SURGICAL PROCEDURE DISTAL FEMORAL PLATE



Distal Femoral Plate

Indications

The distal femoral plate (hereinafter plate) is intended for the osteosynthesis of all fractures of the distal femur (AO-33). It is also intended for type C fractures and periprosthetic fractures. An alternative for type A fractures is the osteosynthesis of the distal femoral nail. For type B fractures it can be used as an additional implant if separate tension screws cannot fix sufficiently (e.g. during osteoporosis).

Description of the implants

The implant system consists of a plate and several screws.

Plate

The plates are for the right or left femur ranging from 4–14 holes (165–336 mm) in size. The plate is attached from the lateral side of the femur and its shape corresponds to the physiological antecurvation. The proximal end of the plate is rounded for easier deployment. For the diaphysis and metaphysis area the plate is 6 mm thick, in the condyle area it broadens and thins. The plate is fitted with angular stable holes along its entire length. The screw can only be locked in the plate in the exact direction of the drill sleeve. This direction gives the join maximum stability. Screws in the diaphysis area are introduced at right angles to the plate. In the area of the condyle, they are inserted at a skew to avoid the screws coming out of the bone. The most distal screw is crucial for repositioning and X-ray alignment. It is introduced at an angle of 95° to the external cortical of the diaphysis. In the diaphysis - metaphysis transition area there is an oval hole that allows primary attachment of the plate or the proximal bone to be pulled to the plate and eventually fragment distraction when introducing the cortical screw.

Screws

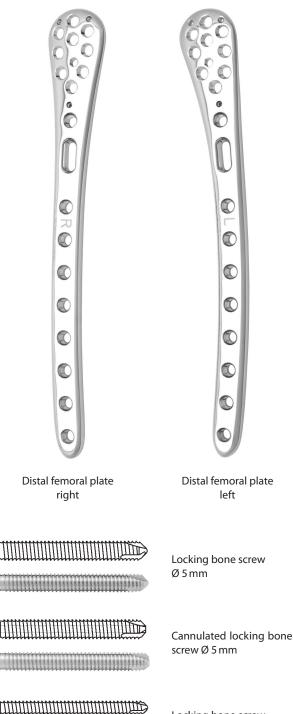
Locking bone screws (hereinafter screws) Ø 5 mm, or Ø 5/3.5 mm or Ø 5 mm cannulated in lengths of 16-50 mm increasing by 2 mm and in lengths of 50-105 mm increasing by 5 mm.

Cortical screw HA 4.5 in lengths of 14-60 mm increasing by 2 mm and in lengths of 60-110 mm by 5 mm.

Alternatively, a 5 HA cortical screw in lengths of 20-80 mm increasing by 5 mm and in lengths of 90 and 100 mm.

Note:

To use all the advantages of the internal fixator, only introduce locking bone screws into the plate. This does not compress the plate against the periosteum, or bone, thus the vascular supply is not further damaged. Using locking bone screws avoids the screws becoming loose and travelling away from the bone. The desired micro-movement supporting bone healing will not take place at the screw/plate level, but in the space between the proximal and distal screws.



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0

7 0

C

Locking bone screw Ø 5/3,5 mm

Self-tapping cortical bone screw Ø 4,5 mm

Self-tapping cortical bone screw Ø 5 mm (alternativa)

This brochure only serves as an illustrative guide for distal femoral plates and the instrumentarium. The aim of the brochure is to give physicians and suture nurses a quick guide in the use of the instruments and implant and their composition in order to achieve the best operational outcome. If you have any questions, please contact the MEDIN, a.s. sales representative.

DISTAL FEMORAL PLATE

Description of instrumentarium

Instrumentarium

Aiming device

It consists of two aiming device bodies (for a left and right plate), an arm and three different connecting screws, which connect the arm with the body, the body with the plate and the third screw is used to fix the \emptyset 8/4 mm drill sleeve in the last hole of the plate.

The aiming device's body and connecting screws are made of steel. The aiming device's arm is partly made of X-ray transparent material.

Sleeves

To protect the soft tissues. Used to guide long rotating instruments. Sleeves are made of steel.

Trocar

Equipped with a triangular piercing-tip for the primary manual perforation of the bone before drilling.

Drills

Intended for easy pre-drilling of the hole for the bolts.

Ø3.9 mm drills are cannulated and non-cannulated and can be differentiated by the number of coloured grooves. The drills are marked with a scale for measuring the length of the screw from the end of the drill sleeve.

Depth Gauge

Used to measure the length of the screw.

The scale has dual colouring, just like the measuring probe, due to shortening of the instrument.

Insertion instruments

The cannulated T-screwdriver is equipped with a hexagonal end for assembly onto the aiming device, or introducing the screws, but not for tightening the screws into the splints.

The T-handle, torque limiter (not part of the sieve) and screwdriver tips are intended for introducing and tightening the locking bone screws to the plate with a set torque. As with the drills, the screwdrivers' terminals are divided into cannulated and non-cannulated. They are distinguished by the number of coloured grooves.

K-wires

Can be used for fixing the plate to the bones.

Color coding description

- I. Aimer arm (blue)
 - II. Sleeve Ø 8/7 mm (blue/orange)
 - III. Sleeve Ø 7/4 mm (orange/yellow)
 - IV. Drill Ø 3.9 mm (yellow)
 - IV. Drill Ø 3.9 mm cannulated (yellow/yellow)
 - IV. Sleeve Ø 4/2.9 mm (yellow/green)
 - V. Drill Ø 2.9 mm (green)
 - IV. Sleeve Ø 4/1.8 mm (yellow/purple)
 - III. Locking bone screw (hexagonal 3.5 mm terminal [orange])
 - III. Cannulated locking bone screw (hexagonal 3.5 mm cannulated terminal [orange/orange])
 - II. Sleeve Ø 8/4 mm (blue/yellow)





Operating technique

The plate can be introduced with the aiming device or without it by using just the sleeves and other instruments. The technique using the aiming device is described below.

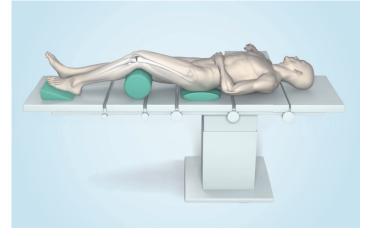
1. Pre-operation planning

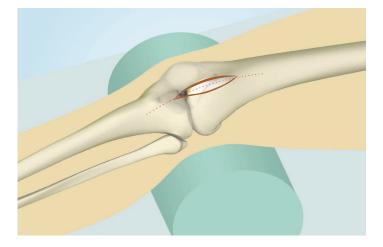
Before the operation, we recommend going through the procedure of the operation. Compare the limb to be operated upon with the healthy one and the X-rays of both limbs. Plan: the incision site, repositioning, the location of the spongious lag screws or K-wires so as not to hamper plate placement. Choose an appropriate implant length and screw location. Choose the plate length so that between the distal fragment and the most distal screw from the proximal fragments there is a space corresponding to approximately the length of the distal fragment. This free part of the plate limits straining and eventual fracture fatigue by the implant during rigid fixation.

The C arm only displays a limited part of the limb. For a pre-operation control, it is suitable to assess in advance the limb's axis and length according to the healthy side (X-ray measurement, the limb's axis with a cable system). It is also appropriate to ascertain whether there is no important blood circulation and nervous tissue, which should not be damaged, at the site of the incision and the introduction of ancillary or supplementary implants.

2. Patient position

The patient is supine with a support for the knee or on a traction table. The second limb is placed above or below the knee to be operated on. The position of the limbs must enable X-ray checks using the C arm in the M-L and A-P projection and stabilize the rough repositioning. If an auxiliary external fixator or distractor is used, it must not prevent the subsequent attachment of the plate or checks using the C arm.





3. Procedure

For simple extra articular fractures, a 6 cm incision above the lateral condyle, eventually distally extended towards the Gerdy's Tubercle, is sufficient. Cut longitudinally through the iliotibial tract to the bone and free the bone with a raspatory to the extent of the plate's widened end. Using a raspatory or forceps, cranially create a space for the plate between the periosteum and the outer thigh muscle.

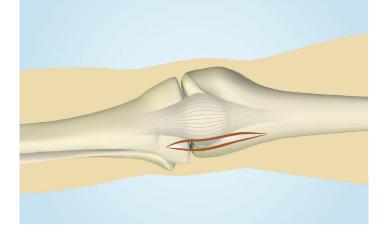
For intra articular fractures a lateral parapatellar cut with sufficient arthrotomy is suitable. Eversion of the patella allows visualisation and an open repositioning of the condylar area of the fracture.

4. Repositioning the fragments

Repositioning and osteosynthesis of the femur condyle must be carried out before attaching the plate because it is not specified as a repositioning plate. Use bone forceps or K-wires to fix reduced condyles outside the planned plate attachment area. K-wires can also be guided medially through the skin, and laterally introduced up to the level of the cortical. It is best to introduce cannulated spongious tensile screws from the inner side. Keep in mind that bad repositioning of the fragments may result in restriction or pain during movement!

5. Introducing and positioning the plate

Attach the plate to the aiming device body with a screw.





Screw the aiming device arm screw before introducing a K-wire to the plate's proximal hole. While assembling make sure you have the correct aiming device body and the aiming device arm is correctly positioned (LEFT PLATE/RIGHT PLATE).





Use the aiming device to cranially introduce the plate around the lateral condyle. The distal end of the plate lies is on the condyle about 2 cm above the joint space. Viewing from the side, the centre of the plate is on the divide between the front and middle thirds of the condyle width. Cranially the plate runs along the epiperiostal area in parallel with the diaphysis. For initial anchorage a HA 4.5 cortical screw can be introduced through the oval hole. This anchorage allows the plate's position on the bone to be corrected.



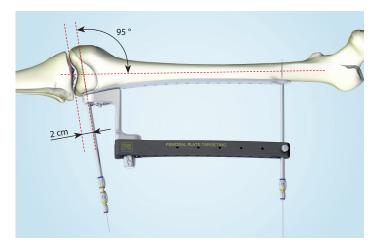
As needs be, fix the plate to the condyle with a Ø 1.5 mm K-wire through a Ø8/7 mm guide sleeve, a Ø7/4 mm drill sleeve and a Ø 4/1.8 mm guide sleeve. Above the proximal end of the plate, measured according to the aiming device, make an incision to the bone and set the plate on the centre of the bone. Drill a Ø 1.5 mm K-wire through the aiming device, the Ø 8/4 mm drill sleeve and the Ø 4/1.8 mm guide sleeve. The Ø8/4 mm drill sleeve is tightened by the screw in the aiming device. This eliminates any plate spring-back. When the plate is in the correct position on the bone, introduce a K-wire through the entire bone to the inner cortical.



Introduce a Ø1.5 mm central K-wire, a Ø 8/7 mm guide sleeve, Ø7/4 mm drill sleeve and Ø4/1.8 mm guide sleeve into the most distal hole in the plate through the aiming device. Use the A-P projection to check the distance of the K-wire from the joint space and whether the K-wire is in parallel with the joint space. If not, the resulting position will deviate accordingly in the sense of the varus-valgus. At a fragmentation zone it is subsequently revealed by a large format X-ray.

Check the correct axial position with the cable technique using coagulation cords.





Before introducing the screws we recommend that you check:

- The fragmentation zone, whether the plate does not contract the limb. If there is uncertainty compare the length of the operative limb by X-ray or clinically with the healthy limb measured previously.
- The plate's proximal end, whether the planned number of screws is sufficiently distant from the fracture (whether the plate is long enough).
- In the side view, assess the position of the plate on the condyle. Check the position of the condyle with regards to the diaphysis and any recurvation is removed by, for instance, bracing.
- The plate's position with regards to diaphysis, whether the plate and aiming device are in parallel with the bone.
- Whether the linear, rotary and angular position is correct on the X-ray and clinically.

NOTE: The distal femoral plate is used for fixation using a similar procedure as a 95° condylar plate or DCS. Thus the plate is 95° to the lateral cortical of the diaphysis. The techniques used in previous implants (positioning join surfaces using wires) can be used. The key distal K-wire must be introduced through the aiming device and sleeves in parallel with the femur-tibia and femur-patella joint space, similar to the central wire in the DCS method.

6. Introducing the cannulated screws

A hole is drilled to the condyle through the K-wire in the distal fragment using a Ø3.9 mm drill, measure the length directly on the drill.





Introduce the locking bone screw. Or introduce 2 to 3 locking bone screws around the most distal screw and, after removing the K-wire, introduce the most distal screw.





7. Procedure for introducing locking bone screws

Introduce a Ø8/7 mm guide sleeve into the aiming device, which is used to introduce the locking bone screw. Insert a Ø7/4 drill sleeve into the Ø8/7 guide sleeve and then screw into the plate. Prepare a depression with the Ø4 mm trocar to make drilling easier and to prevent the drill from slipping.



Then drill a hole with a Ø3.9 mm drill. The screw length can be subtracted on the drill. After drilling the hole remove the Ø3.9 mm drill and the Ø7/4 mm drill sleeve.





Measure screw length with the depth gauge through the \emptyset 8/7 mm guide sleeve.



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Add a torque limiter and a 6HR 3.5 mm screwdriver to the handle and introduce a screw through the Ø8/7 mm guide sleeve.



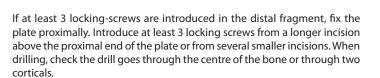
If the osteosynthesis requires the introduction of a **5/3.5 mm locking bone screw**, introduce a Ø8/7 guide sleeve, a Ø7/4 drill sleeve and a 4/2.9 mm guide sleeve into the aiming device. Drill the hole for the 5/3.5 mm locking bone screw with the Ø2.9 mm drill. The screw is then introduced in the same way as previously.





Distal screws are introduced on the medial side subcortically just before the end of the cortical, so that it does not interfere with the joint or irritate the joint capsule and ligaments. In the distal part of the plate, it is best to use the maximum number of holes in the plate.









8. Notes

The locking bone screws are self-tapping, thus a screw-tap is not necessary.

Do not lock a screw into the plate in any of the fragments if the plate is not fixated against the bone in several points. This prevents the plate from rotating on the bone (the helicopter effect).

If the proximal fragment or a large chip deviates from the plate when it has a correct distal position, temporarily pull the bone to the plate with a cortical screw. After tightening and other fixations you can decide whether to leave this screw or replace it with a locking screw.

If you fix the proximal end of the plate and the other locking screws go through the edge of the medullary cavity or just the cortical (e.g. due to enormous diaphysis curvature with a long plate), it is safer to introduce

other 4.5 HA "unlockable" cortical screws and introduce them at an angle through the centre of the femur's medullary cavity.

Introduce at least three proximal screws load bicortically, but with a sufficiently strong lateral cortical it is possible to fix some of the screws monocortically. Of course, the number of screws must be increased.

For osteoporotic bones, it is an advantage to introduce the first proximal screw only monocortically, the medial cortical must not be perforated.

9. Completing the operation

After completing the osteosynthesis, take an X-ray and introduce a Redon Drain to the plate area. If the joint is open, drain it too. Suture the wound in layers and put the limb into Semiflex in the knee joint. With sufficient analgesia, promptly commence rehabilitation.



Implant extraction

Loosen all the screws and then remove them, this prevents the last screw from rotating along with the plate. In the event of complications, use the instrumentarium to remove the screws.

Important notes

Before osteosynthesis always check the proximal end of the aiming device is precisely aligned with the holes in the plate using a \emptyset 8/4 mm drill (tapping) sleeve.

For guaranteed safe usage of the implant, MEDIN a.s. requires only this company's implants be used. There must be no combination of implants from other firms.

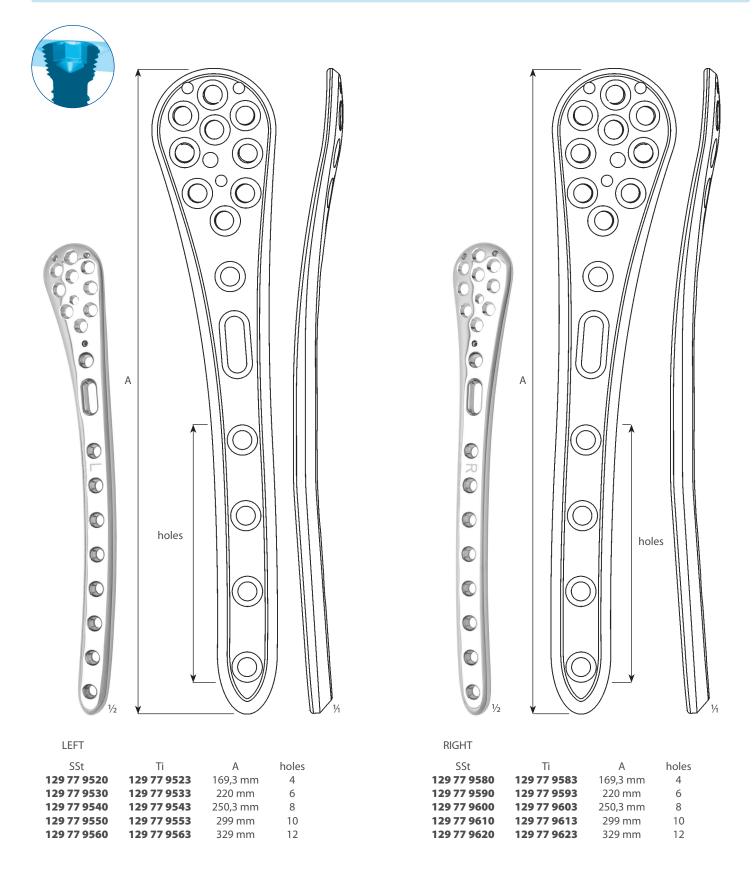
The patient must be warned that the implant will not bear the patient's entire weight. The patient must use a means of support when walking and gradually increase the burden depending on how the muscles are forming in the site of the fracture.

When applied to one patient there should never be a combination of different materials.

The implants are intended for single use, for one patient and for one stabilisation of the damaged bone. Re-use is prohibited. This fact is mentioned in the package leaflet and concerns all implants.

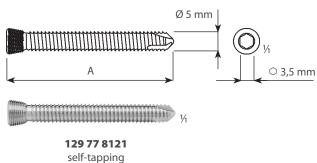
Packaging leaflets PL0201 and PL0088 contain all the important information necessary.





Ti - titanium version, material: Ti6Al4V ELI in accordance with ISO 5832-3

LOCKING BONE SCREWS 5 mm

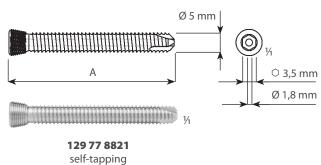


44 mm

NOTES: drilled with Ø 3.9 mm drill introduction by a screwdriver with 3.5 mm socket

SSt	Ti	А
551 129 77 7981	129 77 7984	A 16 mm
129 77 7991	129 77 7994	18 mm
129 77 8001		
129 77 8001	129 77 8004	20 mm
	129 77 8014	22 mm
129 77 8021	129 77 8024	24 mm
129 77 8031	129 77 8034	26 mm
129 77 8041	129 77 8044	28 mm
129 77 8051	129 77 8054	30 mm
129 77 8061	129 77 8064	32 mm
129 77 8071	129 77 8074	34 mm
129 77 8081	129 77 8084	36 mm
129 77 8091	129 77 8094	38 mm
129 77 8101	129 77 8104	40 mm
129 77 8111	129 77 8114	42 mm
129 77 8121	129 77 8124	44 mm
129 77 8131	129 77 8134	46 mm
129 77 8141	129 77 8144	48 mm
129 77 8151	129 77 8154	50 mm
129 77 8161	129 77 8164	55 mm
129 77 8171	129 77 8174	60 mm
129 77 8181	129 77 8184	65 mm
129 77 8191	129 77 8194	70 mm
129 77 8201	129 77 8204	75 mm
129 78 7401	129 78 7404	80 mm
129 78 7411	129 78 7414	85 mm
129 78 7421	129 78 7424	90 mm
129 78 7431	129 78 7434	95 mm
129 78 7441	129 78 7444	100 mm
129 78 7451	129 78 7454	105 mm

CANNULATED LOCKING BONE SCREWS 5 mm



elf-tappin 44 mm

NOTES: drilled with Ø 3.9 mm drill introduction by a cannulated screwdriver with 3.5 mm socket

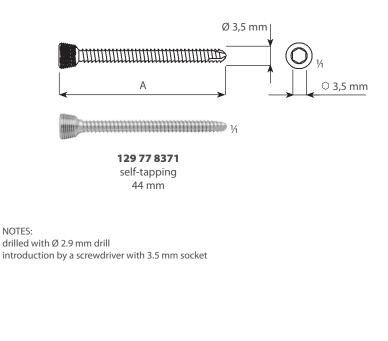
CANNULATED

SSt	Ti	А
129 77 8681	129 77 8684	16 mm
129 77 8691	129 77 8694	18 mm
129 77 8701	129 77 8704	20 mm
129 77 8711	129 77 8714	22 mm
129 77 8721	129 77 8724	24 mm
129 77 8731	129 77 8734	26 mm
129 77 8741	129 77 8744	28 mm
129 77 8751	129 77 8754	30 mm
129 77 8761	129 77 8764	23 mm
129 77 8771	129 77 8774	34 mm
129 77 8781	129 77 8784	36 mm
129 77 8791	129 77 8794	38 mm
129 77 8801	129 77 8804	40 mm
129 77 8811	129 77 8814	42 mm
129 77 8821	129 77 8824	44 mm
129 77 8831	129 77 8834	46 mm
129 77 8841	129 77 8844	48 mm
129 77 8851	129 77 8854	50 mm
129 77 8861	129 77 8864	55 mm
129 77 8871	129 77 8874	60 mm
129 77 8881	129 77 8884	65 mm
129 77 8891	129 77 8894	70 mm
129 77 8901	129 77 8904	75 mm
129 78 7541	129 78 7544	80 mm
129 78 7551	129 78 7554	85 mm
129 78 7561	129 78 7564	90 mm
129 78 7571	129 78 7574	95 mm
129 78 7581	129 78 7584	100 mm
129 78 7591	129 78 7594	105 mm

NOTES:

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LOCKING BONE SCREWS 3,5 mm



SSt	Ti	А
129 77 8231	129 77 8234	16 mm
129 77 8241	129 77 8244	18 mm
129 77 8251	129 77 8254	20 mm
129 77 8261	129 77 8264	22 mm
129 77 8271	129 77 8274	24 mm
129 77 8281	129 77 8284	26 mm
129 77 8291	129 77 8294	28 mm
129 77 8301	129 77 8304	30 mm
129 77 8311	129 77 8314	32 mm
129 77 8321	129 77 8324	34 mm
129 77 8331	129 77 8334	36 mm
129 77 8341	129 77 8344	38 mm
129 77 8351	129 77 8354	40 mm
129 77 8361	129 77 8364	42 mm
129 77 8371	129 77 8374	44 mm
129 77 8381	129 77 8384	46 mm
129 77 8391	129 77 8394	48 mm
129 77 8401	129 77 8404	50 mm
129 77 8411	129 77 8414	55 mm
129 77 8421	129 77 8424	60 mm
129 77 8431	129 77 8434	65 mm
129 77 8441	129 77 8444	70 mm
129 77 8451	129 77 8454	75 mm
129 78 7471	129 78 7474	80 mm
129 78 7481	129 78 7484	85 mm
129 78 7491	129 78 7494	90 mm
129 78 7501	129 78 7504	95 mm
129 78 7511	129 78 7514	100 mm
129 78 7521	129 78 7524	105 mm

NOTES: SSt - stainless steel in accordance with ISO 5832-1 Ti - titanium version, material: Ti6Al4V ELI in accordance with ISO 5832-3

STANDS FOR LOCKING SCREWS



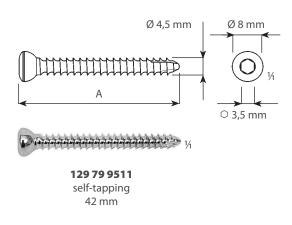
height 120 mm

214 × 126 mm

height 120 mm

height 120 mm

SELF-TAPPING CORTICAL BONE SCREWS - HA 4,5 mm



SSt	Ti	A
129 79 9421	129 79 9424	14 mm
129 79 9431	129 79 9434	16 mm
129 79 9441	129 79 9444	18 mm
129 79 5521	129 79 5524	20 mm
129 79 9451	129 79 9454	22 mm
129 79 9461	129 79 9464	24 mm
129 79 5541	129 79 5544	26 mm
129 79 9471	129 79 9474	28 mm
129 79 5551	129 79 5554	30 mm
129 79 9481	129 79 9484	32 mm
129 79 9491	129 79 9494	34 mm
129 79 5571	129 79 5574	36 mm
129 79 9501	129 79 9504	38 mm
129 79 5581	129 79 5584	40 mm
129 79 9511	129 79 9514	42 mm
129 79 9521	129 79 9524	44 mm
129 79 9531	129 79 9534	46 mm
129 79 9541	129 79 9544	48 mm
129 79 5601	129 79 5604	50 mm
129 79 9551	129 79 9554	52 mm
129 79 9561	129 79 9564	54 mm
129 79 9571	129 79 9574	56 mm
129 79 9581	129 79 9584	58 mm
129 79 5621	129 79 5624	60 mm
129 79 5631	129 79 5634	65 mm
129 79 5641	129 79 5644	70 mm
129 79 5651	129 79 5654	75 mm
129 79 5661	129 79 5664	80 mm
129 79 5671	129 79 5674	85 mm
129 79 5681	129 79 5684	90 mm
129 79 5691	129 79 5694	95 mm
129 79 5701	129 79 5704	100 mm
129 79 5711	129 79 5714	105 mm
129 79 5721	129 79 5724	110 mm

А

20 mm

25 mm

30 mm

35 mm

40 mm

45 mm

50 mm

55 mm

60 mm

65 mm

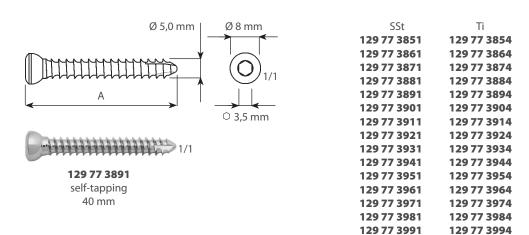
70 mm

75 mm

80 mm 90 mm

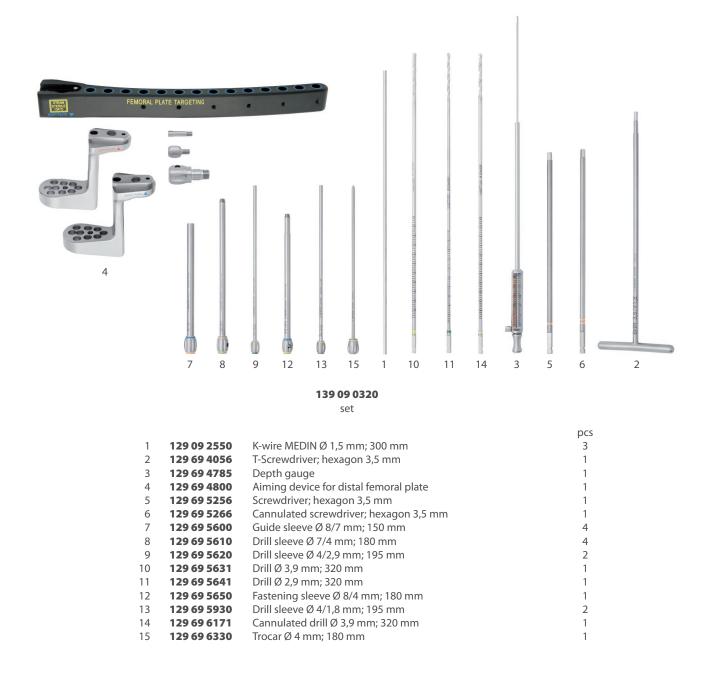
100 mm

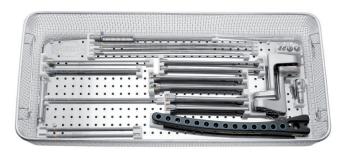
SELF-TAPPING CORTICAL BONE SCREWS - HA 5 mm

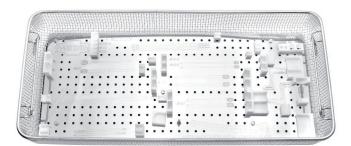


NOTES:

INSTRUMENTS FOR DISTAL FEMORAL PLATES







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