Zimmer®
Periarticular
Locking Plate System
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Introduction: Overview

The Zimmer Periarticular Locking Plate System combines locking screw technology with periarticular plates to create fixed-angle constructs for use in comminuted fractures or where deficient bone stock or poor bone quality is encountered. The fixed-angle plate/screw device can be used in osteopenic bone and other areas where traditional screw fixation may be compromised.

“Locked plates are best used for severe metaphyseal comminution in weight-bearing bones and severe osteoporosis.”

Robert A. Winquist, MD
Clinical Professor
University of Washington
Orthopaedic Surgeon
Proliance Surgeons, Inc.
Seattle, Washington

The Periarticular Locking Plates will accommodate standard screws, as well as locking screws with threaded heads that allow the screw to be locked into position to facilitate proper plate/screw placement. When necessary, interfragmentary compression can be achieved with lag screws.

Cannulated screws and instruments allow provisional fixation with guide pins in the metaphysis. This helps ensure that the threaded locking screw heads align properly with the threaded plate holes.

All plate configurations contain locking screw holes in the plate head, and alternating locking and compression screw holes in the shaft.

Fixation Principles

Standard Plating

Anatomic Reduction of the Fracture Fragments
Rigid Fixation
Preservation of the soft tissues and blood supply to the bone
Early movement of the patient

- Screws tighten plate to bone to generate compression
- Screw threads in bone are under a load applied intraoperatively
- Patient loads (weight and movement) add to the amount of preload on the bone/plate/screw construct
- May assist with reduction and alignment during placement
- Plate relies on absolute stability for primary healing

Locked Plating

Anatomic reduction of the articular surface
Stable fixation
Careful handling and preservation of the soft tissues and blood supply to the bone
Early movement of the patient

- Screws lock to plate
- Screws inserted into bone with minimal axial preload
- No stress in the system (bone or plate) prior to patient loads
- Plate is not compressed to bone – reducing constriction of blood supply
- Does not reduce or align the fracture during its placement
- Plate acts as a splint – relies on relative stability for secondary healing and callus formation

Zimmer Periarticular Locking Plates

- Merge locking screw technology with conventional plating
- Can be used as an internal fixator, permitting stable bridging over shattered zones
- Permit the combination of conventional and locking screws in the same plate
Indications

The Periarticular Locking Plate System is indicated for temporary internal fixation and stabilization of osteotomies and fractures, including:

- Comminuted fractures
- Supracondylar fractures
- Intra-articular and extra-articular condylar fractures
- Fractures in osteopenic bone
- Nonunions
- Malunions

Fracture Classification

The OTA classification for long bone fractures is divided into three general groups, each with three subgroups. The groups are extra-articular, partial articular, and complex articular. The subgroups reflect the degree of metaphyseal comminution.

Type A: extra articular
  - A1: simple
  - A2: metaphyseal wedge
  - A3: metaphyseal complex

Type B: unicondylar, partial articular
  - B1: lateral condyle, sagittal
  - B2: medial condyle, sagittal
  - B3: frontal

Type C: intercondylar, bicondylar, complete articular
  - C1: articular simple, metaphyseal simple
  - C2: articular simple, metaphyseal complex
  - C3: multifragmentary articular fracture

In addition, there are specific fracture classifications for fractures in most major bones.

The Zimmer Periarticular Locking Plate System includes:

- Distal Lateral Femoral Plate
- 3.5mm and 5.5mm Proximal Lateral Tibial Plates
- Distal Medial and Distal Lateral Tibial Plates
- Proximal Humeral Plate
- Distal Radial Plates
  - Volar Lateral Column
  - Volar Medial Column
  - Dorsal T
  - Dorsal Delta
  - Radial Styloid
**Introduction: Locking Screw Technology**

The heads of the locking screws contain male threads while the holes in the plates contain female threads. This allows the screw head to be threaded into the plate hole, locking the screw into the plate. This technical innovation provides the ability to create a fixed-angle construct while using familiar plating techniques.

**General Screw Features**

- The locking plate design does not require compression between the plate and bone to accommodate loading. Therefore, purchase of the screw in the bone can be achieved with a thread profile that is shallower than that of traditional screws. The shallow thread profile, in turn, allows for screws with a large core diameter to accommodate loading with improved bending and shear strength.

- Screw head is designed to create nearly flush profile on the plate to decrease soft tissue irritation

- All screws are self-tapping to aid ease of insertion

- Double-lead screw head thread is double the screw shaft thread pitch. Screws will advance at same rate into the plate and as into the bone.
  - Double-lead thread allows for maximum thread capture in thin plate sections

- Screws are available as cannulated locking screws, noncannulated locking screws and cannulated conical screws.
  - The conical screws do not have threads on the screw head and are used in the locking hole to lag the plate to the bone

- Locking pegs are provided for distal radial locking plates and used to buttress distal fragments

- Screws are machined from cold worked 22-13-5 stainless steel for improved fatigue strength as compared to conventional cold worked 316L stainless steel.

- Screw lengths sized for uni-cortical as well as bi-cortical screw fixation.
Specific Screw Designs and Features

For Distal Lateral Femoral and 5.5mm Proximal Lateral Tibial Locking Plates
- 5.5mm Cannulated Locking Screws
  - 30mm thru 100mm, 5mm increments
- 5.5mm Cannulated Conical Screws
  - 50mm thru 90mm, 5mm increments
- 4.5mm Locking Screws
  - 12mm thru 50mm, 2mm increments
  - 55mm thru 70mm, 5mm increments
- 5.0mm hex drive

For Proximal Lateral Humeral, 3.5mm Proximal Lateral Tibial, Distal Tibial Locking Plates
- 3.5mm Cannulated Locking Screws
  - 30mm thru 90mm, 5mm increments
- 3.5mm Cannulated Conical Screws
  - 30mm thru 70mm, 5mm increments
- 3.5mm Locking Screws
  - 12mm thru 50mm, 2mm increments
  - 55mm thru 90mm, 5mm increments
- 2.7mm Locking Screws (Distal Tibial Locking Plates only)
  - 10mm thru 60mm, 2mm increments
- 2.5mm hex drive

For Distal Radial Locking Plates
- 1.8mm Locking Pegs
  - 18mm thru 30mm, 2mm increments
- 40mm
- 2.4mm Conical Screws
  - 8mm thru 40mm, 2mm increments
- 2.4mm Locking Screws
  - 8mm thru 40mm, 2mm increments
- 1.5mm hex drive
Introduction: Locking Plate Technology

By using locking screws in a bone plate, a fixed-angle construct is created. In osteopenic bone or fractures with multiple fragments, secure bone purchase with conventional screws may be compromised. Locking screws do not rely on bone/plate compression to resist patient load, but function similarly to multiple small angled blade plates. In osteopenic bone or multifragmentary fractures, the ability to lock screws into a fixed-angle construct is imperative.

By combining locking screw holes with compression screw holes in the shaft, the plate can be used as both a locking device and a fracture compression device. If compression is desired, it must be achieved first by inserting the standard screws in the compression screw holes before inserting any locking screws.

The Periarticular Locking Plates will accommodate standard screws, as well as locking screws with threaded heads. When necessary, interfragmentary compression can be achieved with lag screws.

All plate configurations contain locking screw holes in the plate head and alternating locking and compression screw holes in the shaft. The locking screw holes will accept either conical or locking screws.

General Plate Features

- Plates are precontoured to help with metaphyseal/diaphyseal reduction
- Thick-to-thin plate profiles make the plates autocontourable
- The anatomical shape of the head of the plate matches the shape of the bone
- Multiple locking holes in the plate head allow placement of the screws to capture fragments while avoiding lag screws that have been placed outside the plate
- The low profile plate facilitates fixation without impinging on soft tissue
- The plate shaft design allows for a minimally invasive technique
- Plates are available in a variety of sizes and lengths, left and right
Anatomically contoured plates are precontoured to create a fit that require little or no additional bending and helps with metaphyseal/diaphyseal reduction.

- Utilized current proven Periarticular plate shapes as a foundation for creating locking plates.
  - Contours created by digital laser bone scanning techniques.
  - A broad range of cadaver specimens were analyzed and the data gathered to determine and replicate accurate bony contours.
- The low profile plates are thinner at the joint line and facilitate fixation without impinging on soft tissue.

- Conical locking hole shape allows for ease of screw insertion and reduces potential screw cross-threading.
  - Metaphyseal locking holes located at predetermined fixed angles and positions for optimal fragment capture.
  - Diaphyseal locking holes located centrally at predetermined fixed angles for optimal bi-cortical screw fixation.
- Dual compression slots will accommodate periarticular screws or conventional stainless steel screws and allow bi-directional compression and screw angulation.
- K-wire holes (when applicable) provided near joint line to provide option for suture tie down or temporary supplemental K-wire fixation.
- Plates are manufactured from forged 22-13-5 stainless steel for improved fatigue strength as compared to conventional cold worked 316L stainless steel.
- Plates are available in a variety of lengths both left and right.
Features by Plate Family

**Distal Lateral Femoral Locking Plate**

- Left and Right
- 6 hole (159mm), 10 hole (223mm), 14 hole (286mm), and 18 Hole (350mm)
- 22-13-5 Stainless Steel
- Anatomic bow – 102cm (40.25 inches)
- For lagging: 5.5mm cannulated conical screw
- For metaphyseal locking: 5.5mm cannulated locking screws with 3.2mm diameter drill tip guide wire
- For shaft locking: 4.5mm locking screws
- For dual compression: 4.5mm cortical screws or periarticular screws
- Metaphyseal jig

### Metaphyseal Screw Placement and Angulation

- 95° fixed angle between plate head and locking screws to allow screw placement that is parallel to the joint line
- Screws are parallel to each other to maximize fragment capture
- Central locking screw hole in plate head provides initial reduction of the plate to the condyles
- Screws miss condylar notch and patella groove in majority of distal femur sizes 30mm-45mm screw lengths accommodate need for shorter screws if distal femur is small
- Strut screw creates rigid fixation. Splits between the most proximal screws using a maximum 70mm screw length
- Allows placement of independent cortical screws to reduce the fracture
5.5mm Proximal Lateral Tibial Locking Plate

- Left and Right
- 4 Hole (97mm), 6 Hole (128mm), 8 Hole (158mm), 10 Hole (189mm), 12 Hole (219mm) and 14 Hole (250mm)
- 22-13-5 Stainless Steel
- 2.0mm K-wire/suture holes
- **For lagging:** 5.5mm cannulated conical screw
- **For metaphyseal locking:** 5.5mm cannulated locking screws with 3.2mm diameter drill tip guide wire
- **For shaft locking:** 4.5mm locking screws
- **For dual compression:** 4.5mm cortical or periarticular screws
- Metaphyseal jig

3.5mm Proximal Lateral Tibial Locking Plate

- Left and Right
- 6 Hole, (104mm), 8 Hole (128mm), 10 Hole (152mm), 12 Hole (176mm), 14 Hole (200mm), 16 Hole (224mm)
- 2.0mm K-wire/suture holes
- 22-13-5 Stainless Steel
- **For lagging:** 3.5mm cannulated conical screw
- **For metaphyseal locking:** 3.5mm cannulated locking screws with 1.6mm diameter drill tip guide wire
- **For shaft locking:** 3.5mm locking screws
- **For dual compression:** 3.5mm cortical or periarticular screws
- Metaphyseal jig
**Zimmer Periarticular Locking Plate System**

**Metaphyseal Screw Placement and Angulation**
- Designed for:
  - Schatzker Type IV: medial plateau fracture
  - Schatzker Type V: bicondylar plateau fracture
  - Schatzker type VI: plateau fracture with metaphyseal–diaphyseal dissociation
- Most proximal screws positioned parallel to joint line
  - Creates raft construct to buttress plateau fragments
  - 5.5mm plate uses three screws
  - 3.5mm plate uses four screws
  - Allows bi-cortical screw placement
  - Allows capture of most medial fragment (reduces need for medial plating)
- Second most proximal row of screws angled proximally to create rigid construct and maximize thread engagement
- Uses two strut screws to complete rigid construct with most distal strut screw using a maximum 80mm screw length

**Distal Lateral Tibial Locking Plate**
- Left and Right
- 6 Hole, (94mm), 8 Hole (118mm), 10 Hole (142mm), 14 Hole (189mm), 18 Hole (237mm)
- 2.0mm K-wire/suture holes
- 22-13-5 Stainless Steel
- For lagging: 3.5mm cannulated conical screw
- For metaphyseal locking: 3.5mm cannulated locking screws with 1.6mm diameter drill tip guide wire
- For shaft locking: 3.5mm or 2.7mm locking screws
- For dual compression: 3.5mm cortical or Peri screws
- Metaphyseal jig
Metaphyseal Screw Placement and Angulation

- Designed for OTA Type B3 and Type C fractures (Pilon type)
- Four most distal screws create rafting effect to capture fragments
  - Screws inserted from anterior to posterior
  - Screws are parallel to the joint line and nearly parallel to each other
  - Most lateral screw captures stable intact posterior/lateral fragment to anchor the plate and screw construct

- Uses two strut screws to complete rigid construct with most proximal strut screw using the maximum available screw length

Distal Medial Tibial Locking Plate

- Left and Right
- 6 Hole (120mm), 8 Hole (144mm), 10 Hole (168mm), 14 Hole (216mm), 18 Hole (264mm)
- 2.0mm K-wire/suture holes
- 22-13-5 Stainless Steel
- For lagging: 3.5mm cannulated conical screw
- For metaphyseal locking: 3.5mm cannulated locking screws with 1.6mm diameter drill tip guide wire
- For shaft locking: 3.5mm or 2.7mm locking screws
- For dual compression: 3.5mm cortical or Peri screws
- Metaphyseal jig
**Metaphyseal Screw Placement and Angulation**

- Designed to buttress displaced medial fragments and medial comminuted fractures
- Screws are parallel to the joint line and parallel to each other
  - Uses six screws to capture distal fragments
- Uses one strut screw to complete rigid construct using the maximum available screw length

**Proximal Lateral Humeral Locking Plate**

- Left and Right
- 4 Hole (90mm), 6 Hole (114mm), 8 Hole (138mm), 12 Hole (186mm), 16 Hole (234mm)
  - Longer lengths allow fixation of metaphyseal fractures with diaphyseal involvement
- 2.0mm K-wire/suture holes
- 22-13-5 Stainless Steel
- **For lagging:** 3.5mm cannulated conical screw
- **For metaphyseal locking:** 3.5mm cannulated locking screws with 1.6mm diameter drill tip guide wire or 3.5mm Locking
- **For shaft locking:**
  - 3.5mm locking screws
- **For dual compression:** 3.5mm cortical or Peri screws
- Metaphyseal jig
**Metaphyseal Screw Placement and Angulation**

- Designed for three and four part fractures, fracture-dislocations and articular surface fractures (Neer classification)
- Screws angled posteriorly for maximum fracture purchase
- Screw angled anterior to posterior for rotational stability
- Uses one strut screw to complete rigid construct using a maximum 40mm screw length

**Distal Radial Volar Lateral Column Locking Plate**

- Left and Right
- 2 Hole (30mm), 3 Hole (39mm), 4 Hole (52mm), 6 Hole (74mm), 8 Hole (96mm), 10 Hole (118mm), 12 Hole (140mm)
- Adjustment slot (2.4mm conical or 2.7mm cortical screws only)
- 1.6mm K-wire/suture holes
- 22-13-5 Stainless Steel
- **For lagging:** 2.4mm conical screw
- **For metaphyseal locking:** 1.8mm locking peg or 2.4mm locking screw

**For shaft locking:**

- 2.4mm locking screw

**For dual compression:**

- 2.7mm cortical or Peri 3.5mm cortical with 2.7mm head screws

**Metaphyseal jig**

- Most distal screws angled proximally to follow joint line
- Plate contoured to create correct volar tilt
- Follow lateral column of distal radius

Most distal and most lateral screw projected up into radial styloid to capture fragment.
**Distal Radial Volar Medial Column Locking Plate**
- Left and Right
- 2 Hole (32mm), 3 Hole (40mm), 4 Hole (54mm), 6 Hole (78mm)
- Adjustment slot (2.4mm conical or 2.7mm cortical screws only)
- 1.6mm K-wire/suture holes
- 22-13-5 Stainless Steel
- **For lagging:** 2.4mm conical screw
- **For metaphyseal locking:** 1.8mm locking peg or 2.4mm locking screw
- **For shaft locking:** 2.4mm locking screw
- **For dual compression:** 2.7mm cortical or Peri 3.5mm cortical with 2.7mm head screws
- Metaphyseal jig
- Most distal screws angled proximally to follow joint line
- Plate contoured to create correct volar tilt
- Follow medial column of distal radius

**Distal Radial Dorsal T Locking Plate**
- Left and Right
- 2 Hole (36mm), 3 Hole (44mm), 4 Hole (56mm), 6 Hole (77mm), 8 Hole (98mm), 10 Hole (119mm), 12 Hole (139mm)
- Adjustment slot (2.4mm conical or 2.7mm cortical screws only)
- 1.6mm K-wire/suture holes
- 22-13-5 Stainless Steel
- **For lagging:** 2.4mm conical screw
- **For metaphyseal locking:** 1.8mm locking peg or 2.4mm locking screw
- **For shaft locking:** 2.4mm locking screw
- **For dual compression:** 2.7mm cortical or Peri 3.5mm cortical with 2.7mm head screws
- Metaphyseal jig
- Use if Lister’s tubercle is removed
- Most distal screws angled 15° proximally to follow joint line
Zimmer Periarticular Locking Plate System

Distal Radial Dorsal Delta Locking Plate

- Left and Right
- 1 Hole (40mm), 2 Hole (52mm), 4 Hole (74mm), 6 Hole (95mm), 8 Hole (117mm), 10 Hole (138mm)
- Adjustment slot (2.4mm conical or 2.7mm cortical screws only)
- 1.6mm K-wire/suture holes
- 22-13-5 Stainless Steel
- For lagging: 2.4mm conical screw
- For metaphyseal locking: 1.8mm locking peg or 2.4mm locking screw

Radial Styloid Locking Plate

- Left and Right
- 3 Hole (34mm), 5 Hole (51 mm)
- 3.0mm holes (for 1.6mm K-wires placed at angle)
- 316L Stainless Steel
- For lagging: 2.4mm conical screw
- For locking: 1.8mm locking peg or 2.4mm locking screw
- Adjustment slots (2.4mm conical or 2.7mm diameter cortical screws only)
Instrumentation for Distal Femoral and 5.5mm Proximal Tibial Locking Plates

The Jigs are intended to help thread the Cannulas into the plate at the correct angle, so that the screws engage with the plate appropriately.
Instrumentation for 3.5mm Proximal Tibial, Distal Medial and Lateral Tibial and Proximal Humeral Plates

The Forward Captive Screwdrivers are optional and must be purchased separately. They are self-retaining and allow the screws to be inserted without a screw holding sleeve. These drivers are not intended to be used for screw removal.

1. 3.5mm/2.7mm Locking Plate Reduction Instrument 00-2360-011-01
2. 3.5mm/2.7mm Plate Reduction Sleeve 00-2360-011-02
3. Spin Knob 00-2360-012-03

Cleaning Brush 00-1147-076-00
Cleaning Stylet 00-1147-071-00
3.5mm/2.7mm Locking Screw Depth Gauge 00-2360-040-35

2.7mm Standard Locking Screw Tap 00-2360-053-27

2.5mm Hex Standard Forward Captive Screwdriver 00-2360-050-25
2.5mm Hex Standard Cannulated Forward Captive Screwdriver 00-2360-051-25

3.5mm Standard Locking Screw Tap 00-2360-053-35
3.5mm Standard Cannulated Locking Screw Tap 00-2360-054-35

2.7mm Standard Cannula 00-2360-020-27
2.0mm Standard Cannula 00-2360-020-20

2.0mm Standard Drill 00-2360-175-20
2.5mm Hex Standard Screwdriver 00-2360-065-25

3.5mm Cannulated Locking Screw Depth Gauge 00-2360-041-35

3.5mm Prox Lateral Tib Plate Jig, Right 00-2360-093-01
3.5mm Prox Lateral Tib Plate Jig, Left 00-2360-093-02
3.5mm/2.7mm Standard Jig Sleeve 00-2360-093-04

2.7mm Standard Locking Screw Tap 00-2360-053-35
2.0mm Standard Locking Screw Tap 00-2360-054-35

2.5mm Hex Standard Cannulated Screwdriver 00-2360-066-25
Modular Handle 00-2360-086-00

2.0mm Standard Locking Screw Tap 00-2360-053-35
3.5mm Standard Locking Screw Tap 00-2360-054-35

2.0mm Standard Drill 00-2360-175-20
2.5mm Hex Standard Cannulated Screwdriver 00-2360-066-25
Modular Handle 00-2360-086-00
**Instrumentation for Distal Radial Plates**

- **Volar Lateral Column Jig**
  - Left: 00-2360-096-02
  - Right: 00-2360-096-01

- **Volar Medial Column Jig**
  - Left: 00-2360-097-02
  - Right: 00-2360-097-01

- **Dorsal T Jig**
  - Left: 00-2360-098-02
  - Right: 00-2360-098-01

- **Dorsal Delta Jig**
  - Left: 00-2360-099-02
  - Right: 00-2360-099-01
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- Mini handle QC 00-4811-015-00
- 2.4mm/1.8mm Locking Screw Depth Gauge 00-2360-042-24
- Small Depth Gauge 00-4810-002-01
- T-Handle, QC 00-4811-035-00
- 3.5mm Tap 00-4811-110-35
- 2.4mm Locking Screw Tap 00-2360-052-24
- 1.5mm Hex Screwdriver Shaft, Forward Captive (For screw insertion only) 00-2360-062-15
- 2.5mm Hex Screwdriver Shaft, Forward Captive (For screw insertion only) 00-2360-062-25
Instrumentation for Distal Radial Plates (cont.)

1.8mm Locking Pegs 00-2359-XXX-18
2.4mm Locking Screws 00-2359-XXX-24
2.4mm Conical Screws 00-2359-XXX-25

2.0mm QC Drill Bit 00-2360-175-20
2.4mm QC Drill Bit (For Gliding Hole Technique Only) 00-4806-121-24
2.5mm Drill Bit, 110mm 00-4806-110-25
3.5mm Drill Bit, 110mm (For Gliding Hole Technique Only) 00-4806-110-35