

Compression Plating System for 3.5mm & 4.5mm DCP And LC-DCP System

Surgical Technique



DCP and LC-DCP Systems. Dynamic Compression Plates (DCP) and Dynamic Compression Plates with Limited Bone Contact (LC-DCP).

Dynamic Compression Plates are available in dimensions ranging from 10mm to 16mm width, Limited Contact Dynamic Compression Plates range from 10mm to 16mm width.

Plate hole geometries

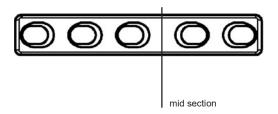


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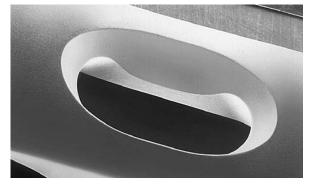
Non-symmetrical holes

Some Dynamic Compression Plates feature non-symmetrical holes which allow to achieve compression in only one direction. These plates feature a mid section which is placed at the position of fragments to be compressed.



The non-symmetrical DCP holes are shaped like a portion of an inclined and angled cylinder. They possess one compres- sion point at the inclined side and one neutral point in the middle.





Symmetrical holes

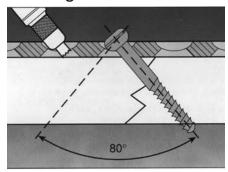
Most LC-DCP 10mm to 16 m have sym- metrical holes. The symmetrical shape of the plate holes enables compression to be achieved in both directions, thus plate positioning is not restricted by the presence of a mid-section.

Symmetrically shaped DCP holes possess one compression and one neutral point on both sides. With some small and mini plates, the neutral points meet in the middle.

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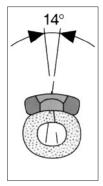


Screw angulations



Non-symmetrical holes

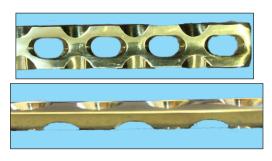
The DCP allows up to 25° longitudinal and 7° transverse screw angulation.



Symmetrical holes

The DCP hole allows up to 50° longitudinal screw angulation for an increased range of applications. LC-DCP holes allow even wider angulations up to 80°. Both plate types allow for 14° transverse screw angulation.

Symmetrical LC-DCP hole Undercuts



Undercuts of the LC-DCP limit contact between plate and bone, minimizing the risk of tissue necrosis under the plate.

Intended Use

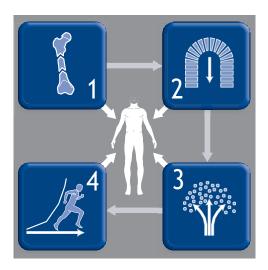
DCP and LC-DCP System Implants are intended for tempo- rary fixation, correction or stabilization of bones in various anatomical regions.

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A.O. PRINCIPLES:

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation 1,2.



Anatomic Reduction:

Fracture reduction and fixation to restore anatomical relationships

Early, active mobilization

Early and safe mobilization and rehabilitation of the injured part and the patient as a whole.

Stable fixation

Fracture fixation providing absolute or relative stability, as required by the patient, the injury, and the personality of the fracture.

Preservation of blood supply Preservation of the blood supply to soft tissues and bone by gentle reduction techniques and careful handling.

- Müller ME, Allgower M, Schneider R, Willenegger H. Manual of Internal Fixation.
 3rd ed. Berlin, Heidelberg, New York: Springer. 1991.
- 2. Ruedi TP, Buckley RE, Moran CG. AO Principles of Fracture Management. 2nd ed. Stuttgart, New York: Thieme. 2007

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Indications:

This Surgical Technique applies to the below Ortho Max DCP and LC-DCP systems and plate lines:

Cloverleaf Plates 3.5

- Distal tibia for comminuted fractures to buttress its medial side
- Proximal humerus for comminuted fractures of the hu-meral head

One-third and One-fourth tubular plate 3.5

- Fractures of smaller sized bones such as fibula, humerus and ulna.

Oblique T Plate & Ellis Plates 3.5mm

Fracture of Distal Radius Head

LC-DCP/DCP 3.5mm Plate, DCP & T-Plates for 3.5mm System

Fracture fixation and fixation after for example osteoto- mies, malunions, nonunions including but not limited to distal radius, proximal and disital tibia, proximal humerus, clavicula.

LC-DCP/DCP 4.5 Plate, DCP &T Plate/ T-Buttress Plate/L- Buttress Plate

- Fractures and osteotomies of large bones such as femur, tibia and humerus

Standard Reconstruction Plate 3.5/4.5

Pelvic and Acetabular Fractures and Osteotomies

Semi-Tubular Plate 4.5

 Fractures and osteotomies of smaller sized bones such as humerus, radius, ulna, clavicula, fibula, tibia and pelvis

Condylar Buttress Plate 4.5

- Buttressing of multifragmentary distal femur fractures
- Supracondylar fractures
- Intra-articular and extra-articular condylar fractures
- Malunions and nonunions of the distal femur
- Periprosthetic fractures

Lateral Tibial Head Buttress Plate 4.5

 Indicated for the stabilization of fractures of the proximal tibia. These include proximal shaft fractures, metaphyseal fractures, intra-articular fractures, periprosthetic fractures

Calceneal Plates

- Fracture of Calcaneal Bone in Foot

Hook Plates 3.5mm

- Fracture of Olecronan bone

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Contraindications:

Since external fixation devices are often used in emergency situations to treat patients with acute injuries, there are no absolute contraindications for use The surgeon's education, training and professional judgment must be relied upon to choose the most appropriate device and treatment for each individual patient. Whenever possible, the device chosen should be of a type indicated for the fracture being treated and/or for the procedure being utilized.

Conditions presenting an increased risk of failure include:

- Insufficient quantity or quality of bone which would inhibit appropriate fixation of the device.
- Compromised vascularity that would inhibit adequate blood supply to the fracture or operative site.
- Previous history of infections.
- Any neuromuscular deficit which could interfere with the patient's ability to limit weight bearing.
- Any neuromuscular deficit which places an unusually heavy load on the device during the healing period.
- Malignancy in the fracture area.
- Mental, physical or neurological conditions which may impair the patient's ability to cooperate with the postoperative regimen.
- Patients with a compromised immune system.
- Pre-existing internal fixation that prohibits proper pin placement

Preparations:

1 Plate contouring





- For the treatment of juxta-articular fractures (distal tibia, tibial plateau, distal femur, distal humerus, radius etc.), good plate contouring to the shape of the bone is very important. Only then satisfactory reduction and adequate stability may be achieved.

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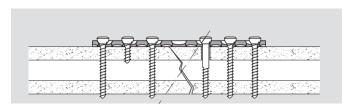


- Pure titanium has mechanical properties differing from stain- less steel. Due to its lower modulus of elasticity, titanium is more springy. Therefore, titanium plates should be slightly over-bent to obtain the desired contour.
- The design of the LC-DC plate ensures uniform rigidity, hence a continuous curvature after bending. The plates should not be bent beyond the necessary extent.
- Use Plate Benders in Pair for plate contouring.

Precaution:

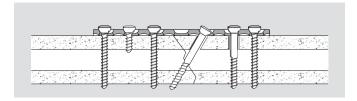
- Avoid repeated bending.
- Sharp indentations on the plate surface, especially around the plate holes, may impair resistance to fatigue and should be avoided.
- Reverse bending or use of the incorrect instrumentation for bending may weaken the plate and lead to premature plate failure (e.g. breakage). Do not bend the plate be- yound what is required to match the anatomy.

Use of lag screws to achieve additional stability



In certain circumstances, the use of a plate for fracture com- pression may be sufficient. In many fractures, however, it is advantageous to insert a lag screw through the plate to in- crease fracture stability and to achieve inter fragmentary compression in the far cortex. If a fracture gap remains, the plate is subjected to high bending stresses.

Using a lag screw through the plate reduces implant stress.



USE OF DRILL SLEEVES:

Different drill sleeves are available to perform drilling for DCP and LC-DCP fixation in both neutral and compression mode.

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1 Standard drill Sleeves for DCP, sizes 3.5 - 4.5



Standard drill guides feature a simple tube to protect soft tissues while drilling. Depending on the positioning of the tube within the hole, neutral or eccentric (compression) drill- ing can be performed



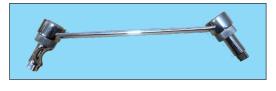


a) Drilling in neutral position:

Position the tube in the middle of the DCP hole.

b) Drilling in eccentric position – compression
 Position the tube in plate hole remote from the fracture

DCP DRILL SLEEVES - Centric/Eccentric



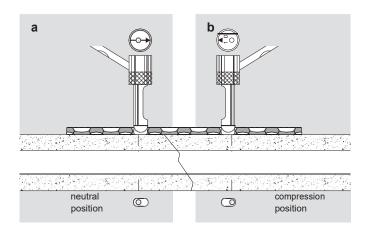


The DCP drill sleeves centric and eccentric can be used with DCP plates only. They feature dedicated ends for neutral application (see arrow) and for application in compression mode.

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DCP drill sleeves carry an arrow enabling correct positioning of the screw.



a) Neutral position

Use the centric side of drill sleeve to place a screw in neutral position. Compression cannot be achieved with the centric side of drill sleeve.

b) Compression

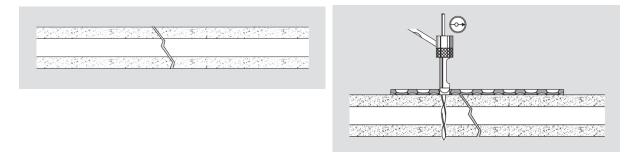
Use the arrow side of drill sleeve to achieve compression. The arrow must point towards the fracture.

COMPRESSION PLATING OF SIMPLE FRACTURES:

Choose a plate of the appropriate length. Ensure that there are enough plate holes over both fragments and that a lag screw can be inserted if necessary.

Illustrations show the procedure with the DCP centric/eccentric Drill Sleeve of DCP using 3.5 and 4.5mm LC-DCP plate.

1 Drill first hole adjacent to fracture



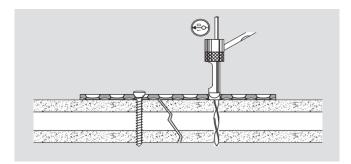
Use an appropriately sized drill bit for threaded holes and drill the first hole
adjacent to the fracture. Use the Drill Sleeve in neutral position with the arrow
pointing towards the fracture. Alternatively, use the Drill Sleeve in depressed
mode (upper part projects) and place it in the hole remote from the fracture.

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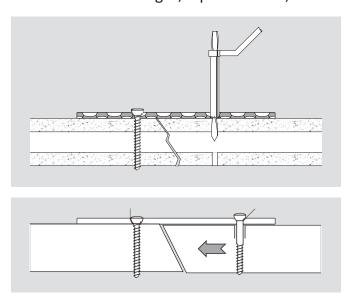
- Determine screw length, tap the thread, and insert the screw.
- Whenever possible, the screws for axial compression should be placed in such a
 way that the apex of the fragment is drawn into the open wedge between plate
 and bone. This greatly reduces the risk of the fragmentslipping

2 Drill the second hole



Drill through both cortices into the opposite fragment with the Drill Sleeve in compression position (arrow points towards the fracture). Alternatively, use the DCP Drill Sleeve placing it in the hole remote from the fracture. Do not depress it (upper part stands flush).

Determine screw length, tap the thread, and insert the screw.



Whenever possible, the screws for axial compression should be placed in such a way that the apex of the fragment is drawn into the open wedge between plate and bone. This greatly reduces the risk of the fragmentslipping

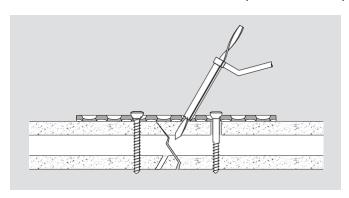
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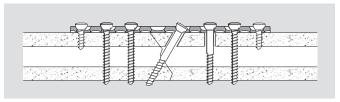
Insert interfragmentary lag screw

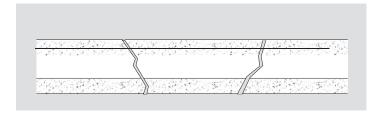
To increase stability in the far cortex and to decrease plate wear, insert an interfragmentary lag screw.

Drill through both cortices with DCP Drill Sleeve in de- pressed mode (inner sleeve projects) and an appropriately sized drill bit for threaded holes. The hemispheric underside of the DCP Drill Sleeve permits ideal positioning of the screw head



Widen the hole in the near cortex with a drill bit for gliding holes. Push the tissue protecting sleeve upwards, insert the drill bit into the hole, then slide the tissue protecting sleeve down until it touches the plate. When drilling, care should be taken that the course of the gliding hole follows exactly that of the previous drill hole.





In the remaining screw holes insert screws in neutral position apart from the hole directly above the fracture.

Implant Removal

In case the surgeon decides to remove the implants, they can be removed by using general surgical instruments.

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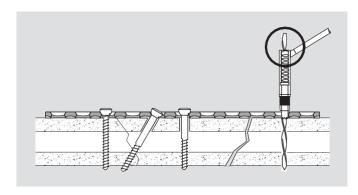
Compression Plating of Multifragmentary Fracture

Fractures should be treated consecutively.

1 Treat first fracture

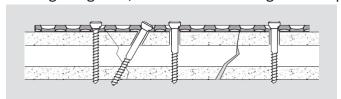
For treatment of the first fracture, follow the previously described example step by step.

2 Treat second fracture

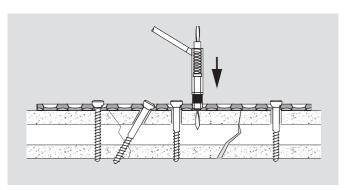


Treat the second fracture using the drill sleeve. Drill a hole into the third fragment using the DCP Drill Sleeve in compression position and a drill bit for threaded holes. Seat the Drill Sleeve at the side of the hole remote from the fracture without depressing the Drill Sleeve (upper part is flush).

Drill a gliding hole, measure screw length and tap the thread.



Insert a screw into the hole. The use of a shaft screw is recommended.

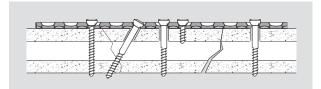


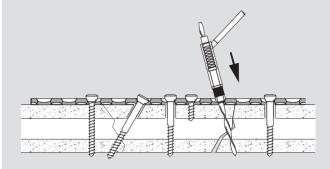
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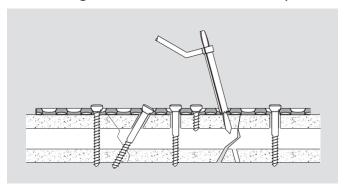
Next insert a screw into the middle fragment. Prepare the screw hole with a drill bit for threaded holes and the DCP Drill Sleeve depressed for neutral position (upper part of inner sleeve projecting).

Place the screw.

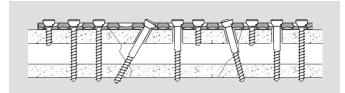




Prepare seating for the lag screw with the Drill Sleeve and a drill bit for threaded screws. Position the Drill Sleeve adjacent to the fracture, depress the Drill Sleeve (inner sleeve projects), set drilling angle and drill. If there is the risk of the drill bit colliding with the screw in the vicinity, the drill bit has to be inclined.



Drill the gliding hole. Widen the near cortex using an appro- priately sized drill bit for gliding holes and the tissue protect- ing sleeve. Measure the screw length and tap the thread.



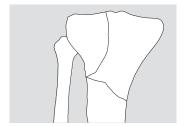
By inserting a shaft screw as lag screw, additional stability is achieved. Tighten lag and compression screws alternately. The remaining screw holes are filled with neutrally placed screws.

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Implant Removal

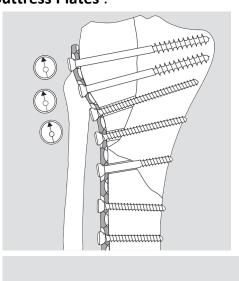
In case the Surgeon decides to remove the implants, they can be removed by using general surgical instruments.

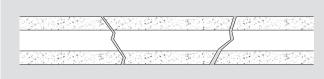


The buttress plate technique is shown using the example of a shear fracture of the lateral part of the tibial head com- bined with a short oblique fracture.

First the distal oblique fracture is treated as in the previously illustrated examples.

Buttress Plates:

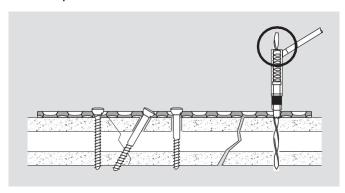




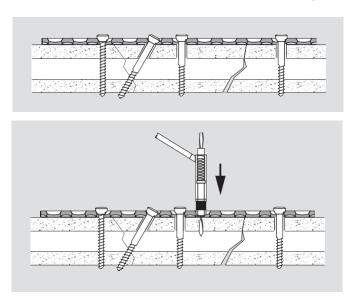
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All the screw holes in the buttress region are prepared with the DCP Drill Sleeve of neutral position.



The arrow of the Drill Sleeve must point away from the fracture. The proximally positioned cancellous bone screws and cortex screws act as lag screws. The thread grips only in the opposite fragment, so that there is compression between the fragments. The use of the Drill Sleeve with the arrow pointing away from the fracture prevents the tibial plateau fragment and the plate from slipping. In this situation, the screw heads are buttressed by the hole edge adjacent to the fracture.



Implant removal:

The DCP/LCDCP Plate should first be removed by following screw removal technique of cortical screws with the help of Hexagonal Screw Driver 3.5 OR 4.5mm. The following should be noted in order to avoid damage to the instrument or implants: Always engage the screw driver tip firmly into the head of screw to remove. Don't give extra quick torque to damage screw head. If screw head gets damaged during removal, use the screw removal instruments to remove damage head screws.

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Note: The final decision of removing the implants shall be taken by the operating surgeon only. It is recommended that the implant used as an aid for healing should be removed once its service is over after proper consultation and examination by the operating surgeon in final follow up, particularly in younger and more active patients.

CAUTION:

Used Implants:

Used implants which appear un-damaged may have internal and/or external defects. It is possible that individual stress analysis of each part fail to reveal the accumulated stress on the metals as a result of use within the body. This may lead ultimately to implant failure after certain point of time due to metal fatigue. Therefore reuse of implants are strictly not recommended.

Disposal of Used Implants:

Every used or removed implant must be discarded after use and must never be reused. It should be bent or scratched & then disposed of properly so that it becomes unfit for reuse. While disposing it off, it should be ensured that the discarded implant does not pose any threat to children, stray animals and environment. Dispose of the implants as per applicable medical practices and local, state and country specific regulatory requirement of Bio Medical Waste rules.

PACKAGING MATERIAL DISPOSAL: The packaging material of this device is made of LDPE and therefore if swallowed, may cause choking Hazards. Therefore, it should be disposed of in such a way that keep out of reach of children and stray animals.

SINGLE BRAND USAGE: Implant components from one manufacture should not be used with those of another. Implants from each manufacture may have metal, dimensions and design differences so that the use in conjunction with different brands of devices may lead to inadequate fixation or adverse performances of the devices.

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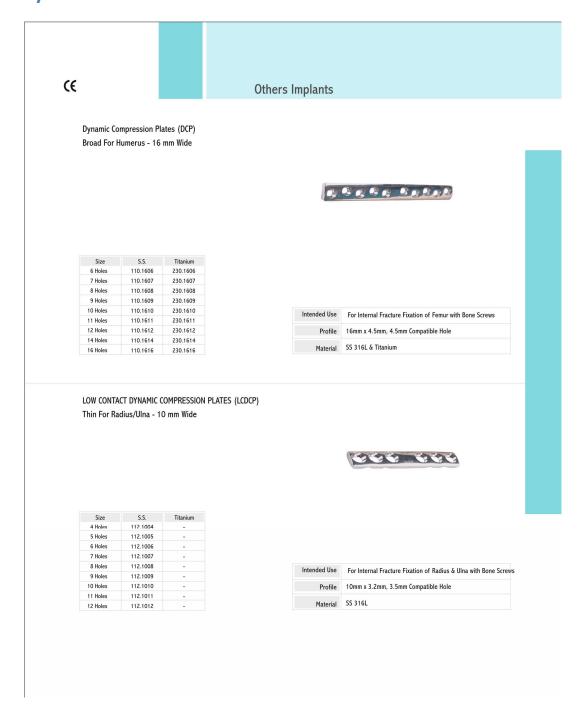


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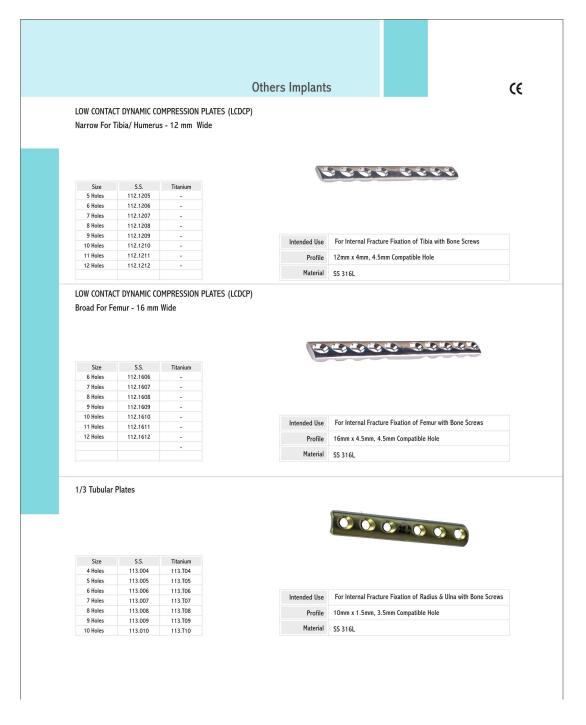
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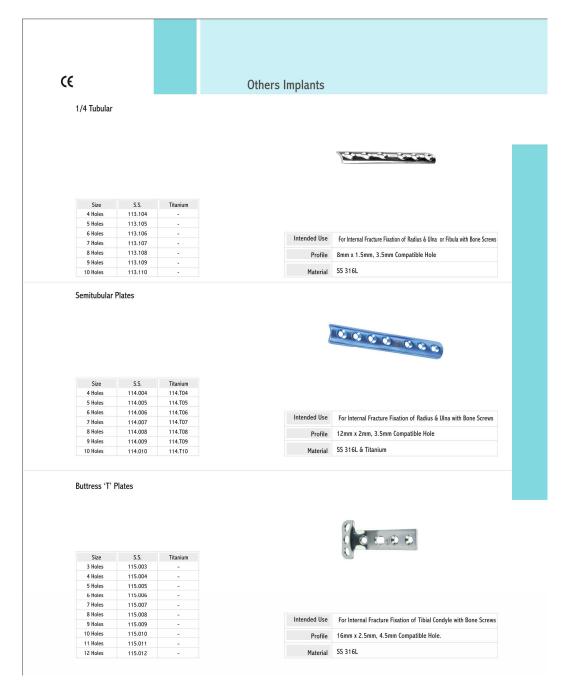
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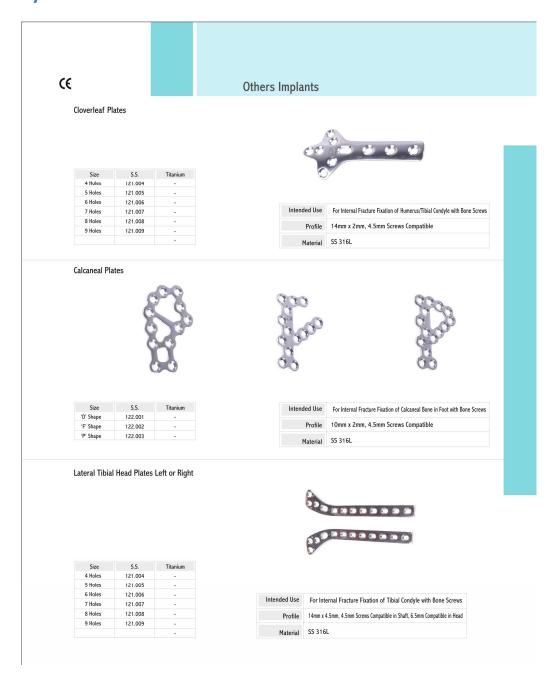
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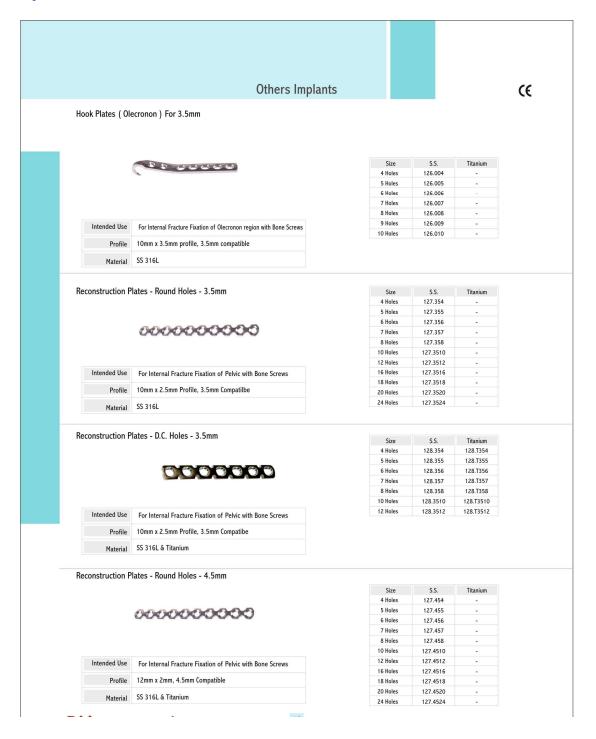
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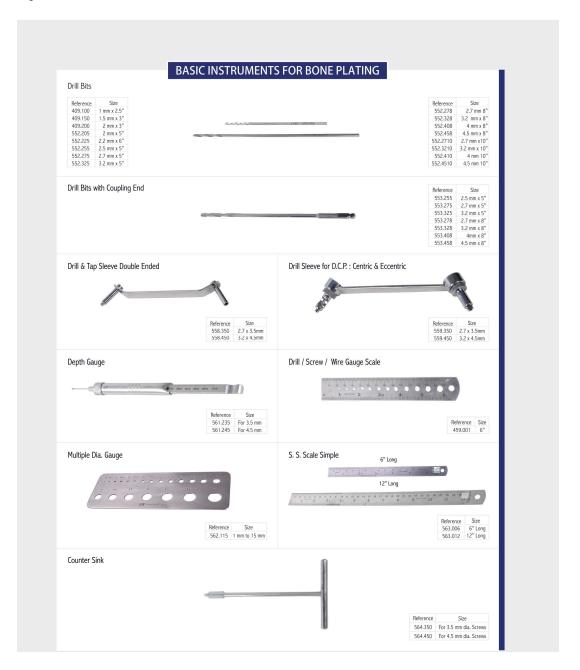
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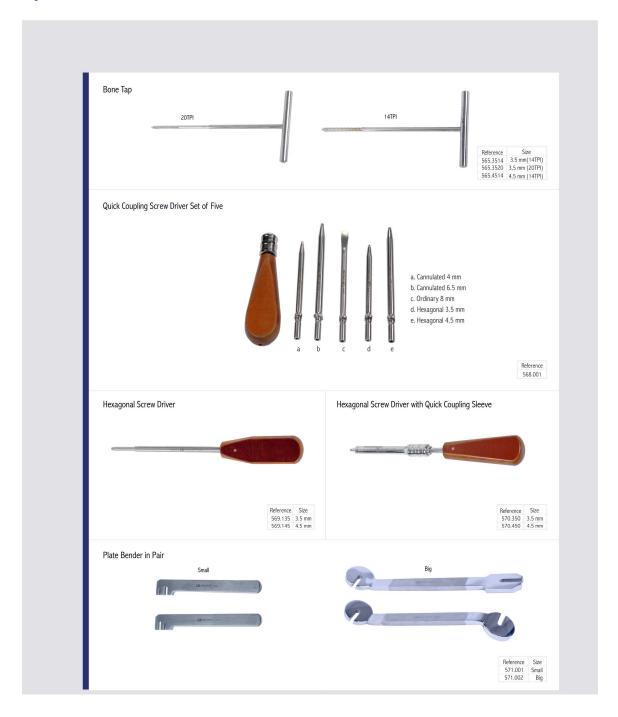
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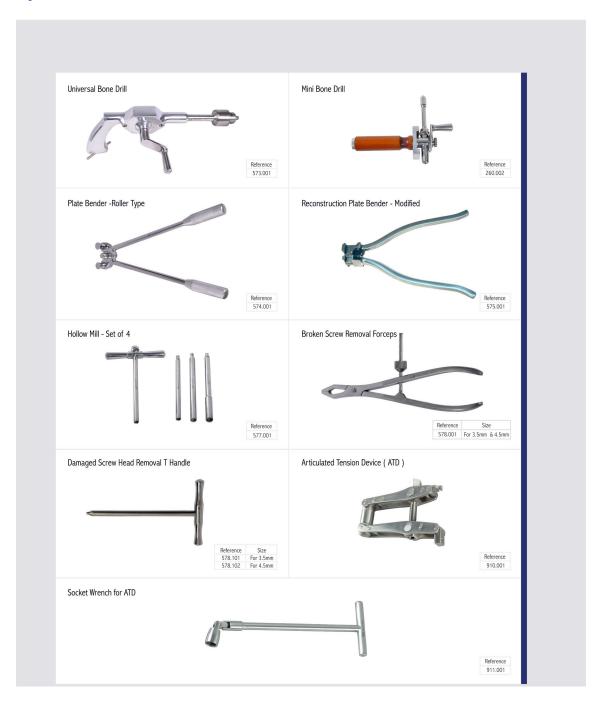
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MFG. UNIT & REGD. OFFICE C-1-B/886/4, G.I.D.C. ESTATE MAKARPURA, VADODARA – 390 010 GUJ. INDIA

Tel: +91-89800 15555 +91-89800 25555

E-mail: <u>info@orthomaxindia.net</u>

admin@orthomaxindia.net

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