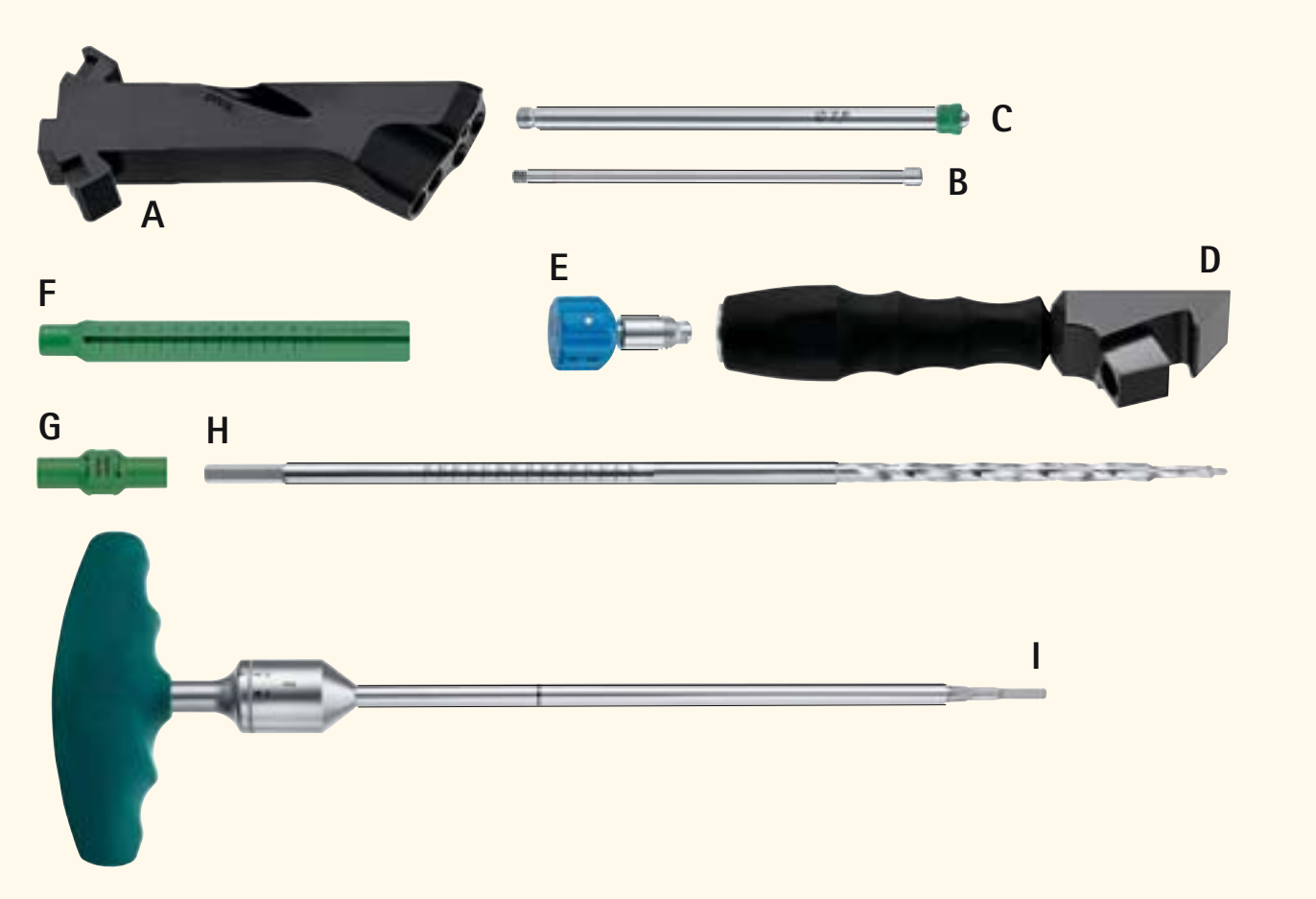


Now both components of the TeleScrew are carefully released from bone and plate. This prevents applying additional torque to overcome the bony ingrowth between the TeleScrew components.

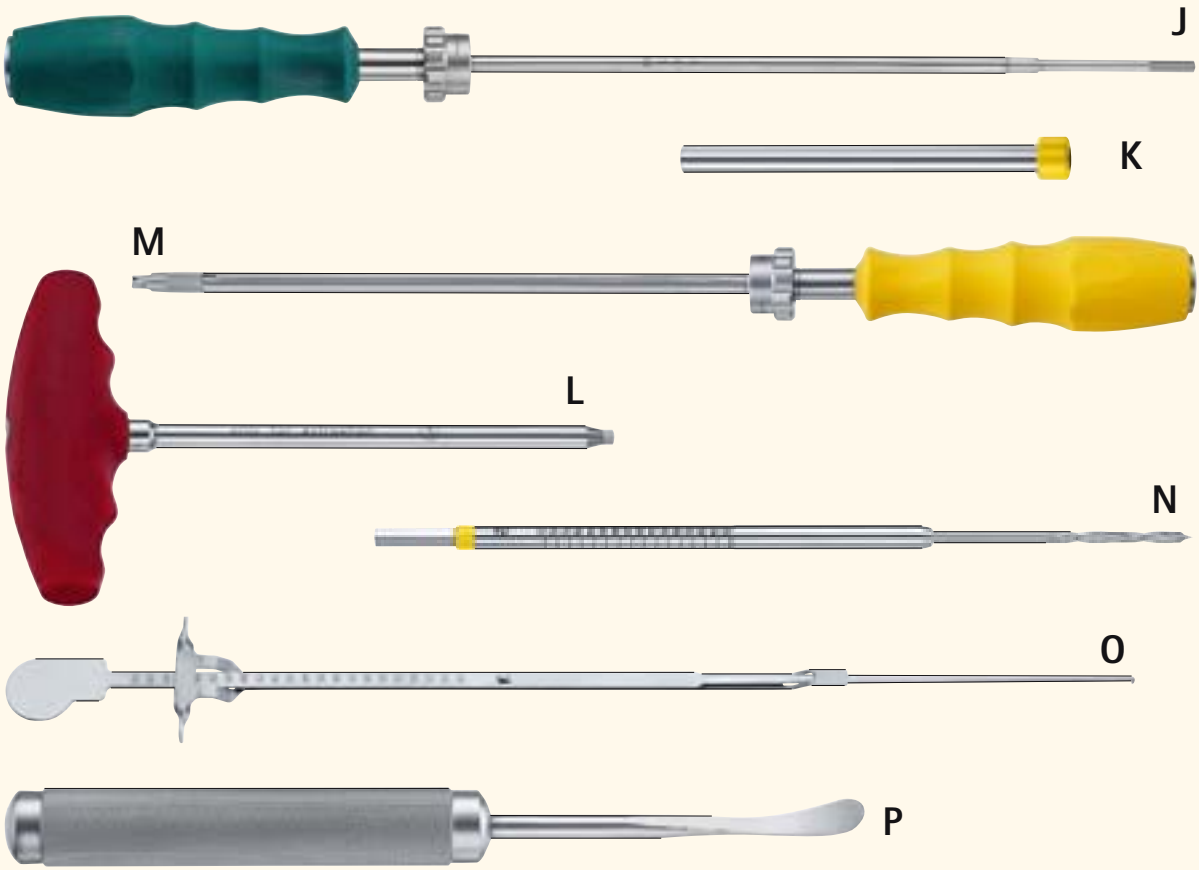
Attention:
The stepped screwdriver KT225R should not be used to remove the TeleScrews.

The yellow Ø 4.5 mm screw driver is then used to extract the distal screws. Care should be taken to ensure there is complete insertion of the screw-driver into the hexagon socket before turning the screw back.

Instruments Overview



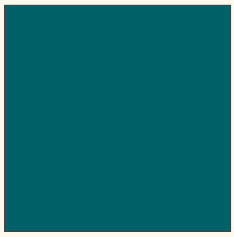
	Article no.	Description
A	KT220P	Aiming attachment
B	KT221R	Holding screw for aiming attachment
C	KT223R	Drill sleeve (3x)
D	KT219P	Handle
E	KT228P	Connecting screw
F	KT230R	Screw length gauge
G	KT235P	Depth stop for drill KT224R
H	KT224R	Step drill
I	KT225R	Stepped screw driver, torque



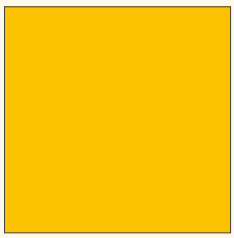
J	KT226R	Screw driver, Ø 3.5 mm
K	KT231R	Tissue protecting sleeve distal
L	KT227R	Screw driver, Ø 5 mm
M	KT236R	Screw driver, Ø 4.5 mm
N	KT229R	Locking drill, Ø 4.1 mm
O	KH274R	Screw length gauge (optional)
P	FK147R	COBB elevator (optional)

Color Coding –
New Organization of the Instrument Tray

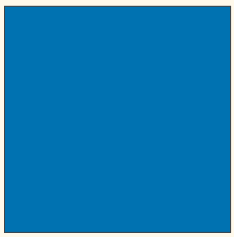
Approach



TeleScrew



Distal Locking



General Instruments

Explantation

Targon® FN – The Instrument System

Color Coding Benefits – New Organization of the Instrument Tray

C Clear

Quick and clear identification of instruments due to color coding.

O Overview

Excellent overview of all instruments required at a glance.

L Logic

Logic arrangement of instruments following the surgical steps for a straight-forward operation.

O Organized

New organization of the instrument tray supports a smooth operative procedure and a quick sterile preparation.

R Reduced

Only 14 basic instruments required to perform the operation arranged in one single instrument tray.

Set Composition and Implants

Targon® FN
KT240 Instrument Set

Quantity	Article no.	Description
1	KT218	X-ray template
1	KT219P	Handle
1	KT220P	Aiming attachment
1	KT221R	Holding screw for aiming attachment
3	KT223R	Drill sleeve
1	KT224R	Step drill
1	KT225R	Stepped screw driver, torque
1	KT226R	Screw driver, Ø 3.5 mm
1	KT227R	Screw driver, Ø 5 mm
1	KT228P	Connecting screw
1	KT229R	Locking drill, Ø 4.1 mm
1	KT230R	Screw length gauge
1	KT231R	Tissue protecting sleeve, distal
1	KT235P	Depth stop for drill KT224R
1	KT236R	Screw driver, Ø 4.5 mm
1	TA012039	Instructions for use Targon® instruments
1	KT241R	Tray for instruments
1	TE914	Template for KT241R
1	JH227R	Lid for KT241R

Optional:

Quantity	Article no.	Description
1	KH274R	Screw length gauge
1	FK147R	COBB elevator

To be ordered separately:

Quantity	Article no.	Description
1	KT234S	Guide pin Ø 2.5 x 310 mm sterile (4 pcs)
1	KT237SU	Twist drill for explantation Ø 5 mm sterile (3 pcs)
1	KT238SU	Twist drill for explantation 7 mm sterile (3 pcs)

Recommended container:
JK440 Container base 592 x 285 x 108 mm
JP001 Primeline lid 1/1 red

KT240

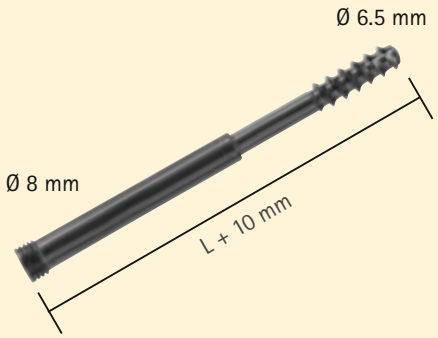
Ordering Information
Implants (in Sterile Packaging)

Article no.	Description
KO802T	Targon® FN femoral plate 130°

Targon® FN Femoral Plate

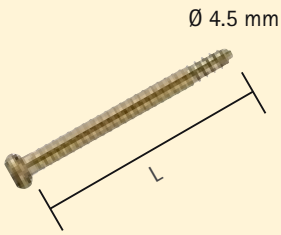
Article no.	Description
KO820T	Targon® FN TeleScrew, 70 mm
KO822T	Targon® FN TeleScrew, 80 mm
KO824T	Targon® FN TeleScrew, 90 mm
KO826T	Targon® FN TeleScrew, 100 mm
KO828T	Targon® FN TeleScrew, 110 mm

Targon® FN TeleScrew



Article no.	Description
KB336TS	Locking screw Ø 4.5 x 36 mm
KB340TS	Locking screw Ø 4.5 x 40 mm
KB344TS	Locking screw Ø 4.5 x 44 mm
KB348TS	Locking screw Ø 4.5 x 48 mm
KB352TS	Locking screw Ø 4.5 x 52 mm
KB356TS	Locking screw Ø 4.5 x 56 mm
KB360TS	Locking screw Ø 4.5 x 60 mm

Locking screw Ø 4.5 mm



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