SURGICAL TECHNIQUE
DISTAL RADIUS PLATES 3.5 mm / ANGULARLY STABLE

MEDIN

Distal radius plates 3.5 mm / angularly stable

Indication

The plates are used for extra- and intra-articular osteosynthesis of fractures of the distal radius volar side.

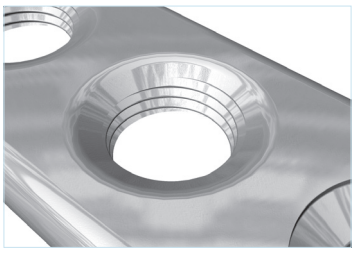
Description of the medical device

The implant system consists of a plate and the necessary number of angularly stable screws, or cortical screws.

Distal radius plates 3,5 mm / angularly stable

Angularly stable plate for distal radius includes locking holes to attache locking screws into the bone. Those plates include also standard oval hole. Properties of angularly stable plates enable their successful using even in less quality and osteoporotic bones. Angularly stable connection is mainly useful during intraarticulatory fractures treatment. Some plates can be anatomically shaped for a better fit to the natural anatomy of common bones in distal radius.

Locking hole

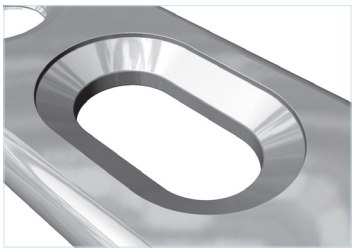


Self-tapping or self-drilling screws can be introduced into the bone and „locked" by fastening of the conical thread on the screw head in the same screw in the plate hole. Such connection is towards the plate angularly stable, the whole system works on the principle of inner fixator. This solution helps to prevent from following problems:

— primary loss of reposition
— secondary loss of reposition, in the first place in cases of fragmentation fractures without sufficient bone support, low quality or osteoporotic bone
— periosteum compression and following worsening of blood supply of cortical bone

Use locking screws up to 3.5 mm in this hole. It is also possible to use standard screw with ball head with stem up to 3.5 mm.

Standard oval hole



Standard oval hole enables to the surgeon to use compression screws for fastening of broken fragments and fracture fixation by axial compression. The screws can be introduced under different angles, lengthwise or transversally.
Do not insert locking screws in this hole!

Locking bone screws

The distal radius plates are fixed using Ø 3.5 mm and Ø 3.5/2.7 mm angularly stable screws.
Ø 3.5 mm angularly stable screws come in lengths of 8–50 mm increasing by 2 mm and 50–75 mm by 5 mm.
Ø 3.5/2.7 mm angularly stable screws come in lengths of 10–50 mm increasing by 2 mm.

Cortical bone screw

Cortical HA 3.5 mm screws are intended for the distal radius plates.

Implants are made of implant steel or titanium.

T–plate angularly stable

Anatomical T–plate angularly stable

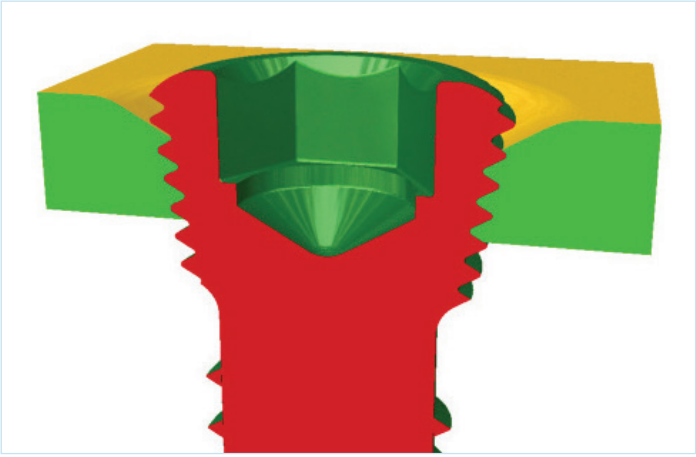
Anatomical T–plate angularly stable

Locking bone screw
Ø 3,5 mm

Locking bone screw
Ø 3,5/2,7 mm

Self-tapping cortical bone screw
HA 3,5 mm

System of angularly stable plates



The system is based on the principle of the inner fixator. By means of the tight connection „screw - plate", the angularly stable connection is achieved between the plate system and the bone. This transfers part of the weight from the screw-bone connection to the screw-plate connection. Thanks to that it is possible to use the system successfully even in a less quality and an osteoporotic bone.
If the angularly stable plate is used with locking screws, the plate and the screws make tight system together. The plate does not have to be pushed against the bone therefore the bone still gets sufficient supply of blood. Locking screws can be introduced monocortically without enfeebling the strength of the configuration or the fracture fixation, because the screws are firmly anchored in the plate.

Principles of fixation

1. Only compression screws

It is about a commonly used method of fracture fixation with the help of plate and compression screws.
Fragments of a bone are fastened to the plate, the plate is closely pushed against the bone and stability of the whole system is reached by bone pressure on the bottom part of the plate with the help of compression screws. Shape of the plate is crucial for the correct function of osteosynthesis.

2. Only locking screws

If you use only locking screws then you make a system that works on a very similar principle as outer fixator.
When using only locking screws, the plate shape is not what matters but high-quality fracture reposition before tightening of the locking screws.

3. Combination of locking and compression screws

a) Use the plate on the base of the common plating principle; first perform fracture reposition and fixation by compression screws. (You can use the spacer to keep the space between the bone and the plate). Then screw the locking screws to reach the angularly stable plate fixation towards the bone.
b) After the fracture reposition and plate fixation by locking screws, it is possible to fasten the separated fragment (e.g. multi-fragmentation or splintery fractures) to the fixed part of the bone by compression screw.
c) After fixation of one fracture fragment by locking screws, it is possible to push the second fragment to the first one with compression screws and eventually after that to fix even the second fragment with other locking screws.

Note: Do not use locking screws closely to both sides of the fracture because the strain, to which the plate is exposed, would be concentrated only to the space between these screws and the plate could get broken. It is generally recommended to leave from 1 to 3 holes empty above the fracture area.

Note: To use the locking plate system correctly, it is necessary to understand the principles of fixation and their biomechanical properties. Draw your attention to pre-operation planning.

Caution: Only a specialist can work with the implants.

This brochure only serves as an illustrative guide for distal radius plates 3,5 mm and the instrumentation. The aim of the brochure is to give physicians and suture nurses a quick guide and the correct composition in the use of the instruments and implant in order to achieve the best operational outcome. If you have any questions, please contact your MEDIN, a.s. salesperson.

Surgical technique

Only introduce angularly stable screws in the area of the epiphysis monocortically, bicortically in the area of the diaphysis.
Pay attention to locking screws, they do not behave as standard compression screws. It is necessary to realise that during fastening the screw and locking the screw's head in the plate hole, the screw is strongly fixed and the force compression of bone fragments does not happen. Therefore, careful anatomical bone reconstruction is necessary (mainly in intra-articulatory fractures) with the help of compression (standard) screws, K-wires or cannulated screws. If the intra-fragment compression is required, using of compression screws is also necessary.

1. Reposition the fracture

Reposition the fracture under X-ray control. If essential, fixate it with K-wires MEDIN or forceps.

2. Shape the plate

Shape the plate before operation suitably. Use only allowed shaping instruments, those that are identical with instruments for standard plates.
It is not necessary to shape the plate exactly on the bone for correct and quality reposition. Quality and stability of the connection does not depend on the contact of the plate with bone surface. This is mainly suitable for mini-invasive operation methods, when it is not possible to shape the plate in advance. Anatomical plates are pre-shaped already so that they would correspond to the shape of common bone; their next bending is only possible in the place of oval hole.
When bending prevent from deformation of the holes with thread, they could get damaged. Do not use locking screws or spacers to protect the thread during bending, they could get stuck in the hole, and thus their removal would be impossible or damage of the thread would happen. Do not use locking drilling sleeves for bending. It is possible to bend protrusion with hole at the plate with protrusion. CAUTION! It is not allowed to bend the plate more times than once!

Fig. 1

3. Insert the spacer

To minimise the contact of the plate with the bone, it is possible to place the spacer (Fig. 1) in the hole with thread before fixation of standard screws, it ensures the space between the plate and the bone 2 mm (Fig. 2). It is possible to remove it again after plate securing with locking screws.

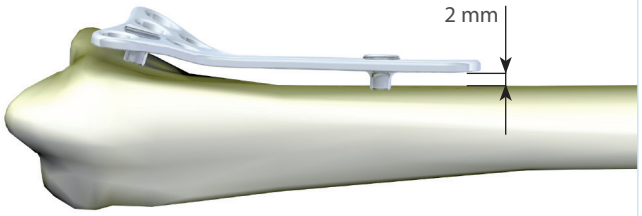


Fig. 2

4. Insert guide sleeve locking

Screw the guide sleeve locking carefully into the thread of chosen plate hole until it is tightly hold. Use the guide sleeves locking for manipulation and correct plate placing (Fig. 3).

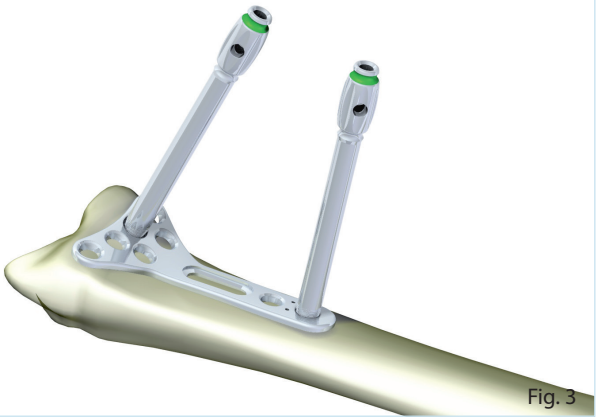


Fig. 3

AN OVERVIEW OF THE TOOLS:

	Lockable aiming sleeve 2.9 mm; 60 mm	marked green
	Aiming sleeve for 1.5 mm wire; 75 mm	marked green/pink
	Guide rod 1.5 × 300 mm	marked in sieve – pink
	Aiming sleeve for 2.0 mm wires; 75 mm	marked green/purple
	K-wire with shank; 2.0 × 300 mm	marked in sieve – purple
	Drill 2.9 × 190 mm	marked green

5. Place the plate and fix it temporarily

Place the plate in situ using lockable aiming sleeves and temporarily fix them with MEDIN K-wires, forceps or by screwing a cortical 3.5 HA screw into the oval hole (Fig. 4).
Correct position of the screws is necessary for right function, mainly screw alignment with the plate hole. To determine correct screw position you can use K-wires. Screw locking sleeve 2.9 mm into required plate hole and insert guide sleeve for rods 1.5 mm into it and introduce the wire. Use RTG to picture the wires – they represent final position of locking screws.

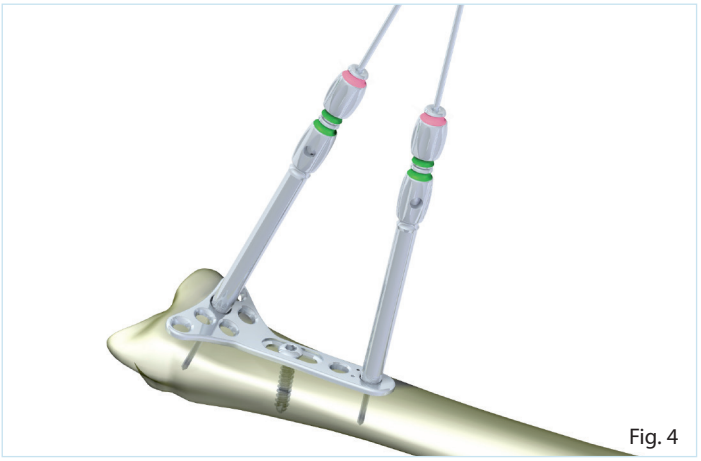


Fig. 4

6. Pre-drill the hole

Remove the guide sleeve for rods Ø 1.5 mm and leave the drilling sleeve Ø 2.9 mm in the place. With the help of this sleeve, pre-drill the hole for screw (Fig. 5). Drill only until first cortex then you can screw the screw easily thanks to the self-tapping thread on the tip.
Carefully with a drill (Ø 2.9 mm for screw of Ø 3.5 mm; for screws Ø 2.7 mm pre-drill the bone with wire of Ø 2 mm and using guide sleeve) pre-drill hole in the bone with the help of attached guide sleeve. Use the electric drill for mechanical pre-drilling. Use the hand-handle of the drill for more exact control above depth of drilling and to prevent the soft tissues from damage on the opposite side of the bone.

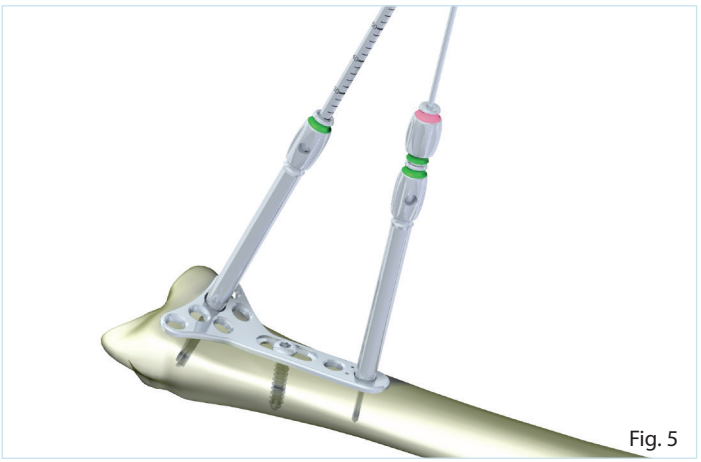


Fig. 5

7. Unscrew the guide sleeve

Unscrew the guide sleeve carefully. In case that it is not possible to unscrew the sleeve only by hand from some reason, you can help yourself with guide sleeve for wires – insert it into the hole of the drilling sleeve handle and use it as an elevator (Fig. 6). Use the wire hole for screw depth determination with gauge.


Fig. 6

8. Measure the hole depth and choose the correct screws

Measure the depth of the pre-drilled hole with the help of the depth gauge (Fig. 7). Perform it from the upper surface of the plate – the lengths of the screws are mentioned including the head. Choose the correct length of the screw carefully. If the bone is strong and of a good quality, it is possible to use the screws monocortically. For osteoporotic or less quality bone, we recommend using of bicortical screws. For proper system function it is the screw density important (proportion of the number of the screws to number of the holes in the plate). Ideal proportion is 0.4–0.5. In contrast with standard plates, using of screw in each plate hole is not recommended. Nevertheless, plate fixation proximally or distally towards the fracture place is still very important. At least two screws should be used monocortically for fixation of each main fragment, we recommend using 2 or 3 screws into main fragments, and in case fixation some of the screws were not optimal. To enhance the quality and stability of the system we recommend using at least one screw bicortically.

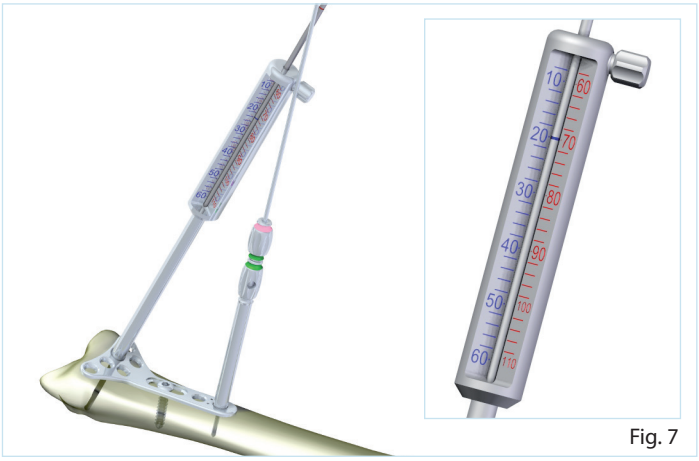
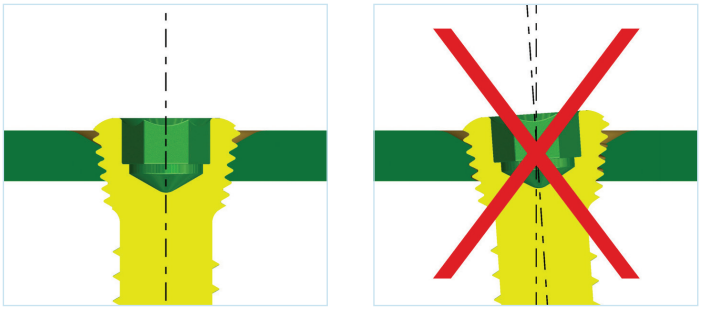


Fig. 7

9. Insert the screw

Before introduction of the first locking screw, make sure that the plate is firmly fixed - when fastening the screw the rotation could happen – the plate round the screw axis. Make the screws tight with the help of screw driver handle, torque limiter and hexagonal screwdriver 2,5 mm (Fig. 8).

Pre-drill the holes for locking screws with the help of the guide sleeve. For proper plate function, it is necessary to introduce the screws in the plate in a way that the lengthwise axis of the screw is identical to the axis of the corresponding hole in the plate. At a divergence smaller than 5 ° the connection of the screw's head and the plate is decreased to 70 %.



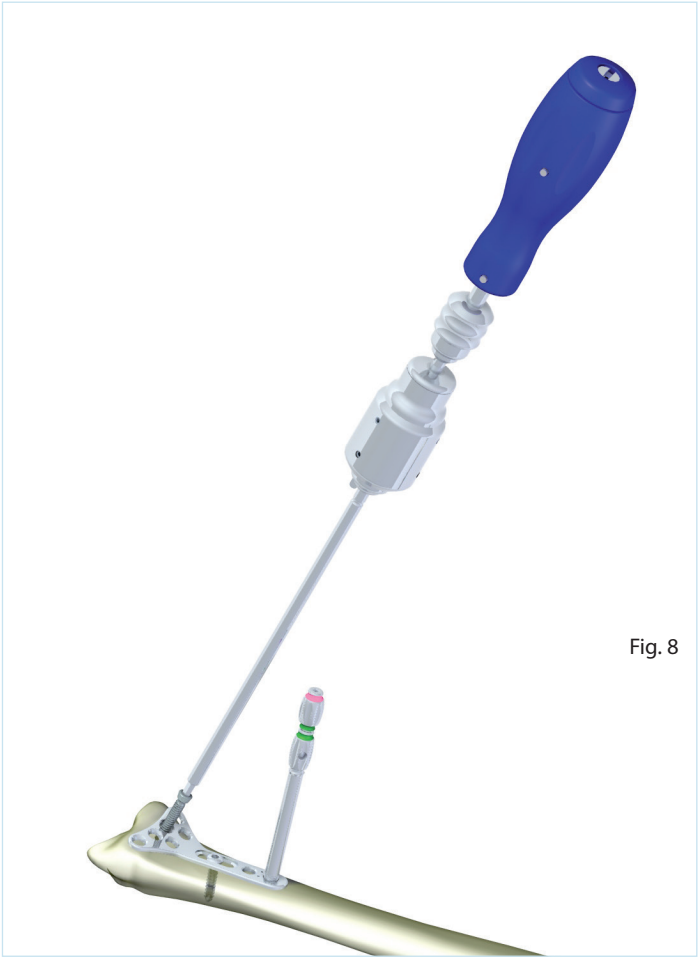


Fig. 8

10. Make sure everything is all right

Check that the locking screws are tight (Fig. 9). Remove instruments necessary for temporary plate fixation.

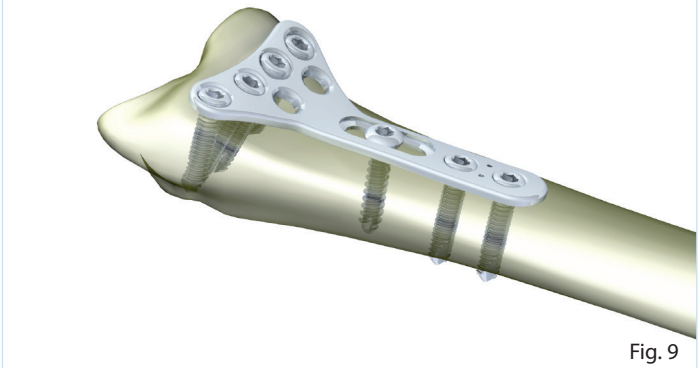


Fig. 9

11. Concluding remarks

— Implants are available in steel and titanium design. When applied to one patient there should never be a combination of different materials.

— To guarantee the safe use of the implant, MEDIN requires only implants of this company be used. There must not be a combination of implants from other firms.

— The implants are intended for single use, for one patient and for one stabilization of the damaged bone. Reuse is forbidden. This fact is mentioned in the package leaflet and concerns all implants.

Plate removal

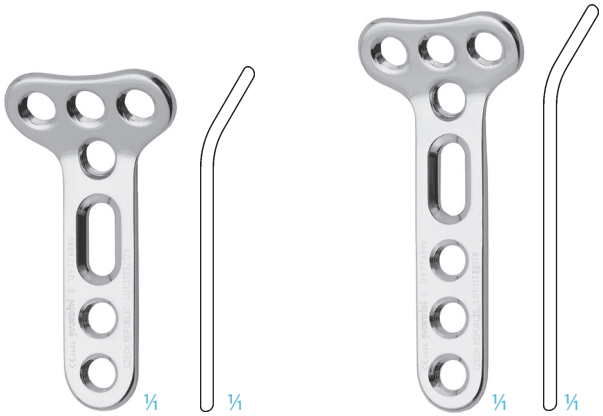
When removing the plate, loose all the screws first, after that start to take them out one after the other. In this way, you prevent from possible rotation of the plate round the axis of the screw that was taken out as the last one. If the hexagon head of the screw gets stripped or during other problems with screws removing, use the instrumentation for removal of MEDIN screws.

T–plate angularly stable

SSt	Ti	A	holes
129 77 7800	**129 77 7803**	40 mm	2×4

plate thickness 1,5 mm

SCREWS:
locking bone screws 3.5 and 3.5/2.7 mm
cortical screws HA 3.5

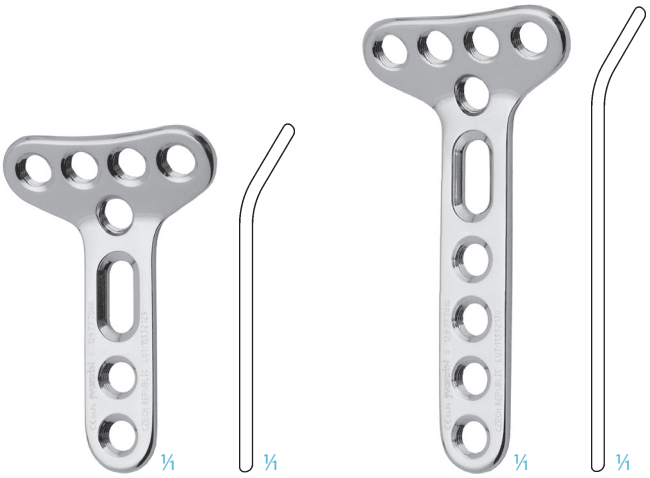


T–plate angularly stable

SSt	Ti	A	holes
129 77 6980	**129 77 6983**	46 mm	3×4
129 77 6990	**129 77 6993**	54 mm	3×5

plate thickness 1,7 mm

SCREWS:
locking bone screws 3.5 and 3.5/2.7 mm
cortical screws HA 3.5



T–plate angularly stable

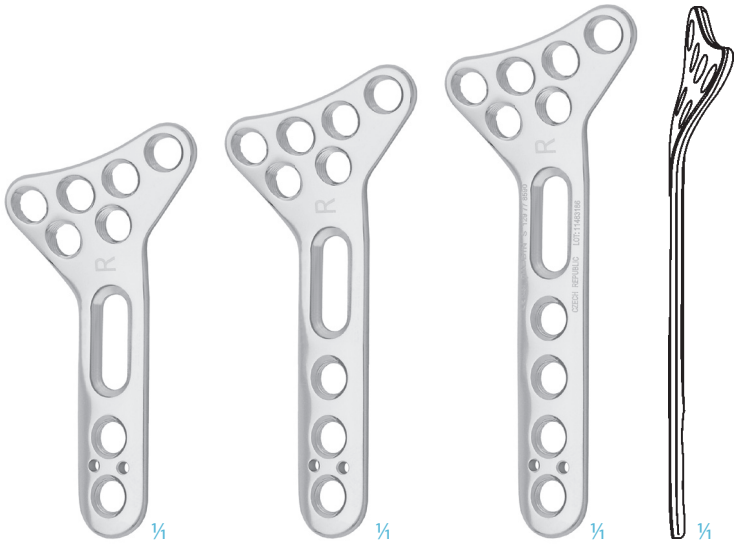
SSt	Ti	A	holes
129 77 7000	**129 77 7003**	46 mm	4×4
129 77 7010	**129 77 7013**	62 mm	4×6

plate thickness 1,7 mm

SCREWS:
locking bone screws 3.5 and 3.5/2.7 mm
cortical screws HA 3.5

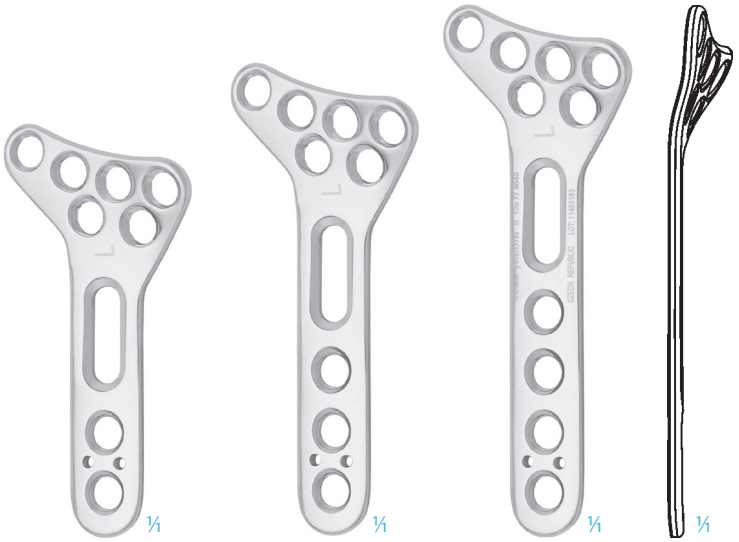
NOTES: SSt – stainless steel in accordance with ISO 5832-1 Ti – titanium version, material: Ti6Al4V ELI in accordance with ISO 5832-3

IMPLANTS



Anatomical T–plate angularly stable, right

SSt	Ti	A	holes
129 77 8210	**129 77 8213**	55 mm	6×3
129 77 8580	**129 77 8583**	63 mm	6×4
129 77 8590	**129 77 8593**	71 mm	6×5



Anatomical T–plate angularly stable, left

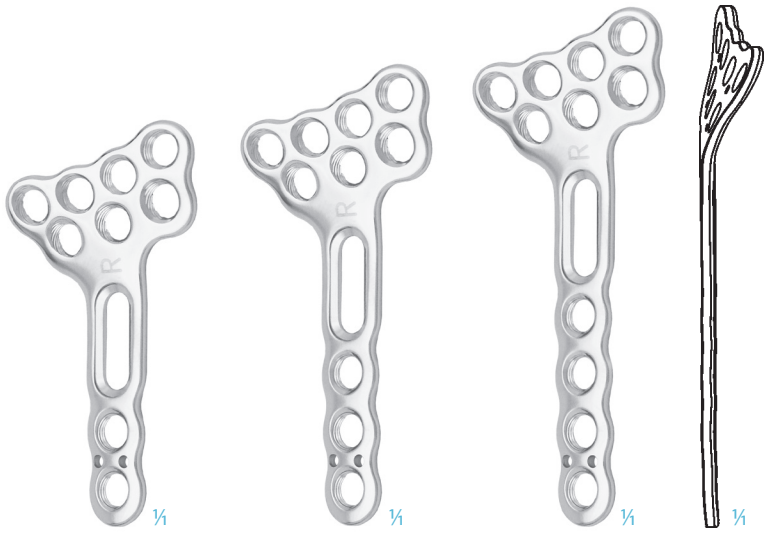
SSt	Ti	A	holes
129 77 8620	**129 77 8623**	55 mm	6×3
129 77 8630	**129 77 8633**	63 mm	6×4
129 77 8640	**129 77 8643**	71 mm	6×5

plate thickness	1,7 mm

SCREWS:
locking bone screws 3.5 and 3.5/2.7 mm
cortical screws HA 3.5

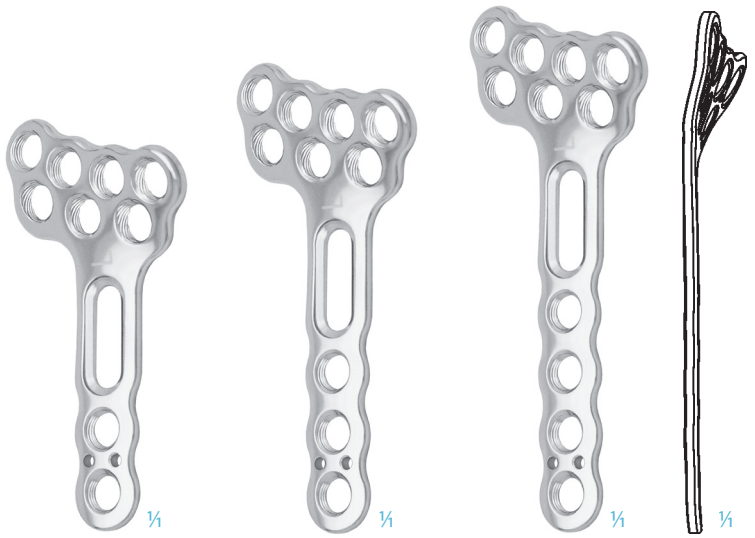
NOTES: SSt – stainless steel in accordance with ISO 5832-1 Ti – titanium version, material: Ti6Al4V ELI in accordance with ISO 5832-3

IMPLANTS



Anatomical T–plate angularly stable, right

SSt	Ti	A	holes
129 77 8220	**129 77 8223**	54 mm	7×3
129 77 8600	**129 77 8603**	62 mm	7×4
129 77 8610	**129 77 8613**	70 mm	7×5



Anatomical T–plate angularly stable, left

SSt	Ti	A	holes
129 77 8650	**129 77 8653**	54 mm	7×3
129 77 8660	**129 77 8663**	62 mm	7×4
129 77 8670	**129 77 8673**	70 mm	7×5

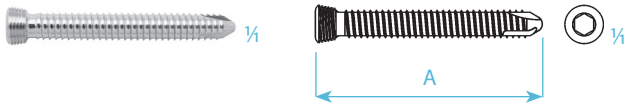
plate thickness 1,7 mm

SCREWS:
locking bone screws 3.5 and 3.5/2.7 mm
cortical screws HA 3.5

129 69 4380 Stand for angularly stable plates DR
211 × 149 × 43 mm
excluding implants

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

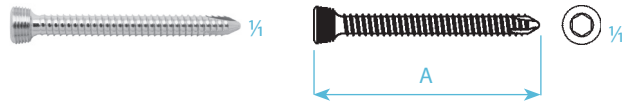
IMPLANTS



thread diameter	3,5 mm
core diameter	3,0 mm
head diameter	5,0 mm
drill bit for threaded hole	Ø 2,9 mm
screwdriver	⬡ 2,5 mm

Locking bone screw 3.5

SSt	Ti	A
129 77 7021	**129 77 7024**	8 mm
129 77 7031	**129 77 7034**	10 mm
129 77 7041	**129 77 7044**	12 mm
129 77 7051	**129 77 7054**	14 mm
129 77 7061	**129 77 7064**	16 mm
129 77 7071	**129 77 7074**	18 mm
129 77 7081	**129 77 7084**	20 mm
129 77 7091	**129 77 7094**	22 mm
129 77 7101	**129 77 7104**	24 mm
129 77 7111	**129 77 7114**	26 mm
129 77 7121	**129 77 7124**	28 mm
129 77 7131	**129 77 7134**	30 mm
129 77 7141	**129 77 7144**	32 mm
129 77 7151	**129 77 7154**	34 mm
129 77 7161	**129 77 7164**	36 mm
129 77 7171	**129 77 7174**	38 mm
129 77 7181	**129 77 7184**	40 mm
129 77 7191	**129 77 7194**	42 mm
129 77 7201	**129 77 7204**	44 mm
129 77 7211	**129 77 7214**	46 mm
129 77 7221	**129 77 7224**	48 mm
129 77 7231	**129 77 7234**	50 mm
129 77 7241	**129 77 7244**	55 mm
129 77 7251	**129 77 7254**	60 mm
129 77 7261	**129 77 7264**	65 mm
129 77 7271	**129 77 7274**	70 mm
129 77 7281	**129 77 7284**	75 mm



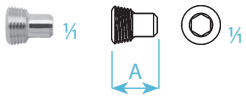
thread diameter	2,7 mm
core diameter	2,2 mm
head diameter	5,0 mm
drill bit for threaded hole	Ø 2,0 mm
screwdriver	⬡ 2,5 mm

Locking bone screw 3.5/2.7

SSt	Ti	A
129 77 7431	**129 77 7434**	10 mm
129 77 7441	**129 77 7444**	12 mm
129 77 7451	**129 77 7454**	14 mm
129 77 7461	**129 77 7464**	16 mm
129 77 7471	**129 77 7474**	18 mm
129 77 7481	**129 77 7484**	20 mm
129 77 7491	**129 77 7494**	22 mm
129 77 7501	**129 77 7504**	24 mm
129 77 7511	**129 77 7514**	26 mm
129 77 7521	**129 77 7524**	28 mm
129 77 7531	**129 77 7534**	30 mm
129 77 7541	**129 77 7544**	32 mm
129 77 7551	**129 77 7554**	34 mm
129 77 7561	**129 77 7564**	36 mm
129 77 7571	**129 77 7574**	38 mm
129 77 7921	**129 77 7924**	40 mm
129 77 7931	**129 77 7934**	42 mm
129 77 7941	**129 77 7944**	44 mm
129 77 7951	**129 77 7954**	46 mm
129 77 7961	**129 77 7964**	48 mm
129 77 7971	**129 77 7974**	50 mm

129 79 9960 Stand for locking screws 3.5
225 × 161 × 86 mm
excluding implants

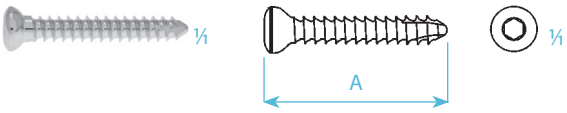
NOTES: SSt – stainless steel in accordance with ISO 5832-1 Ti – titanium version, material: Ti6Al4V ELI in accordance with ISO 5832-3



head diameter	5,0 mm
screwdriver	⬡ 2,5 mm

Locking spacer

SSt	Ti	A
129 77 7420	**129 77 7423**	6 mm



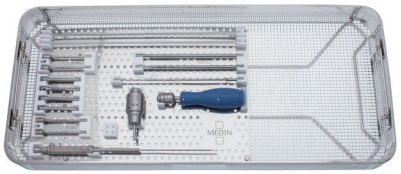
thread diameter	3,5 mm
core diameter	2,4 mm
head diameter	6,0 mm
drill bit for threaded hole	Ø 2,7 mm
drill bit for gliding hole	Ø 3,6 mm
screwdriver	⬡ 2,5 mm

Self-tapping cortical bone screw HA 3.5

SSt	Ti	A
129 79 5241	**129 79 5244**	16 mm
129 79 5251	**129 79 5254**	18 mm
129 79 5261	**129 79 5264**	20 mm
129 79 5271	**129 79 5274**	22 mm
129 79 5281	**129 79 5284**	24 mm
129 79 5291	**129 79 5294**	26 mm
129 79 5301	**129 79 5304**	28 mm
129 79 5311	**129 79 5314**	30 mm
129 79 5321	**129 79 5324**	32 mm
129 79 5331	**129 79 5334**	34 mm
129 79 5341	**129 79 5344**	36 mm
129 79 5351	**129 79 5354**	38 mm
129 79 5361	**129 79 5364**	40 mm
129 79 5371	**129 79 5374**	42 mm
129 79 5441	**129 79 5444**	44 mm
129 79 5451	**129 79 5454**	46 mm
129 79 5461	**129 79 5464**	48 mm
129 79 5391	**129 79 5394**	50 mm
129 79 5401	**129 79 5404**	55 mm
129 79 5411	**129 79 5414**	60 mm
129 79 5421	**129 79 5424**	65 mm
129 79 5431	**129 79 5434**	70 mm

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

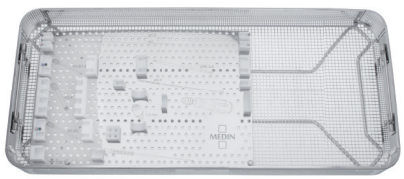
INSTRUMENTS FOR ANGULARLY STABLE PLATES WITH SCREWS 3.5



139 09 0255 Instruments for ASP with screws 3.5 mm
540 × 240 × 50 mm
including instruments

139 09 0250 set

			pcs
1	**129 09 2550**	K-wire MEDIN; 1.5 mm; 300 mm	3
2	**129 09 2570**	K-wire MEDIN; 2.0 mm; 300 mm	3
3	**129 69 3360**	Guide sleeve locking 2.9 mm; 60 mm	4
4	**129 69 3370**	Guide sleeve for wires 1.5 mm; 75 mm	2
5	**129 69 4360**	Guide sleeve for wires 2.0 mm; 75 mm	2
6	**129 69 4780**	Depth gauge	1
7	**129 69 5131**	Screwdriver handle	1
8	**129 69 5126**	Torque limiter 1.5 Nm	1
9	**129 69 5231**	Screwdriver; hexagon 2.5 mm; 160 mm	2
10	**129 79 9981**	Drill 2.9 mm; 190 mm	1



129 69 4390 Sieve for instrumentarium ASP 3.5
540 × 240 × 50 mm
excluding instruments

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