Large Fragment Locking Compression Plate (LCP) System

Stainless Steel and Titanium

Surgical technique

LOC Plate series

WASTON MEDICAL 华森

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Introduction

AO Principles

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation. These principles, as applied to the Small Fragment LCP implants, are:

Anatomic reduction

Facilitates restoration of the articular surface by exact screw placement using wire sleeves

Stable fixation

Locking screws create a fixed-angle construct, providing angular stability.

Preservation of blood supply

Tapered end allows submuscular plate insertion, preserving tissue viability.
Limited-contact plate design reduces plate-to-bone contact, limiting vascular trauma and insult to bone.

Early, active mobilization

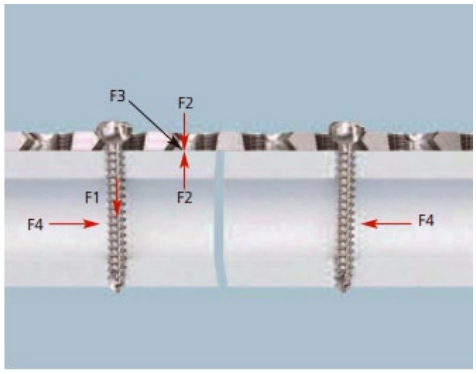
Plate features combined with AO technique create an environment for bone healing, expending a return to optimal function.

Fixation Principle

The locking screw concept was produced by Dr. Tepic S and Dr. Perren SM for the first timein 1995. With locking compression plate put in use, is because one of the most important developments of plate and screw internal fixation in recent years. Locking screws provide the ability to create a fixed-angle construct while utilizing familiar conventional plating techniques. The fixed-angle construct function like a internal fixators which maintain primary and secondary loss of reduction. This kind construct also provides improved fixation in osteopenic bone or multifragment fractures where traditional screw purchase is compromised. LCP constructs do not rely on plate-to-bone compression to maintain stability. Therefore, the periosteum will be protected and the blood supply to the bone preserved. With these distinguished improvements, the LCP become an important category of increasing importance for trauma treatment.

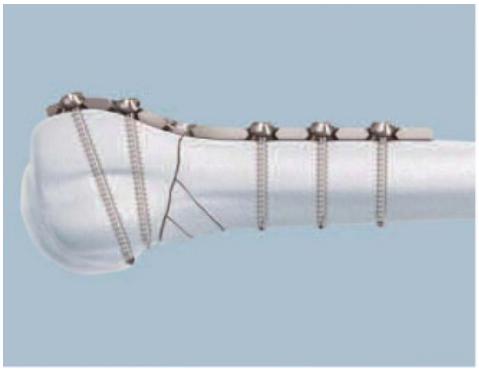
Product Information

Conventional plating
Absolute stability



The tensile force (F1) originating from tightening the screws presses the plate onto the bone (F2). The developing friction (F3) between the plate and the bone leads to stable plate fixation. To ensure absolute stability, the friction resistance must be higher than the axial forces (F4) arising during rehabilitation.

Anatomic contouring of the plate

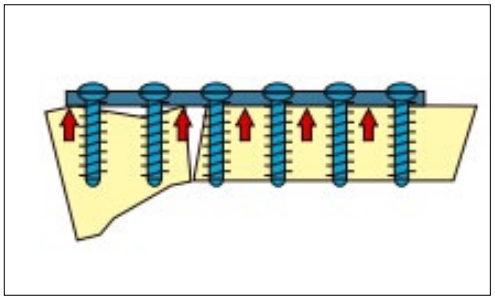


The aim of internal fixation is anatomic reduction, particularly in articular fractures. Therefore, the plate must be contoured to the shape of the bone.

Lag screw

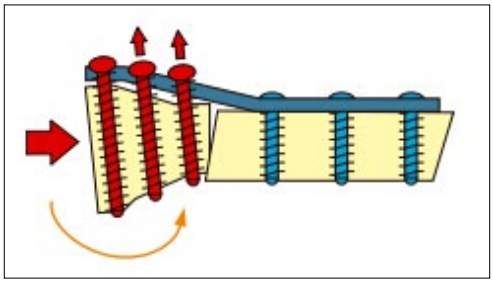
Interfragmentary compression is accomplished by using a lag screw. This is particularly important in intra-articular fractures which require a precise reduction of the joint surfaces. Lag screws can be angled in the plate hole, allowing placement of the screw perpendicular to the fracture line.

Primary loss of reduction



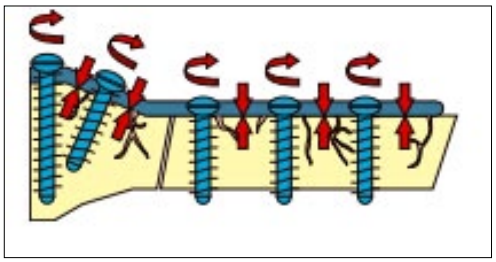
In conventional plating, even though the bone fragments are correctly reduced prior to plate application, fracture dislocation will result if the plate does not fit the bone. In addition, if the lag screw is not seated perpendicular to the fracture line (e.g., spiral fracture of the distal tibial), shear forces will be introduced. These forces may cause loss of reduction.

Secondary loss of reduction



Under axial load, postoperative, secondary loss of reduction may occur by toggling of the screws. Since cortex screws do not lock to the plate, the screws cannot oppose the acting force and may loosen, or be pushed axially through the plate holes.

Blood supply to the bone



The periosteum is compressed under the plate area, reducing or even interrupting blood supply to the bone. The result is delayed bone healing due to temporary osteoporosis underneath the plate.

Osteoporosis

Due to compromised cortical structure, screws cannot be tightened sufficiently to obtain the compression needed to support the bone. This may cause loosening of the screws and loss of stability, and may jeopardize the reduction.

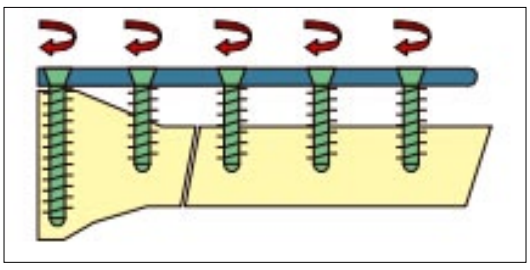
Standard plating achieves good results in:
-Good quality bone
-Fractures which are traditionally fixed with lag screws to achieve direct bone healing

Special attention must be paid to:
-Osteoporotic bone; during rehabilitation, the load should be kept to a minimum to prpevent postoperative loss of reduction
-Multifragmentary fractures; the anatomic reduction may be accomplished at the expense of extensive soft tissue and denudation

Bridge/locked plating using locking screws

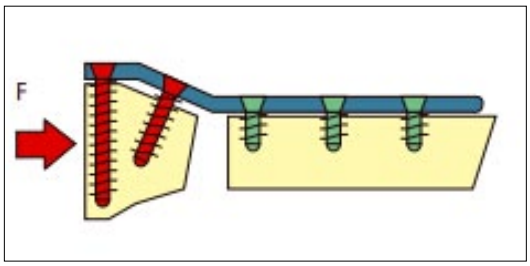
-Screws lock to the plate, forming a fixed-angle construct
-Bone healing is achieved indirectly by callus formation when using locking screws exclusively

Maintenance of primary reduction



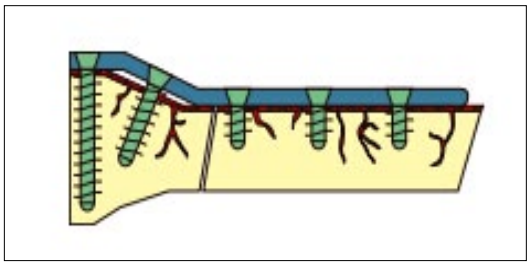
Once the locking screws engage the plate, no further tightening is possible. Therefore, the implant locks the bone segments in their relative positions regardless of degree of reduction.
Pre-contouring the plate minimizes the gap between the plate and the bone, but an exact fit is not necessary for implant stability. This feature is especially advantageous in minimally or less invasive plating techniques because these techniques do not allow exact contouring of the plate to the bone surface.

Stability under load



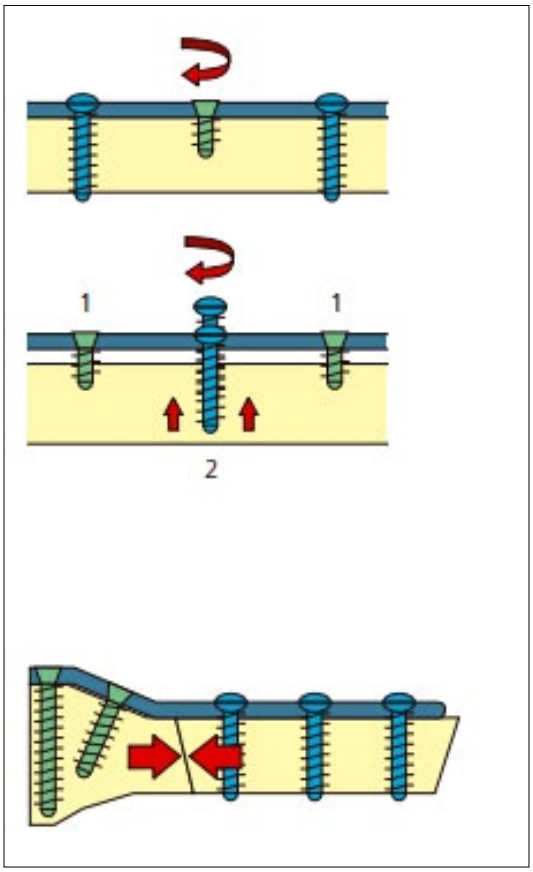
By locking the screws to the plate, the axial force is transmitted over the length of the plate. The risk of a secondary loss of the intraoperative reduction is reduced.

Blood supply to the bone



Locking the screw into the plate does not generate additional compression. Therefore, the periosteum will be protected and the blood supply to the bone preserved.

Combined internal fixation



The combination of conventional compression plating and locked plating techniques enhances plate osteosynthesis. The result is a combination hole of Combi hole that, depending on the indication, allows standard compression plating, locked/bridge plating or a combination of both.

Internal fixation using a combination of locking screws and standard screws

Note: if a combination of cortex and locking screws is used, a cortex screw should be inserted first to pull the plate to the bone.

If locking screws (1) have been used to fix a plate to a fragment, subsequent insertion of a standard screw (2) in the same fragment without loosening and retightening the locking screw is not recommended.

Note: if a locking screw is used first, care should be taken to ensure that the plate is held securely to the bone to avoid spinning of the plate about the bone.

Dynamic compression

Once the metaphyseal fragment has been fixed with locking screws, the fracture can be dynamically compressed using standard screws in the DCU portion of the Combi hole.

Locked and standard plating techniques

-First, use lag screws to anatomically reconstruct the joint surfaces

-The behavior of a locking screw is not the same as that of a lag screw. With the locked plating technique, the implant locks the bone segments in their relative positions regardless of how they are reduced

-A plate used as a locked/bridge plate does produce any additional compression between the plate and the bone

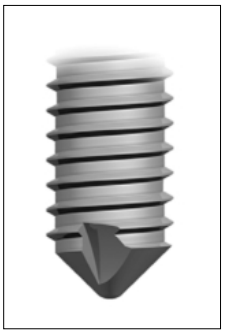
-The unicortical insertion of a locking screw causes no loss of stability

Large Fragment Locking Compression Plate (LCP) System

Locking screw features

Locking screw with Torx Drive recess

The Torx drive recess provides improved torque transmission to the screw and minimizes the possibility of cross thread.



Locking screw with self-tapping flutes

Less surgical steps

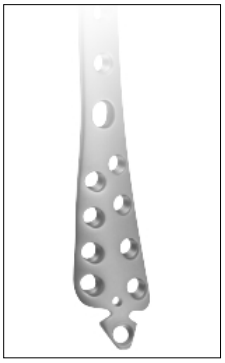
Cortical thread with large core diameter

The large core diameter improves bending and shears strength of the screw, and distributes the load over a larger area in the bone.

Special double-lead thread beneath the screw head engages and locks into the threaded holes of the plate.

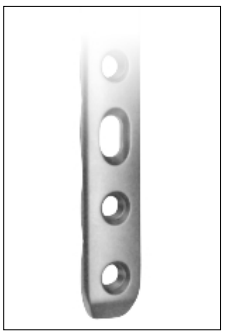
Easier and faster locking the screws with the plates

Plate's features



The unique locking hole design

The locking holes allow placement of conventional cortex and cancellous bone screws of locking screws on the same hole



Round holes

The round holes allow placement of conventional cortex and cancellous bone screws on the side or threaded conical locking screws on the opposite side of each hole.

Periarticular plates anatomical design

Periaticular plates are pre-contoured to create an anatomical fit that requires little or no additional bending and minimizes impinging on tsoft tissue.

Indications

The LCP system applies to many different plate types and is therefore suitable for a large number of fracture types.
Fractures
Osteotomies
Malunions, nonunions

Surgical Technique

Plate selection
The plates are available in various lengths. If necessary, use a bending template to determine plate length and configuration.

Contouring
Use the current bending instruments to contour the locking compression plate to the anatomy. The plate holes have been designed to accept some degree of deformation. When bending the plate, place the bending irons on two consecutive holes. This ensures that the threaded holes will not be distorted. Significant distortion of the locking holes will reduce locking effectiveness.

Reduction and temporary plate placement

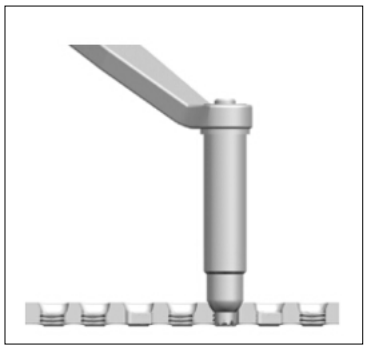
The plate may be temporarily held in place with standard plate holding forceps. The middle of the plate should be positioned over the fracture site if compression of the fracture fragments is desired. Alternatively, the Drill Guide can be used as an aid to position the plate on the bone.

Screw insertion

Determine whether conventional cortex screws, cancellous bone screws or locking screws will be used for fixation. A combination of all may be used. If a combination of cortex, cancellous and locking screws is used, a conventional screw should be used first to pull the plate to the bone. If a locking screw is used first, care should be taken to ensure that the plate is held securely to the bone to avoid spinning of the plate about the bone as the locking screw is tightened to the plate.

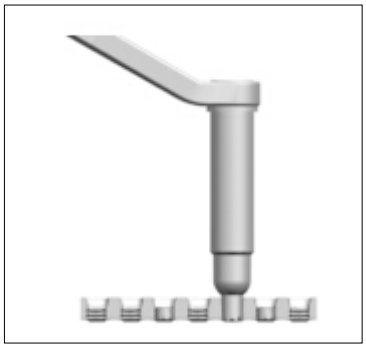
Neutral insertion of a screw in compression holes and locking holes

When pressing the universal drill guide or special locking drill guide into the DCU portion of the compression holes, it will center itself and allow neutral pre-drilling.



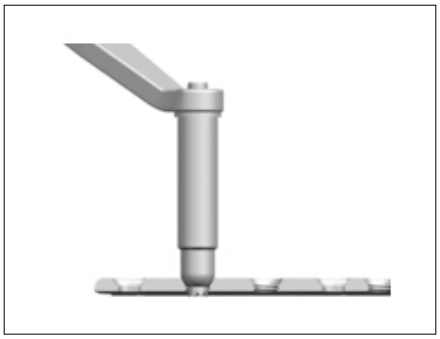
Dynamic compression, eccentric insertion of a cortex screw in compression hole

To drill a hole for dynamic compression, place the universal drill guide eccentrically at the edge of the DCU portion of the compression hole, without applying pressure. Tightening of the cortex screws will result in dynamic compression corresponding to that of LC-DCP plates.



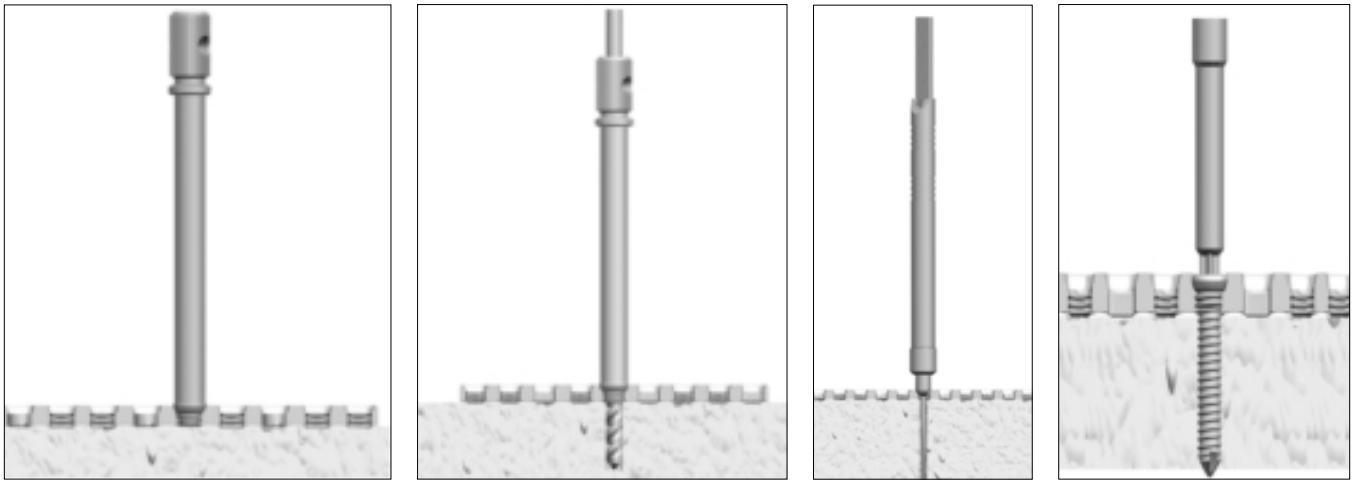
Neutral insertion of a conventional screw in locking hole

When pressing the universal drill guide into the unique design locking hole, it will center itself and neutral pre-drilling.



Insertion of the locking screws

The locking screw is not a lag screw. Use non-locking screws when requiring a precise anatomical reduction (e. g. joint surfaces) or interfragmentary compression. Before inserting the first locking screw, perform anatomical reduction and fix the fracture with lag screws, if necessary. After the insertion of locking screws, an anatomical reduction will no longer be possible without loosening the locking screw.



A B D

A. Screw the appropriate Threaded Drill Guide for 3.5 mm, 5.0mm screws into an LCP plate hole until fully seated. Do not try to bend the plate using the Threaded Drill Guide because damage may occur to the threads.

B. Use the appropriate Drill Bit (2.8mm for 3.5mm screws, 4.3mm for 5.0mm screws) to drill to the desired depth.

C. Remove the drill guide.

D. Use the Depth Gauge to determine screw length.

E. Insert the locking screw and finally tighten using the Torque Limiting Screwdriver. The screw is securely locked to the plate when a "click" is heared. Never use power equipment to seat the locking screws into the plate without a Torque Limiting Screwdriver

Postoperative treatment

Postoperative treatment with locking compression plates does not differ from conventional internal fixation procedures.

Implant removal

To remove locking plates, unlock all screws from the plate; then the screws completely from the bone. This prevents simultaneous rotation of the plate when removing the last locking screw.

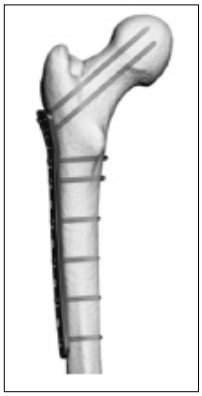
Operative Technique for Lateral Proximal Femur Plate III

Insert ø4.3 Threaded Guide Wire through the Guide

Use the Depth Gauge to determine the ø5.0 screw length

Insert desired ø5.0 locking screw

Following LCP surgical technique, use 5.0 locking screws or 4.5 conventional screws for the staff fixation



Implants

10702

Tibia LOC plate

Product No.	Holes	Length(mm)
10702-006	6	109
10702-007	7	127
10702-008	8	145
10702-009	9	163
10702-010	10	181
10702-012	12	217
10702-014	14	253

Note:Used for tibial shaft fracture with HA5.0 locking screws, HA4.5 cortical screws. Instrument set: 15060 Simple set for large bone LOC system Combined Hole is available.

10703

Femur LOC plate

Product No.	Holes	Length(mm)
10703-007	7	128
10703-008	8	146
10703-009	9	164
10703-010	10	182
10703-012	12	218
10703-014	14	254
10703-016	16	290

Note:Used for femoral shaft fracture with HA5.0 locking screws, HA4.5 cortical screws. Instrument set: 15060 Simple set for large bone LOC system
Combined Hole is available.

10721

Proximal lateral femoral LOC plate I

Product No.		Holes	Length(mm)
10721-005	L	5	136
10721-105	R		
10721-007	L	7	172
10721-107	R		
10721-009	L	9	208
10721-109	R		
10721-011	L	11	244
10721-111	R		
10721-013	L	13	280
10721-113	R		

Note:Used for proximal femoral fracture with HA5.0 locking screws, HA4.5 cortical screws. Instrument set: 15060, Simple set for large bone LOC system. Combined Hole is available.

10716

Proximal lateral femoral (condylar) LOC plate II

Product No.		Holes	Length(mm)
10716-005	L	5	136
10716-105	R		
10716-007	L	7	172
10716-107	R		
10716-009	L	9	208
10716-109	R		
10716-011	L	11	244
10716-111	R		
10716-013	L	13	280
10716-113	R		

Note:Used for proximal lateral femoral(condylar) fracture with HB6.5 cannulated locking screws for head part, HA5.0 locking screws, HB6.5 cannulated screws for shaft. Instrument set: 15060, Simple set for large bone LOC system & 15015, HB6.5 cannu-lated locking screws instrument set.
Combined Hole is available.

10722

Distal lateral femoral (Condylar) LOC plate

Product No.		Holes	Length(mm)
10722-005	L	5	161
10722-105	R		
10722-007	L	7	201
10722-107	R		
10722-009	L	9	241
10722-109	R		
10722-011	L	11	281
10722-111	R		
10722-013	L	13	321
10722-113	R		

Note:Used for distal lateral femoral(condylar) fracture with HA5.0 locking screws, HA4.5 cortical screws.Instrument set: 15060, Simple set for large bone LOC system.
Combined Hole is available.

10722

Distal Lateral Femoral (Condylar) LOC Plate

Product No.		Holes	Length(mm)
10722-005	L	5	161
10722-105	R		
10722-007	L	7	201
10722-107	R		
10722-009	L	9	241
10722-109	R		
10722-011	L	11	281
10722-111	R		
10722-013	L	13	321
10722-113	R		

10761

5.0 Dynamic Locking Screws

Product No.	Dia	Length(mm)
10761-(028~050)	HB5.0	50~85

Note:Used for distal lateral femoral (condylar) fracture with HA5.0 locking screws for the head part, HA5.0 Dynamic locking screws for the rest part and Simple Set for Large Bone LOC System.

10741

Femoral trochanter LOC plate

Product No.		Holes
10741-005	L	5
10741-105	R	

Note:Used for femoral trochanter fracture with HB6.5 cannulated locking screws, HB6.5 half-threaded locking screws for head part, HA5.0 locking screws for shaft. Instrument set: 15060, Simple set for large bone LOC system.

10742

Femoral neck LOC plate

Product No.		Holes
10742-005	L	5
10742-105	R	

Note:Used for femoral neck fracture with HB6.5 cannulated locking screws and HB6.5 half-threaded locking screws for head part, HA5.0 locking screws for shaft. Instrument set: 15060, Simple set for large bone LOC system.

10723

5.0mm Proximal lateral tibial golf LOC plate

Product No.		Holes	Length(mm)
10723−005	L	5	145
10723−105	R		
10723−007	L	7	185
10723−107	R		
10723−009	L	9	225
10723−109	R		
10723−011	L	11	265
10723−111	R		
10723−013	L	13	305
10723−113	R		

Note:Used for tibial plateau fracture with HA5.0 locking screws, HA4.5 cortical screws. Instrument set: 15060, Simple set for large bone LOC system. Combined Hole is available.

10739

3.5mm Proximal lateral tibial LOC plate

Product No.		Holes	Length(mm)
10739−204	L	4	108
10739−304	R		
10739−206	L	6	140
10739−306	R		
10739−208	L	8	172
10739−308	R		
10739−210	L	10	204
10739−310	R		
10739−212	L	12	236
10739−312	R		

Note:Used for proximal tibial fracture with HA3.5 locking screws, HB6.5 cancellous screws for head part, HA5.0 locking screws, HA4.5 cortical screws for shaft. Instrument set: 15060, Simple set for large bone LOC system & 15057, Extra instruments for small bone LOC system.

10724

Distal medial tibial LOC plate II

Product No.		Holes	Length(mm)
10724−006	L	6	142
10724−106	R		
10724−008	L	8	168
10724−108	R		
10724−010	L	10	194
10724−110	R		

Note:Used for distal tibial fracture with HA3.5 locking screws, HB4.0 cancellous screws. Instrument set: 15059, Simple set for small bone LOC system). Combined Hole is available.

10725

5.0mm Distal lateral tibial LOC plate

Product No.		Holes	Length(mm)
10725−005	L	5	122
10725−105	R		
10725−007	L	7	158
10725−107	R		
10725−009	L	9	194
10725−109	R		
10725−011	L	11	230
10725−111	R		

Note:Used for distal tibial fracture with HA5.0 locking screws. Instrument set: 15060, Simple set for large bone LOC system.

10737

3.5mm Distal lateral tibial LOC plate

Product No.		Holes	Length(mm)
10737−005	L	5	81
10737−105	R		
10737−007	L	7	107
10737−107	R		
10737−009	L	9	133
10737−109	R		
10737−011	L	11	159
10737−111	R		
10737−013	L	13	185
10737−113	R		

Note:Used for distal tibial fracture with HA3.5 locking screws, HB4.0 cancellous screws, HA3.5 cortical screws.Instrument set: 15059, Simple set for small bone LOC system.

10725

TS Distal tibial LOC plate (YAP)

Product No.		Holes	Length(mm)
10725−405	L	5	65
10725−505	R		
10725−407	L	7	89
10725−507	R		
10725−409	L	9	113
10725−509	R		

Note:Used for distal posterior column fractures of tibia with HA3.5 locking screws for the head part, HA3.5 locking screws, HA3.5 cortical screws for the rest part and Simple Set for Small Bone LOC System .
Combined Hole is available.

10725

TS Distal lateral tibial LOC plate (YAP)

Product No.		Holes	Length(mm)
10725−205	L	5	120
10725−305	R		
10725−207	L	7	146
10725−307	R		
10725−209	L	9	172
10725−309	R		

Note:Used for distal anterior column fractures of tibia with HA3.5 locking screws for the head part, HA3.5 lock-ing screws, HA3.5 cortical screws for the rest part and Simple Set for Small Bone LOC System .
Combined Hole is available.

10726

T−LOC plate I

Product No.	Holes	Length(mm)
10726−003	3	68
10726−004	4	84
10726−005	5	100
10726−006	6	116
10726−007	7	132
10726−008	8	148

Note:Used for tibial plateau medial fracture with HA5.0 locking screws, HA4.5 cortical screws. Instrument set: 15060, Simple set for large bone LOC system.
Combined Hole is available.

10727

L−buttress LOC plate I

Product No.		Holes	Length(mm)
10727−003	L	3	73
10727−103	R		
10727−004	L	4	89
10727−104	R		
10727−005	L	5	105
10727−105	R		
10727−006	L	6	121
10727−106	R		

Note:Used for tibial plateau fracture with HA5.0 Locking screws and HA 4.5 cortical screws. Instrument set: 15060, Simple set for large bone LOC system.
Combined Hole is available.

Screws

HA2.7 / HA3.5 / HA5.0 Locking Screw
(Self-tapping,Torx)

Product No.	Dia	Length(mm)
10750-(010-060)	HA2.7	10-40In (2mm increments)
		45-60(5mm increments)
10750-(112-160)	HA3.5	12-32(2mm increments)
		35-60(5mm increments)
10750-(114-150)	HA5.0	14-50(2mm increments)
10750-(055-110)		55-110(5mm increments)

HA3.5 / HA5.0 Locking Screw(Self-tapping and Self-drilling)

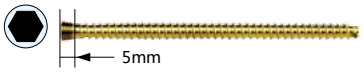
Product No.	Dia	Length(mm)
10752-(010-060)	HA3.5	16-60
10752-(022-080)	HA5.0	22-80

HB6.5 locking screws (Hexagonal/Half-threaded)

Product No.	Dia	Length(mm)
10760-(060~120)	HB6.5	60-120

Note:Used for proximal lateral femoral plate II, In 5mm increments.

HB6.5 cannulated locking screws



Product No.	Dia	Length(mm)
10756-(060~120)	HB6.5	60-120

Note:Used for proximal lateral femoral plate II, In 5mm increments.

Locking Spacer

Product No.	Length(mm)
10751-210	4
10755-215	5

Note:Used for Loc plates of upper and lower limbs fracture.

Instruments

Drill bit 4.2 3.2

Tap HA5.0 & HA4.5

Screw Driver (Hex/SW3.5) & Screw Holding Guide

Depth Gauge (Lower Limbs)

Drill Sleeve (3.2/HA4.5)

Plate Bending Wrench (Lower Limbs)

Threaded Drill Guide 4.3

Quick Coupling Screw Driver (SW3.5)(Torx)

Torque Spanner 3.5N

T25 Screwdriver (Torx)

Quick Coupling Screw Driver (SW3.5)