

2.4 mm Variable Angle LCP Distal Radius System. For fragment-specific fracture fixation with variable angle locking technology.

Technique Guide

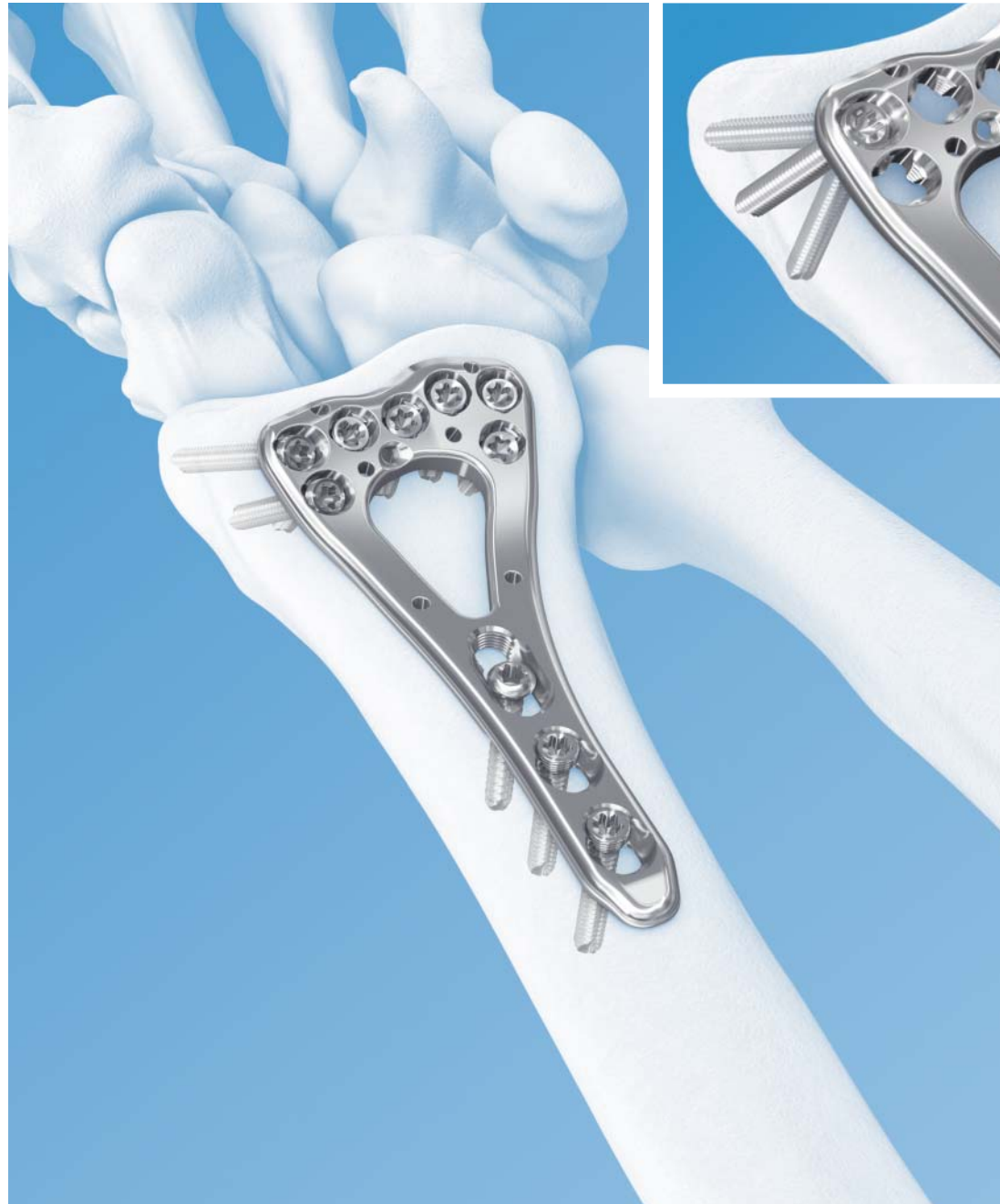


Table of Contents

Introduction

2.4 mm Variable Angle LCP Distal Radius System	2
AO Principles	4
Indications	5
Clinical Cases	6

Surgical Technique

Three-Column Theory	7
Preoperative Planning	8
Preparation	10
Reduce Fracture and Position Plate	11
Insert Proximal Screws	13
Drill for Variable Angle Screws	14
Preliminary Screw Placement	17
Confirm Proper Joint Reconstruction	18
Lock Variable Angle Screws	19
Close Incision	20

Product Information

Implants	21
Instruments	25
Set Lists	28

2.4 mm Variable Angle LCP Distal Radius System

Plate features

- Anatomically contoured volar distal radius plates designed to address both simple and complex fractures
- Variable angle LCP (VA-LCP) holes in the head of the plate combined with variable angle locking screws offer a locked construct to support the articular surface and reduce the need for bone graft
- Manufactured in stainless steel and titanium

Variable angle locking

- Screws can be angled anywhere within a 30° cone around the central axis of the plate hole (Figure 1)
- Four columns of threads in the variable angle locking hole provide four points of threaded locking between the VA-LCP plate and the variable angle locking screw, forming a fixed-angle construct at the desired screw angle (Figure 2)
- The head of the 2.4 mm variable angle locking screw has a rounded shape to facilitate various angles within the locking hole (Figure 3)



Figure 1

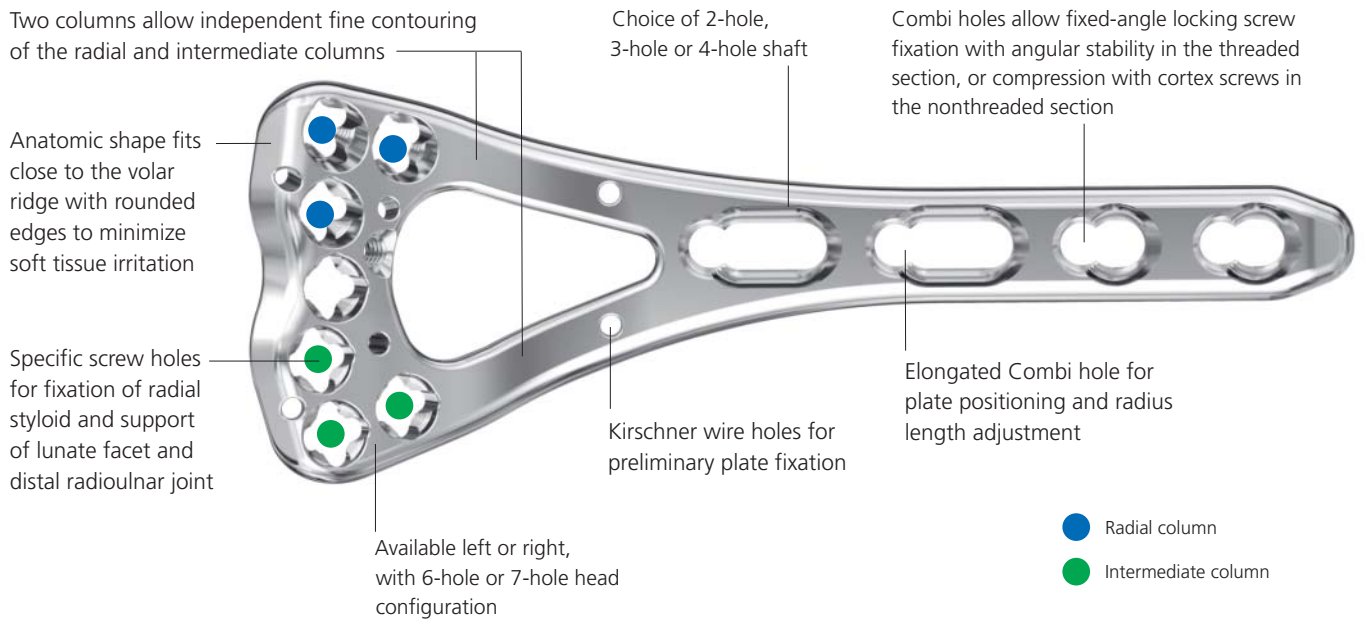


Figure 2

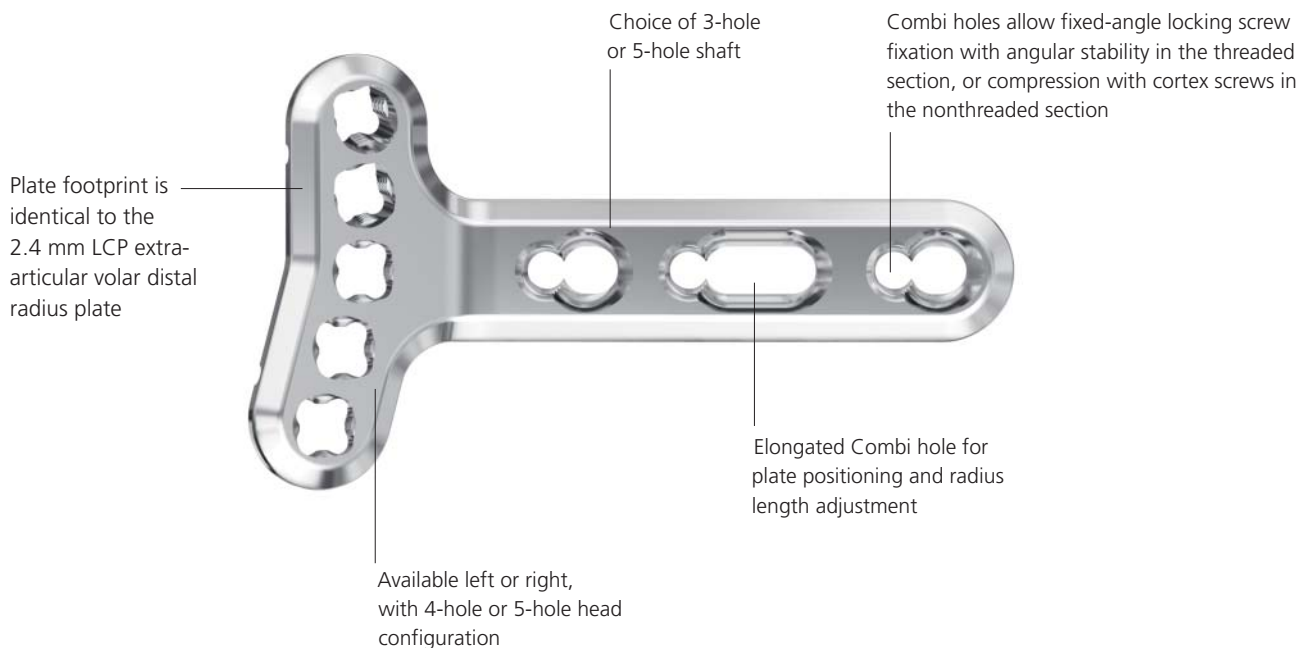


Figure 3

2.4 mm Variable Angle LCP Two-Column Volar Distal Radius Plate



2.4 mm Variable Angle LCP Volar Extra-Articular Distal Radius Plate



AO Principles

In 1958, the AO formulated four basic principles, which have become the guidelines for internal fixation.¹ Those principles, as applied to the 2.4 mm Variable Angle LCP Distal Radius System, are:

Anatomic reduction

The use of variable angle locking technology allows fragment specific fixation by providing the flexibility to lock screws in trajectories that can diverge from the central axis of the plate hole. Variable screw angles provide fixation options for a variety of fracture patterns.

Stable fixation

Variable angle locking screws create a locked construct, providing angular stability.

Preservation of blood supply

Limited-contact plate reduces plate-to-bone contact, limiting vascular trauma. Additionally, locked plates do not require close contact with the bone.

Early, active mobilization

Early mobilization per standard AO technique creates an environment for bone healing, expediting a return to optimal function.

1. M.E. Müller, M. Allgöwer, R. Schneider, and H. Willenegger:
Manual of Internal Fixation, 3rd Edition. Berlin: Springer-Verlag. 1991.

Indications

The 2.4 mm Variable Angle LCP Distal Radius Plates are indicated for fixation of complex intra- and extra-articular fractures and osteotomies of the distal radius and other small bones.



Clinical Cases

Case 1

77-year-old female,
cause of injury: unknown



Preoperative AP

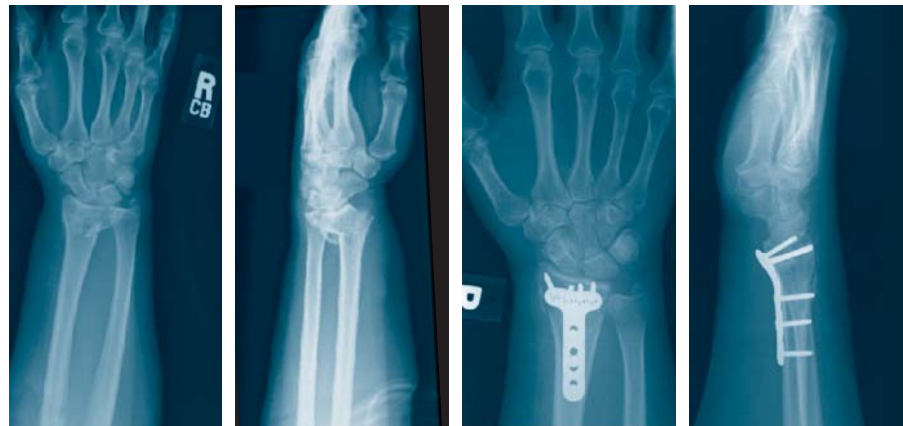
Preoperative lateral

Postoperative AP

Postoperative lateral,
20° inclined

Case 2

47-year-old female,
cause of injury: hit by horse



Preoperative AP

Preoperative lateral

Postoperative AP

Postoperative lateral

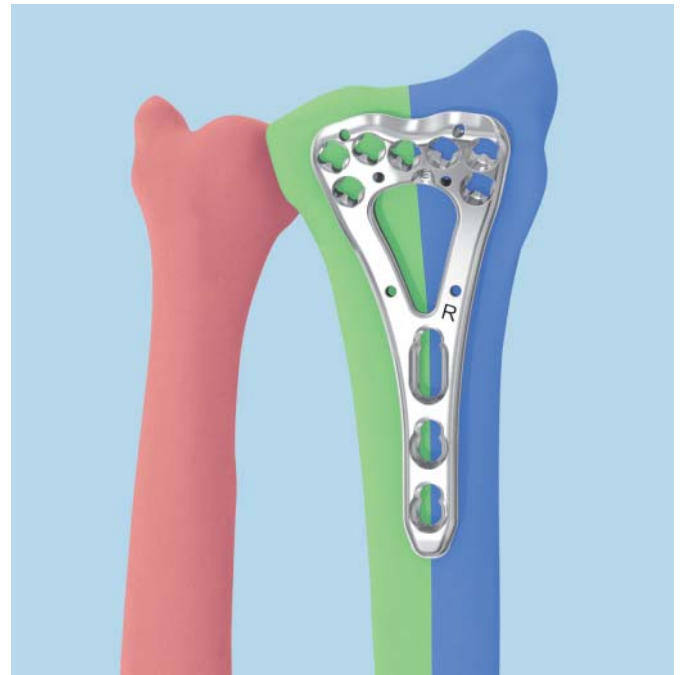
Three-Column Theory

The treatment of distal radius fractures requires a meticulous reconstruction of the joint surface, as well as stable internal fixation and early functional postoperative treatment. Extra-articular fractures require both the restoration of the volar tilt and radial length to reduce the possibility of displacement. Malalignment may result in limitations of movement, changes of load distribution and midcarpal instability, as well as increased risk of osteoarthritis in the radiocarpal joint. Intra-articular fractures with articular displacement of more than 2 mm in the radiocarpal joint may result in osteoarthritis and functional impairment.

The distal radius and distal ulna form a three-column biomechanical construction²:

- The intermediate column is the medial part of the distal radius, with the lunate fossa and the sigmoid notch.
- The radial column is the lateral radius with the scaphoid fossa and the styloid process.
- The ulnar column is the distal ulna, the triangular fibrocartilage and the distal radioulnar joint.

Following reduction, stabilization requires optimal fixation of the intermediate column as well as the radial column. In the case of a fractured distal ulna that compromises the distal radioulnar joint, the ulnar column should be stabilized as well.



VA-LCP two-column volar distal radius plate allows both fixation and buttressing of the two columns of the distal radius.

- Radial column
- Intermediate column
- Ulnar column

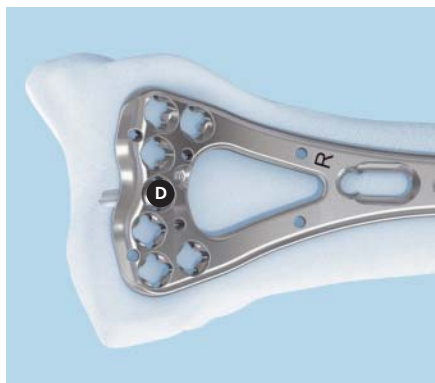
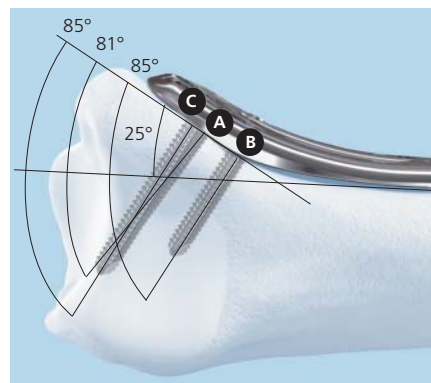
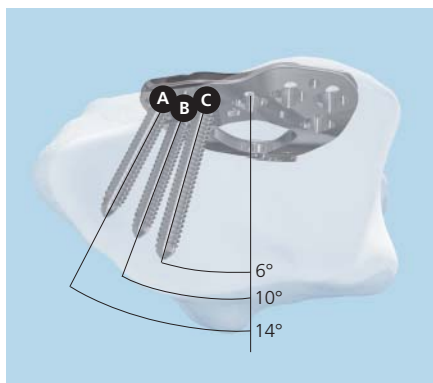
2. D.A. Rikli, P. Regazzoni: "Fractures of the distal end of the radius treated by internal fixation and early function. A preliminary report of 20 cases." *J Bone Joint Surg [Br]* 78 (4): 588–592. 1996.

Preoperative Planning

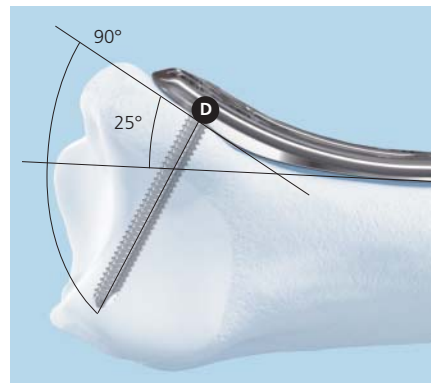
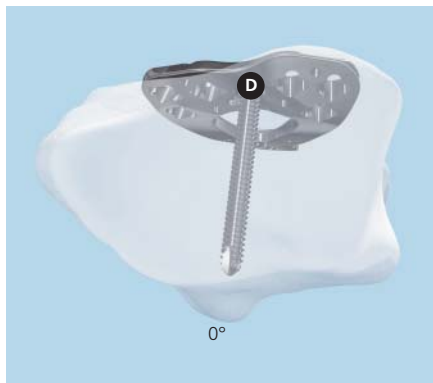
Nominal screw trajectories for variable angle LCP two-column volar distal radius plates with 7 head holes



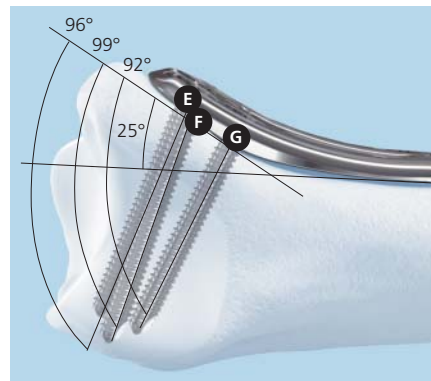
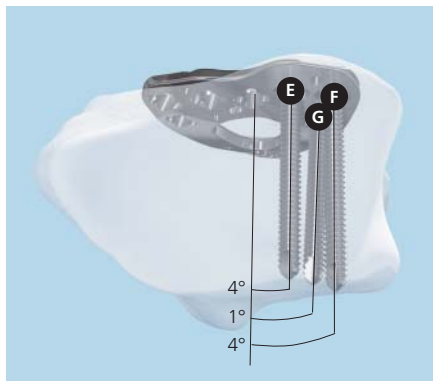
Radial column screws



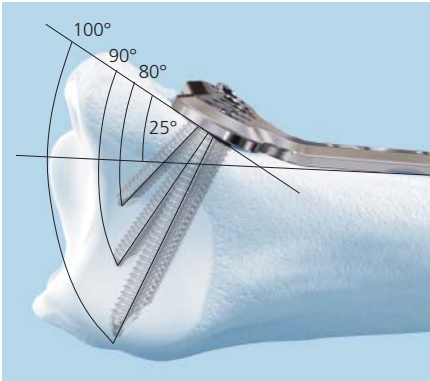
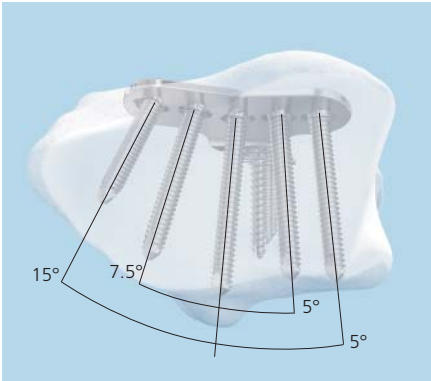
Central screw



Intermediate column screws



Nominal screw trajectories for variable angle LCP volar extra-articular distal radius plates



Nominal screw angles

Preparation

1

Preparation

Required sets

01.110.070/ 2.4 mm Variable Angle LCP Distal Radius System Instrument and Implant Set (stainless steel or titanium)

105.515/ 2.4 mm LCP Distal Radius Instrument and 145.515 Implant Set (stainless steel or titanium)

Make a longitudinal incision slightly radial to the flexor carpi radialis tendon (FCR) (Figure 1). Dissect between the FCR and the radial artery, exposing the pronator quadratus (Figure 2). Detach the pronator quadratus from the lateral border of the radius and elevate it toward the ulna (Figure 3).

Important: Leave the volar wrist capsule intact to avoid devascularization of the fracture fragments and destabilization of the volar wrist ligaments.

Note: For information on fixation principles using conventional and locked plating techniques, please refer to the *Small Fragment Locking Compression Plate (LCP) System Technique Guide*.

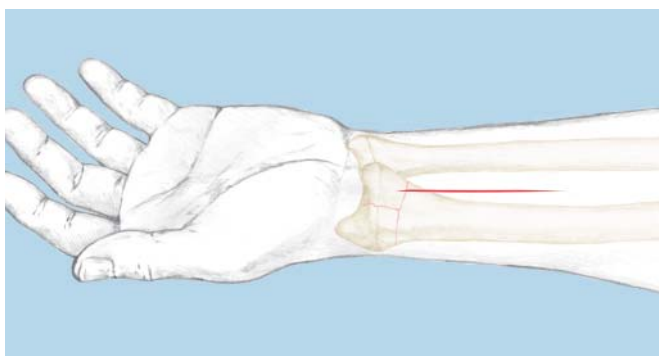


Figure 1

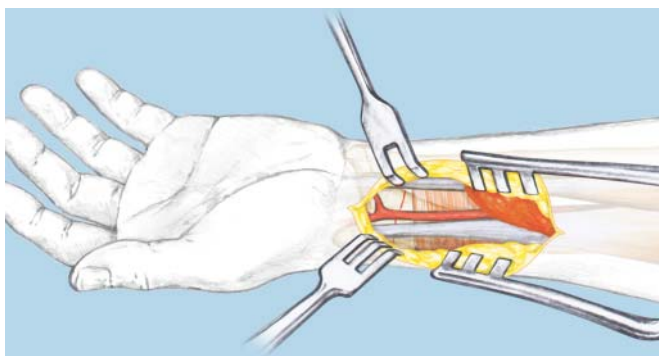


Figure 2

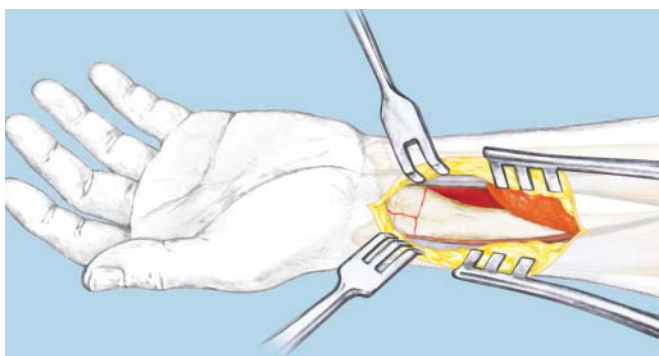


Figure 3

Reduce Fracture and Position Plate

2

Reduce fracture and position plate

Instruments

310.19	2.0 mm Drill Bit, quick coupling
310.509	1.8 mm Drill Bit with depth mark, quick coupling
311.43	Handle, with quick coupling
314.453*	Short StarDrive Screwdriver Shaft, T8, 55 mm
314.467	StarDrive Screwdriver Shaft, T8, 105 mm
319.006	Depth Gauge, for 2.0 mm and 2.4 mm screws
319.01	Depth Gauge, for 2.7 mm screws
323.202	2.4 mm Universal Drill Guide
323.26	2.7 mm Universal Drill Guide

Reduce the fracture using the preferred reduction technique. The reduction method will be fracture specific.

Apply the plate to fit the extra-articular volar surface and insert a 2.4 mm or 2.7 mm cortex screw in the elongated hole in the plate shaft. Measure screw length using the appropriate depth gauge. Adjust the plate position as necessary and tighten the screw with a T8 StarDrive screwdriver.

Note: Use the 1.8 mm drill bit when inserting a 2.4 mm cortex screw. Use the 2.0 mm drill bit when inserting a 2.7 mm cortex screw.

The order of screw insertion in the shaft and metaphysis may vary depending on the fracture pattern and reduction technique.

Verify plate and distal screw location with a drill bit or K-wires before inserting multiple screws.



* Also available

2

Reduce fracture and position plate continued

If necessary, use 1.25 mm K-wires inserted through selected K-wire holes to temporarily fix the plate distally.

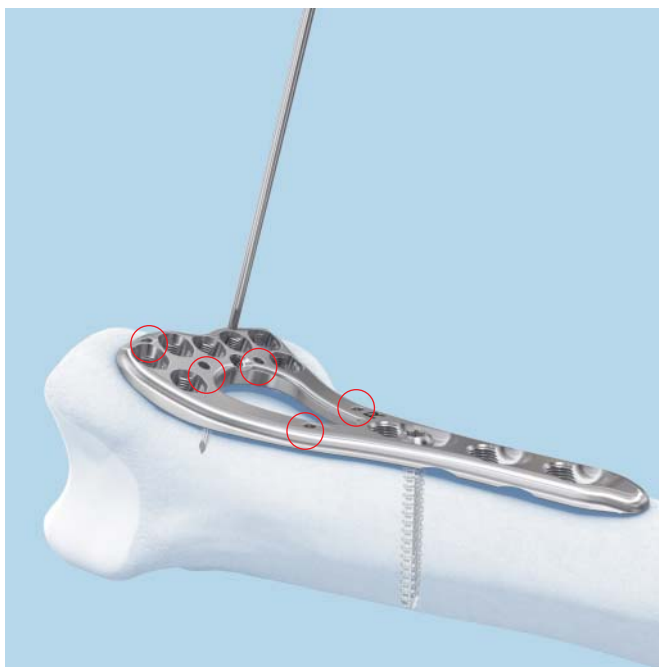
The order of screw insertion and the use of K-wires may vary depending on the fracture pattern and reduction technique.

Optional instruments

	Guide Blocks for Two-Column Plates
03.111.600	6 hole, right
03.111.601	6 hole, left
03.111.700	7 hole, right
03.111.701	7 hole, left

A guide block may be attached to a two-column plate (not shown).

- Perform several radiographic views of the distal radius to ensure alignment and reduction.



Options for preliminary Kirschner wire fixation

Insert Proximal Screws

3

Insert proximal screws

Instruments

310.19	2.0 mm Drill Bit, quick coupling
310.509	1.8 mm Drill Bit with depth mark, quick coupling
311.43	Handle, with quick coupling
314.453*	Short StarDrive Screwdriver Shaft, T8, 55 mm
314.467	StarDrive Screwdriver Shaft, T8, 105 mm
319.006	Depth Gauge, for 2.0 mm and 2.4 mm screws
319.01	Depth Gauge, for 2.7 mm screws
323.029	Threaded LCP Drill Guide
323.202	2.4 mm Universal Drill Guide
323.26	2.7 mm Universal Drill Guide

Determine where 2.4 mm locking screws or 2.4 mm or 2.7 mm cortex screws will be used in the shaft of the plate. Insert these screws beginning with the most proximal screw.

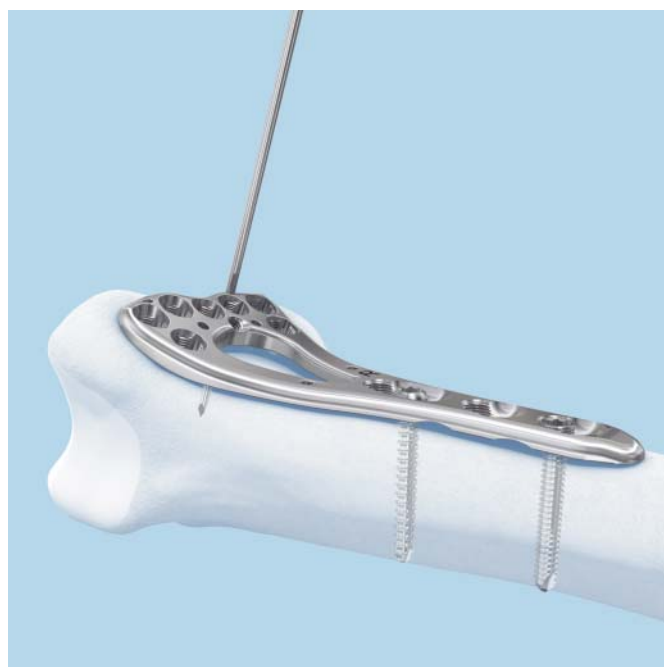
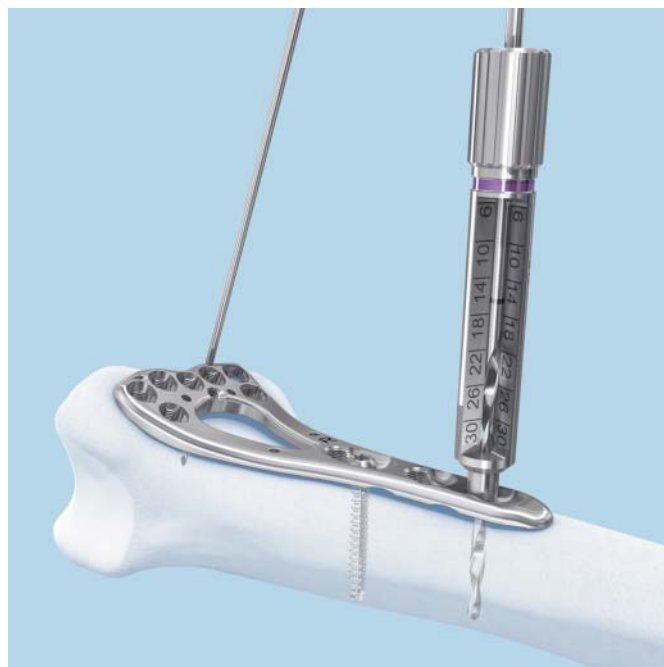
Note: Use the 1.8 mm drill bit when inserting a 2.4 mm locking or cortex screw. Use the 2.0 mm drill bit when inserting a 2.7 mm cortex screw.

Insert the threaded LCP drill guide into the threaded portion of the Combi hole when drilling for a 2.4 mm locking screw.

Measure for locking screw length directly from the depth mark on the drill bit and the gauge on the LCP drill guide window.

Alternatively, use the appropriate depth gauge to measure for screw length.

Insert screws with a T8 StarDrive screwdriver.



* Also available

Drill for Variable Angle Screws

4

Drill for variable angle screw distally

Instruments

03.110.000	1.8 mm Universal Variable Angle Locking Drill Guide
310.509	1.8 mm Drill Bit with depth mark, quick coupling
311.43	Handle, with quick coupling
314.467	StarDrive Screwdriver Shaft, T8, 105 mm
319.006	Depth Gauge, for 2.0 mm and 2.4 mm screws

The 2.4 mm variable angle locking screws may be inserted in the head of the plate. Use the funnel-shaped end of the universal variable angle locking drill guide to drill variable angle holes at the desired angle.

The drill guide tip keys into the cloverleaf design of the VA-LCP holes.

Note: The drill guide inserts coaxially into the hole (Figure 1). Ensure that the tip of the drill guide remains fully seated in the hole while drilling.

When the universal variable angle locking drill guide is engaged in the variable angle locking hole, use the 1.8 mm drill bit to drill to the desired depth at the desired angle (Figure 2).



Figure 1

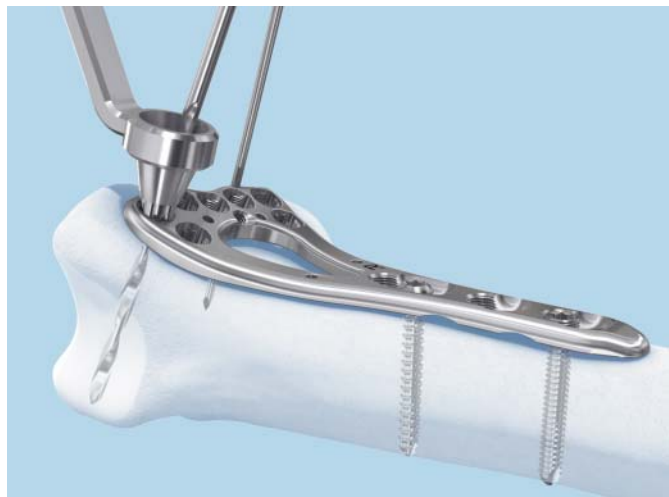


Figure 2

The funnel of the drill guide allows the drill bit a total variation in angulation of 30° (Figure 3).

When drilling off-axis, the drill guide should remain in place and the drill bit may be aimed in any direction within the cone.

The fixed-angle end of the drill guide only allows the drill bit to follow the nominal trajectory of the locking hole (Figure 4).

- Verify the drill bit angle under C-arm to ensure the desired angle has been achieved. If necessary, drill at a different angle and verify again under C-arm.

Use the depth gauge for 2.0 mm and 2.4 mm screws to measure for the correct screw length.

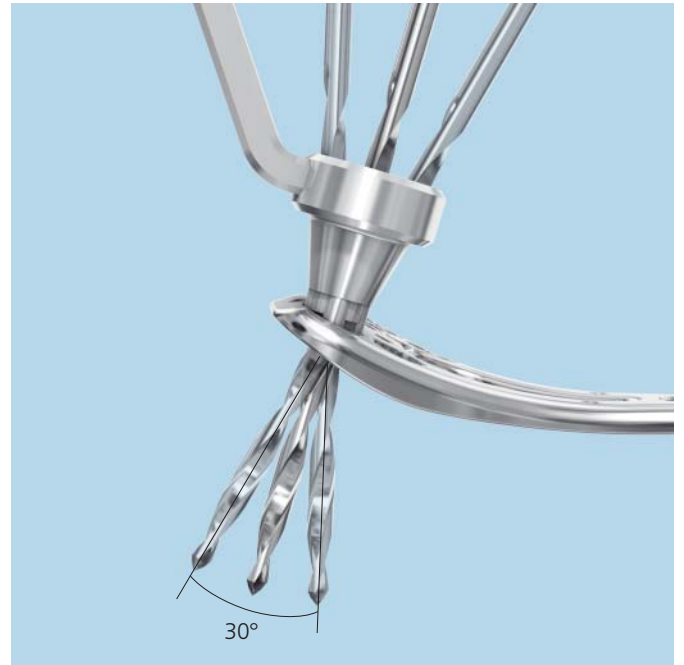


Figure 3



Figure 4

4

Drill for variable angle screw distally continued

Alternative technique

Instruments

03.110.021	1.8 mm Drill Guide with Measuring for Guide Block
03.111.007	Positioning Screw for Variable Angle LCP Two-Column Plate Guide Block
	Guide Blocks for Two-Column Plates
03.111.600	6 hole, right
03.111.601	6 hole, left
03.111.700	7 hole, right
03.111.701	7 hole, left

Alternatively, to insert screws at the nominal screw angle (“on-axis”), use the two-column distal radius plate guide block in combination with the drill guide.

The guide block holes are designed to accept the drill guide with measuring for guide block.

For drilling, insert the drill guide into the locking hole and drill to the desired depth using the 1.8 mm drill bit.

Read the screw length directly from the laser mark on the drill bit.

Alternatively, measure using a corresponding depth gauge directly through the guide block.

Note: For the direction of predefined screw angles, refer to page 8 or 9.



Preliminary Screw Placement

5

Preliminary screw placement

Instruments

311.43	Handle, with quick coupling
314.453*	Short StarDrive Screwdriver Shaft, T8, 55 mm or
314.467	StarDrive Screwdriver Shaft, T8, 105 mm

Insert the correct length variable angle locking screw manually, using the self-retaining T8 StarDrive screwdriver shaft and handle with quick coupling. Insert the screw until the screw-head is seated in the variable angle locking hole. **Do not over-tighten the screw.** Insert additional screws as needed.

Note: When a guide block is used, the locking screw (variable angle LCP or standard LCP) may be inserted with a T8 StarDrive screwdriver directly through the guide block.



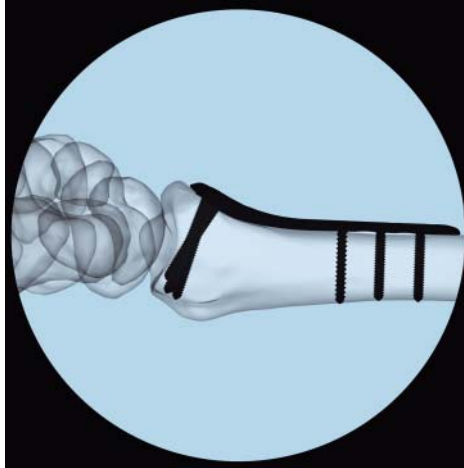
* Also available

Confirm Proper Joint Reconstruction

6

Confirm proper joint reconstruction

- Confirm proper joint reconstruction, screw placement and screw length using multiple C-arm views. To ensure that the distal screws are not in the joint, use additional views such as a 10° dorsally tilted, 20° inclined lateral, and 45° pronated oblique view.



Lock Variable Angle Screws

7

Lock variable angle screws

Instruments

03.110.002	Torque Limiting Attachment, 1.2 Nm
03.110.005	Handle for Torque Limiting Attachment
314.453*	Short StarDrive Screwdriver Shaft, T8, 55 mm or
314.467	StarDrive Screwdriver Shaft, T8, 105 mm
511.776*	Torque Limiting Attachment, 0.8 Nm

Use the 1.2 Nm torque limiting attachment to perform the final locking step for variable angle locking screws. The torque limiting attachment attaches to the T8 StarDrive screwdriver shaft and the blue handle for torque limiting attachment.



* Also available

7

Lock variable angle screws continued

The torque limiting attachment ensures maximum strength of the plate-screw interface and prevents over-tightening of the variable angle screws. With this final locking step, the screws are securely locked into the plate.

If less than 1.2 Nm insertion torque is applied, ensure that the screw is tightened enough to facilitate a snug fit with the plate. The 0.8 Nm torque limiting attachment may be used.



8

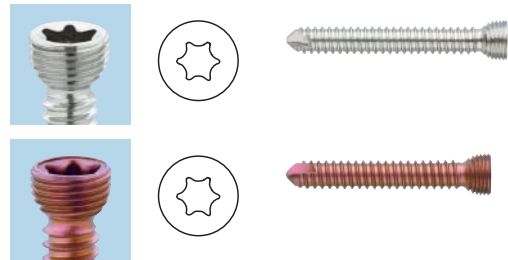
Close incision

Use the appropriate method for surgical closure of the incision.

Screws Used with the 2.4 mm Variable Angle Distal Radius Plates

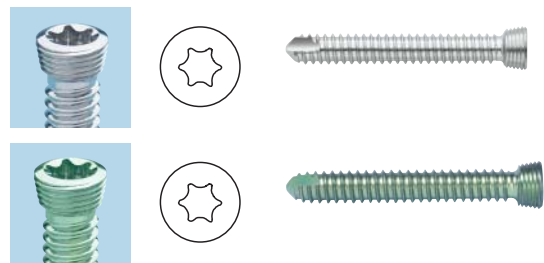
2.4 mm Variable Angle Locking Screws, with StarDrive recess

- Threaded, rounded head locks securely into the variable-angle locking holes in the plate head to provide angular stability at angles determined by the surgeon
- Locked screws allow unicortical screw fixation and load transfer to the near cortex
- 8 mm to 30 mm lengths (2 mm increments)
- Self-tapping tip



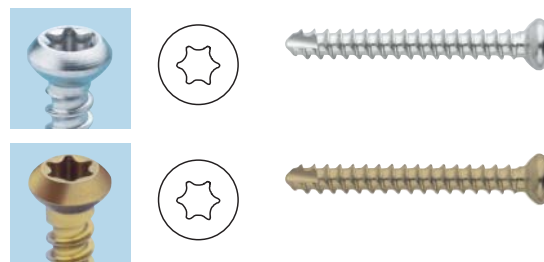
2.4 mm Locking Screws, self-tapping, with StarDrive recess

- Threaded, conical head locks securely into the threaded portion of the Combi holes in the plate to provide angular stability
- Locked screws allow unicortical screw fixation and load transfer to the near cortex
- 6 mm to 30 mm lengths (2 mm increments)



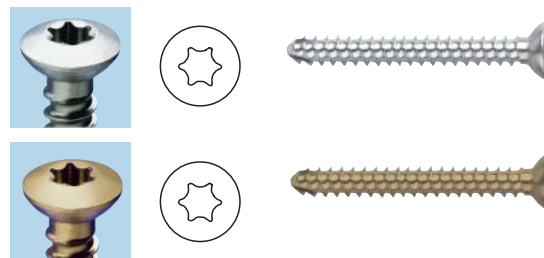
2.4 mm Cortex Screws, self-tapping, with StarDrive recess

- For use in round or Combi holes
- Low-profile head in the plate holes
- Used to provide compression or neutral fixation
- 6 mm to 30 mm lengths (2 mm increments)



2.7 mm Cortex Screws, self-tapping, with StarDrive recess

- For use in Combi holes
- Used to provide compression or neutral fixation
- 10 mm to 30 mm lengths (2 mm increments)



Stainless steel screws are made of implant-quality 316L stainless steel
Titanium screws are made of titanium alloy, Ti-6Al-7Nb

2.4 mm Variable Angle LCP Two-Column Volar Distal Radius Plates

Left plates



02.111.621/
04.111.621



02.111.631/
04.111.631



02.111.641/
04.111.641



02.111.721/
04.111.721



02.111.731/
04.111.731



02.111.741/
04.111.741

Part numbers beginning with "02" indicate 316L stainless steel plates.
Part numbers beginning with "04" indicate commercially pure (CP) titanium plates.

Right plates



02.111.620/
04.111.620



02.111.630/
04.111.630



02.111.640/
04.111.640



02.111.720/
04.111.720



02.111.730/
04.111.730



02.111.740/
04.111.740

Part numbers beginning with "02" indicate 316L stainless steel plates.
Part numbers beginning with "04" indicate commercially pure (CP) titanium plates.

2.4 mm Variable Angle LCP Volar Extra-Articular Distal Radius Plates

Left plates



02.110.203/
04.110.203



02.110.204/
04.110.204



02.110.207/
04.110.207



02.110.208/
04.110.208

Right plates



02.110.201/
04.110.201



02.110.202/
04.110.202



02.110.205/
04.110.205



02.110.206/
04.110.206

Part numbers beginning with "02" indicate 316L stainless steel plates.
Part numbers beginning with "04" indicate commercially pure (CP) titanium plates.

Instruments

03.110.000 1.8 mm Universal Variable Angle Locking Drill Guide



03.110.002 Torque Limiting Attachment, 1.2 Nm



03.110.005 Handle for Torque Limiting Attachment



03.110.021 1.8 mm Drill Guide with Measuring for Guide Block



03.111.007 Positioning Screw for Variable Angle LCP Two-Column Plate Guide Block



03.111.600 Guide Block for Two-Column Plate, 6-hole head right
03.111.601 left



03.111.700 Guide Block for Two-Column Plate, 7-hole head right
03.111.701 left



Selected Instruments from the 2.4 mm LCP Distal Radius Plate

Instrument and Implant Sets

Stainless Steel (105.515) and Titanium (145.515)

310.19 2.0 mm Drill Bit, quick coupling



310.509 1.8 mm Drill Bit with depth mark, quick coupling



311.43 Handle, with quick coupling



314.467 StarDrive Screwdriver Shaft, T8, 105 mm



319.006 Depth Gauge, for 2.0 mm and 2.4 mm screws



319.01 Depth Gauge, for 2.7 mm screws



323.029 Threaded LCP Drill Guide



323.202 2.4 mm Universal Drill Guide



323.26 2.7 mm Universal Drill Guide



Also Available

314.453 Short StarDrive Screwdriver Shaft, T8, 55 mm



511.776 Torque Limiting Attachment, 0.8 Nm, quick coupling



2.4 mm Variable Angle LCP (VA-LCP) Two-Column Volar Distal Radius System Implant Set

Stainless Steel (01.111.461) and Titanium (01.111.462)

Module

60.111.461 Module for Variable Angle LCP Two-Column Volar Distal Radius Plate

Instruments

03.110.021 1.8 mm Drill Guide with Measuring for Guide Block, 2 ea.

Guide Blocks for Two-Column Plates

03.111.600 6 hole head, right

03.111.601 6 hole head, left

03.111.700 7 hole head, right

03.111.701 7 hole head, left



Implants

2.4 mm Variable Angle LCP Two-Column Volar Distal Radius Plates

Stainless Steel*	Titanium**	Head Holes	Shaft Holes	
02.111.620	04.111.620	6	2	right
02.111.621	04.111.621	6	2	left
02.111.630	04.111.630	6	3	right
02.111.631	04.111.631	6	3	left
02.111.640	04.111.640	6	4	right
02.111.641	04.111.641	6	4	left
02.111.720	04.111.720	7	2	right
02.111.721	04.111.721	7	2	left
02.111.730	04.111.730	7	3	right
02.111.731	04.111.731	7	3	left
02.111.740	04.111.740	7	4	right
02.111.741	04.111.741	7	4	left

* 316L stainless steel

** Commercially pure (CP) titanium

Note: For additional information, please refer to package insert.

2.4 mm Variable Angle LCP (VA-LCP) Distal Radius System Instrument and Implant Set

Stainless Steel (01.110.070) and Titanium (01.110.071)

Module

60.110.070 Variable Angle LCP Distal Radius Instrument and Implant Module

Instruments

03.110.000 1.8 mm Universal Variable Angle Locking Drill Guide
03.110.002 Torque Limiting Attachment, 1.2 Nm
03.110.005 Handle for Torque Limiting Attachment
314.467 StarDrive Screwdriver Shaft, T8, 105 mm

Implants

2.4 mm Variable Angle LCP Volar Extra-Articular Distal Radius Plates

Stainless Steel*	Titanium**	Head Holes	Shaft Holes	
02.110.201	04.110.201	5	3	right
02.110.203	04.110.203	5	3	left
02.110.202	04.110.202	5	5	right
02.110.204	04.110.204	5	5	left
02.110.205	04.110.205	4	3	right
02.110.207	04.110.207	4	3	left
02.110.206	04.110.206	4	5	right
02.110.208	04.110.208	4	5	left

2.4 mm Variable Angle Locking Screws, with StarDrive recess

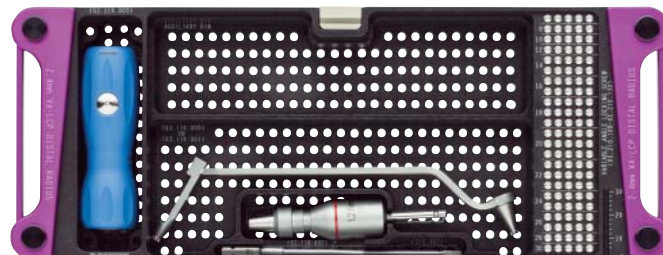
Stainless Steel*	Titanium†	Length (mm)	Qty.
02.210.108	04.210.108	8	5
02.210.110	04.210.110	10	5
02.210.112	04.210.112	12	5
02.210.114	04.210.114	14	10
02.210.116	04.210.116	16	10
02.210.118	04.210.118	18	15
02.210.120	04.210.120	20	15
02.210.122	04.210.122	22	15
02.210.124	04.210.124	24	10
02.210.126	04.210.126	26	10
02.210.128	04.210.128	28	5
02.210.130	04.210.130	30	5

* 316L stainless steel

** Commercially pure (CP) titanium

† Titanium alloy, Ti-6Al-7Nb

Note: For additional information, please refer to package insert.



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