

medartis®

PRECISION IN FIXATION

SURGICAL TECHNIQUE – STEP BY STEP

# Elbow System 2.0, 2.8



APTUS®  
Elbow

# Contents

3	Introduction
	Product Materials
	Indications
	Contraindications
	Color Coding
	Symbols
4	Radial Head Plates
	Coronoid Plates
5	Olecranon Plates
7	Distal Humerus Plates
8	General Instrument Application
	Sizing Templates
9	Bending
12	Drilling
13	Thread Preparation
14	Surgical Technique Lag Screw Techniques
16	Assigning the Screw Length
17	Screw Pick-Up
18	Aiming Device for Distal Humerus Plates
21	Surgical Techniques Plates
	Radial Head Plates
23	Coronoid Plates
25	Olecranon Tension Plate
28	Olecranon Double Plates
31	Proximal Ulna Double Plates
32	Distal Humerus Plates
36	TriLock Locking Technology
	Correct Application of the TriLock Locking Technology
37	Correct Locking ( $\pm 15^\circ$ ) of the TriLock Screws in the Plate
38	Appendix – Implants and Instruments

For further information regarding the APTUS product line visit [www.medartis.com](http://www.medartis.com)

# Introduction

## Product Materials

APTUS implants, plates and screws, are made of pure titanium (ASTM F67, ISO 5832-2) or titanium alloy (ASTM F136, ISO 5832-3). All of the titanium materials used are biocompatible, corrosion-resistant and non-toxic in a biological environment.

K-wires and staples are made of stainless steel (ASTM F138, ASTM F139); instruments are made of stainless steel, PEEK, aluminum or titanium.

## Indications

- Management of proximal radius fractures and osteotomies
- Management of fractures and osteotomies of the ulna
- Management of fractures, osteotomies and non-unions of the distal humerus

## Contraindications

- Pre-existing or suspected infection at or near the implantation site
- Known allergies and/or hypersensitivity to implant materials
- Inferior or insufficient bone quality to securely anchor the implant
- Patients who are incapacitated and/or uncooperative during the treatment phase
- Growth plates are not to be blocked with plates and screws

Specific complications that may be associated with the fixation of proximal ulna fractures include:

- early osteoarthritis

## Color Coding

System	Color Code
APTUS 2.0	Blue
APTUS 2.8	Orange

## Plates and Screws

Special implant plates and screws have their own color:

Gold implant plates	Fixation plates
Blue implant plates	TriLock plates (locking)
Gold implant screws	Cortical screws (fixation)
Blue implant screws	TriLock screws (locking)

## Symbols



HexaDrive



TriLock screw hole on sizing templates



## Radial Head Plates

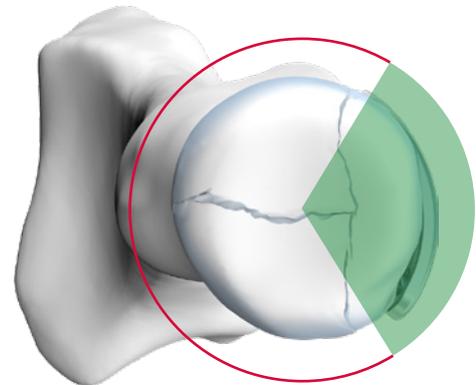
The radial head plates can be used for fractures and osteotomies of the proximal radius, in which internal fixation with plates is indicated. The plates should be placed in the so-called «Safe Zone» whenever the fracture pattern allows it.

The radial head plates exist in two versions:

- A-4656.68 Rim plate
- A-4656.69 Buttress plate

The radial head buttress plate has the advantage to spare the annular ligament and enables the buttressing of a fracture with comminution in the neck region.

The radial head rim plate lies in part under the annular ligament, but gives the possibility to treat complex fracture patterns of radial head by internal fixation. In particular, the orientation of the screw holes of the rim plate makes it possible to place bicortically subchondral screws in the most proximal screw range that are parallel to the humeroradial joint surface. This enables an optimal angular stable bridging of a potential comminuted zone.



**Safe Zone**  
View on the articulation of the radial head from proximal. Right radius in neutral position.



A-4656.68  
Radial Head Rim Plate



A-4656.69  
Radial Head Buttress Plate

## Coronoid Plates

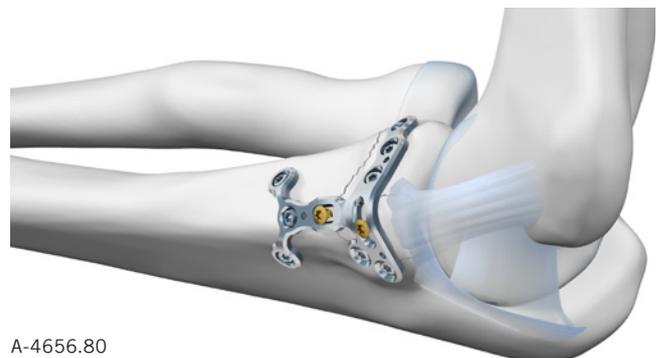
The coronoid plates can be used for fractures and osteotomies of the proximal ulna, in which internal fixation with plates is indicated. The coronoid plates are provided in a right (A-4656.80) and a left version (A-4656.81).



A-4656.80 1:1



A-4656.81 1:1



A-4656.80  
Coronoid Plate, Right

## Olecranon Plates

We distinguish two fracture and plate types:

Fractures with inter-fragmentary support

→ **Olecranon Tension Plate (A-4856.01)**

Fractures without inter-fragmentary support

→ **Double Plates (A-4856.10–15)**

The **olecranon tension plate** is intended to replace the classical tension band wiring. It is very thin entailing limited hardware prominence and can only withstand tension forces.

The **double plates** integrate increased bending stiffness and are suitable for angular stable «bridging» of comminuted fracture zones. The double plates are placed as a pair laterally and medially to the dorsal rim of the proximal ulna, which is the favorable position from the biomechanical standpoint. Medartis offers two types of double plates to address various fracture patterns:

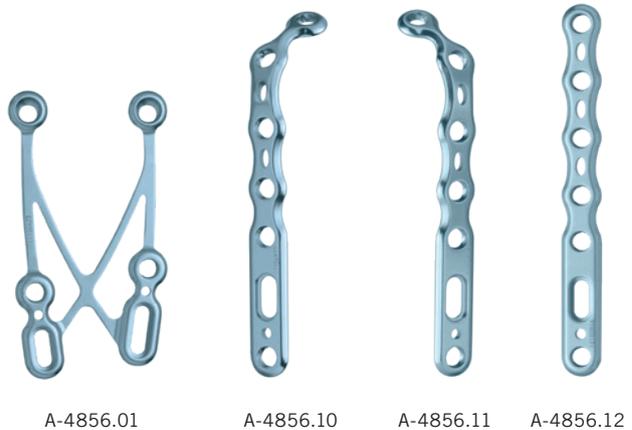
Proximal fractures of the proximal ulna

→ **Olecranon Double Plates**

Distal fractures of the proximal ulna

→ **Proximal Ulna Double Plates**

In the case of the double plates, at least two screws should be placed in each fragment for both plates.

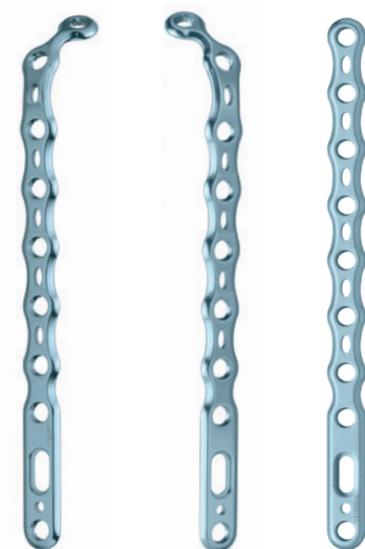


A-4856.01

A-4856.10

A-4856.11

A-4856.12



A-4856.13

A-4856.14

A-4856.15

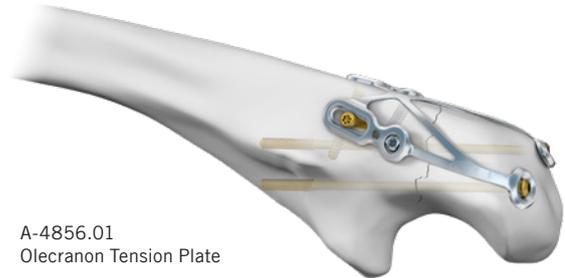
The **olecranon double plates** are to be used if the fracture pattern is so proximal that the proximal part of the plates must surround the tip of the olecranon, entering the insertion of the triceps tendon.

The **proximal ulna double plates** can be used if the fracture pattern is distal enough that the proximal part of the plates does not have to go around the olecranon tip, thus sparing the insertion of the triceps tendon.

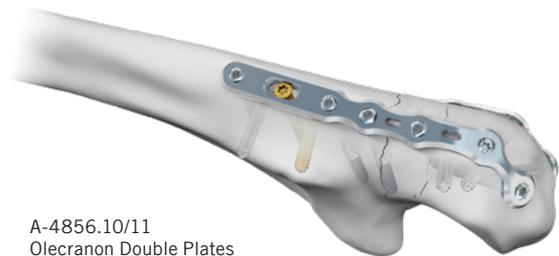
Because the olecranon double plates become to lie around the tip of the olecranon, they are already pre-contoured. Additionally, the most proximal screw hole is laterally angulated, to the right side for A-4856.10 and to the left side for A-4856.11.

This angulation assures that the most proximal holes do not abut one another behind the olecranon and that the two small incisions in the insertion of the triceps tendon can be parallel to the muscle fibres.

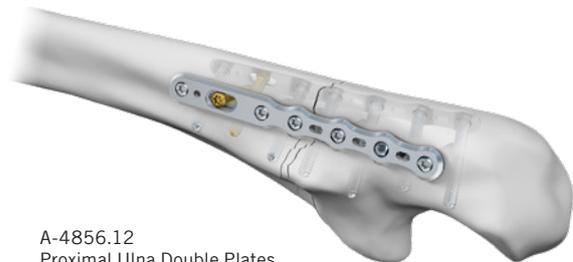
The olecranon plates have several holes for temporary fixation with K-wires of diameter 1.6 mm.



A-4856.01  
Olecranon Tension Plate



A-4856.10/11  
Olecranon Double Plates



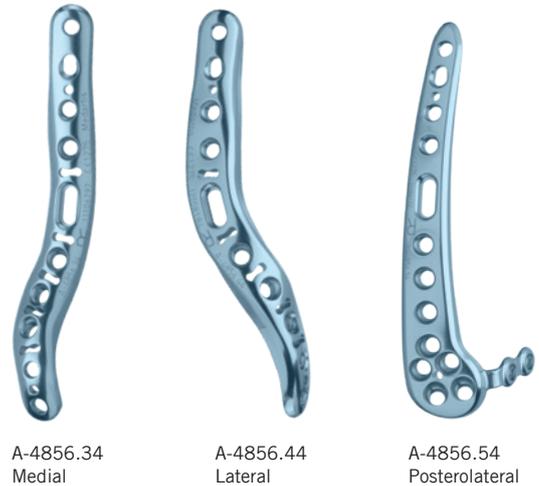
A-4856.12  
Proximal Ulna Double Plates

## Distal Humerus Plates

Three plate types are designed for internal fixation of distal humerus fractures with the following plate positions:

- Medial position
- Lateral position
- Posterolateral position

All plates are available in three lengths and in a left and a right version.



The plates can be used as a pair in the case of complex fractures, either in a 90° (perpendicular) or in a 180° (parallel) configuration.

The distal humerus plates have holes for the temporary fixation with K-wires of diameter 1.8 mm.



The aiming device (A-2096) facilitates the placement of the screws in the region of the articulation, in particular in the cases of long screws between the epicondyles, because the exit point of the screws is precisely fixed before drilling.

Please refer to chapter «Aiming Device for Distal Humerus Plates» for a detailed description.



# General Instrument Application

## Sizing Templates

Sizing templates facilitate the intraoperative selection of the appropriate implant.

Sizing templates for the 2.8 TriLock Olecranon Plates are available according to the Appendix Implants and Instruments.

The sizing templates feature symbols that indicate the type of the screw hole and its position on the respective implant:

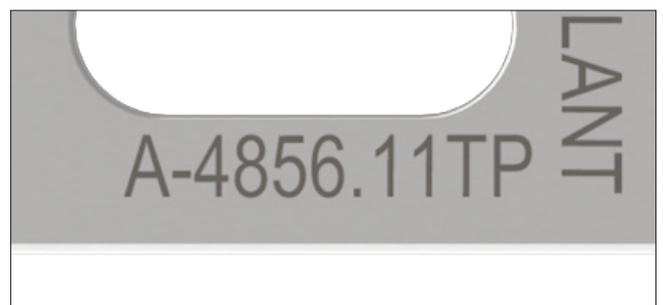


for a TriLock screw hole (locking) using a TriLock or a cortical screw



Sizing template with TriLock screw hole symbols

The article number of the sizing template (e.g. A-4856.11TP) corresponds to the article number of the sterile implant (e.g. A-4856.11S). The suffix TP stands for template.



A-4856.11TP  
Template for A-4856.11S

Use appropriate K-wires to temporarily fix the sizing template to the bone, if necessary.

### Caution

Do not implant sizing templates.

Do not bend or cut sizing templates.

## Bending

If required, radial head plates and the coronoid plate can be bent with the plate bending pliers (A-2040 or A-2047). The olecranon plates and the lateral flap of the postero-lateral distal humerus plates can be bent only with the plate bending pliers A-2047. These plate bending pliers have two different pins to protect the locking holes of flat and curved plates during the bending process.



A-2040  
1.2-2.3 Plate Bending Pliers, with Vario Pin



A-2047  
2.0-2.8 Plate Bending Pliers, with Pins

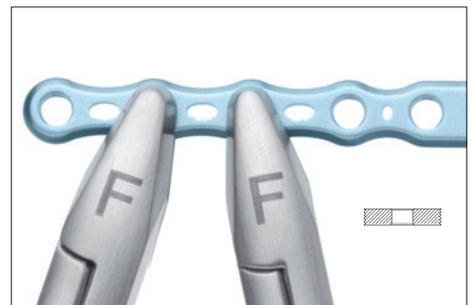
**Plate bending pliers with Vario pin (A-2040)**

The labeled side of the plate must always face upward («UP») when inserting the plate into the bending pliers.



**Plate bending pliers with pin (A-2047)**

When bending a flat plate (olecranon plate), the plate bending pliers must be held so that the letters «F – FLAT PLATE THIS SIDE UP» are legible from above.



When bending the flap of the posterolateral plate, the plate bending pliers must be held so that the letters «F – FLAT PLATE THIS SIDE UP» are legible from above.



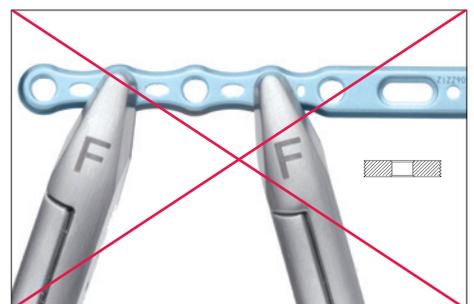
**Notice**

When bending a curved plate (radial head plates and coronoid plates), the letters «C – CURVED PLATE THIS SIDE UP» must be legible from above. This ensures that the plate holes are not damaged.



**Notice**

While bending, the plate must always be held at two adjacent holes to prevent contour deformation of the intermediate plate hole.

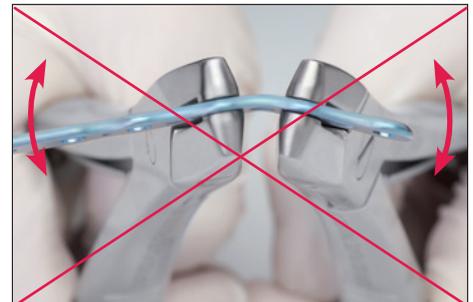


**Caution**

Do not bend the plate by more than 30°. Bending the plate further may deform the plate holes and may cause the plate to break postoperatively.

**Caution**

Repeatedly bending the plate in opposite directions may cause the plate to break postoperatively. Always use the provided plate bending pliers to avoid damaging the plate holes. Damaged plate holes prevent correct and secure seating of the screw in the plate and increase the risk of system failure.

**Plate Bending Iron Elbow (A-2090)**

With the help of the plate bending irons (A-2090), the distal humerus plates can be twisted or bent out of the plate plane.



A-2090  
Plate Bending Iron Elbow

The medial and lateral distal humerus plates are to be bent in the open slits «med» and «lat», respectively, out of the plate plane and to be twisted in the closed slits «med» and «lat», respectively. The posterolateral distal humerus plates are both to be bent and twisted in the open slit «post-lat».



## Drilling

Color-coded twist drills are available for every APTUS system size. All twist drills are color-coded via a ring system.

System size	Color Code
APTUS 2.0	Blue
APTUS 2.8	Orange



Core hole drills = one colored ring



A-3431



A-3834

Gliding hole drills = two colored rings

There are two different types of twist drills available for every system size: drills for core holes are characterized by one colored ring, drills for gliding holes (for lag screw technique) are characterized by two colored rings.

The drill must always be guided through a drill guide to prevent damaging the plate hole and to protect surrounding tissue from direct contact with the drill. The drill guide also serves to limit the drilling angle.



A-2620  
2.0/2.3 Drill Guide



A-2820  
2.8 Drill Guide

### Notice

For locking plates ensure that the screw holes are pre-drilled with a pivoting angle of up to  $\pm 15^\circ$ . For this purpose, the drill guides feature a limit stop of  $\pm 15^\circ$ . A pre-drilled pivoting angle of  $> 15^\circ$  no longer allows the TriLock screws to correctly lock in the plate.



## Thread Preparation with the Tap

All APTUS screws are self-tapping. In the case of very hard bone, especially in the shaft region of the distal humerus, it can be indicated to reduce the insertion torque of the 2.8 mm screws by using the 2.8 tap (A-3839).

An unusually high resistance during the drilling of the core hole and/or an unusually high insertion torque of the screw can be signs of a particularly hard bone requiring prior tapping.

After drilling a core hole with a 2.8 core hole drill (A-3832 or A-3837, one orange ring), create a thread in the hole by using the 2.8 tap (A-3839) together with the handle (A-2070 or A-2073).

Then insert the screw with the corresponding screwdriver (screwdriver blade A-2013 with handle A-2070 or A-2073).



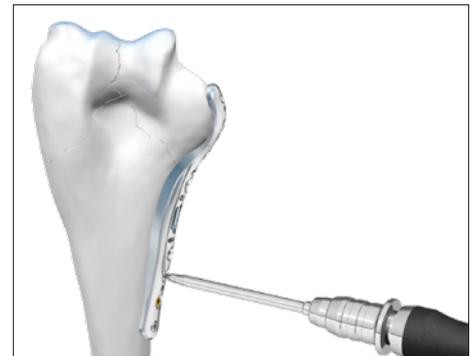
A-3839 2.8 Tap



A-2070 Handle with Quick Connector, AO



A-2073 Handle with Quick Connector, AO



## Surgical Technique Lag Screw Techniques

Two lag screw techniques can be used, depending on the implant. The drill guides (A-2620 for 2.0 mm and A-2820 for 2.8 mm) for lag screws are used to perform the classical lag screw technique according to AO/ASIF.

### A) Lag Screw Technique Using Cortical Screws

The procedure for the lag screw technique using cortical screws (2.0 mm: A-5400.xx or 2.8 mm: A-5800.xx) is as follows:

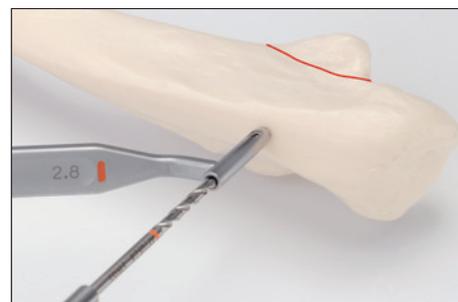
#### 1. Drilling the gliding hole

Use the end of the drill guide labeled with LAG. Use the twist drill for gliding holes (two colored rings) of the required system size to drill at a right angle to the fracture line.



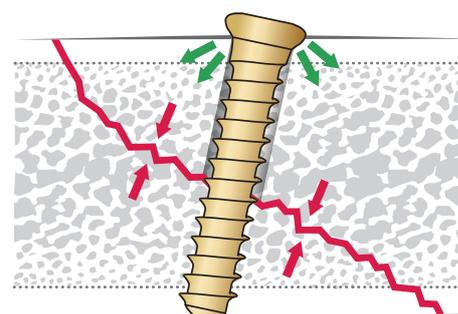
#### 2. Drilling the core hole

Insert the other end of the drill guide A-2620 (2.0 mm) or A-2820 (2.8 mm) into the drilled gliding hole and use the twist drill for core holes (one colored ring) to drill the core hole.



#### 3. Compressing the fracture

Compress the fracture with a cortical screw of the corresponding system size.

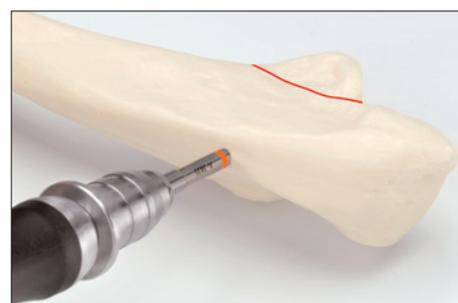


#### 4. Optional steps before compression

If required, use the countersink for cortical screws (A-3835) to create a recess in the bone for the screw head.

#### Recommendation

Use the handle (A-2070 or A-2073) instead of a power tool.

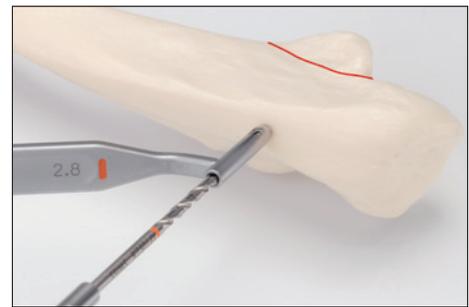


## B) Lag Screw Technique Using Lag Screws

For lag screws (A-5830.xx, 2.8 mm) without thread in the shaft/neck, it is sufficient to drill a core hole using the drill guide and the core hole drill and to insert the screw.

### 1. Drilling the core hole

Place the end of the drill guide (A-2820) which is not labeled with LAG onto the bone and use the core hole drill (A-3832 or A-3837, one orange ring) to drill the core hole.



### 2. Compressing the fracture

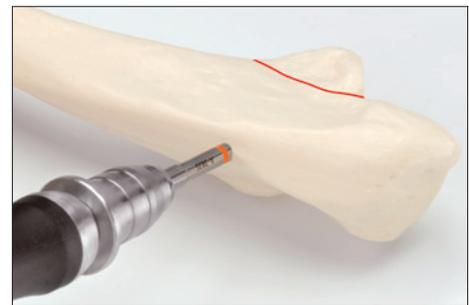
Compress the fracture by the use of a lag screw of the corresponding system size.

### 3. Optional steps before compression

If required, use the countersink (A-3835) to create a recess in the bone for the screw head.

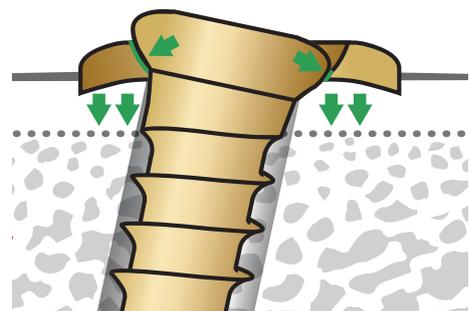
#### Recommendation

Use the handle (A-2070 or A-2073) instead of a power drive.



#### Recommendation

If the cortical bone is soft, a washer (A-4750.70) can be used for 2.8 mm cortical or lag screws in order to distribute the lag forces over a larger surface of the bone around the screw hole.



## Assigning the Screw Length

The depth gauges (A-2032 for 2.0 mm screws and A-2836 for 2.8 mm screws) are used to assign the ideal screw length for use in monocortical or bicortical screw fixation.



A-2032  
2.0/2.3 Depth Gauge



A-2836  
2.8 Depth Gauge

Retract the slider of the depth gauge.

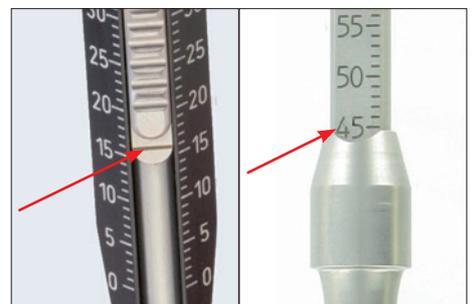
The caliper of the depth gauge has a hooked tip that is either inserted to the bottom of the hole or is used to catch the far cortex of the bone. When using the depth gauge, the caliper stays static, only the slider is adjusted.



To assign the screw length, place the distal end of the slider onto the implant plate or directly onto the bone.



The ideal screw length for the assigned drill hole can be read on the scale of the depth gauge.



## Screw Pick-Up

All screwdrivers (A-2610, A-2070 and A-2073) and the screwdriver blade (A-2013) feature the patented HexaDrive self-holding system.



To remove the screws from the implant container, vertically insert the appropriately color-coded screwdriver into the screw head of the desired screw with axial pressure and lift the screw out of the container.

### Notice

The screw will not hold without axial pressure!

Vertically extract the screw from the compartment.

### Notice

Picking up the screw repeatedly may lead to permanent deformation of the self-retaining area of the HexaDrive inside the screw head. Therefore, the screw may no longer be able to be picked up correctly. In this case, a new screw has to be used.

Check the screw length and diameter at the scale of the measuring module. The screw is measured at its head.



A-2610  
2.0/2.3 Screwdriver, HD6, Self-Holding



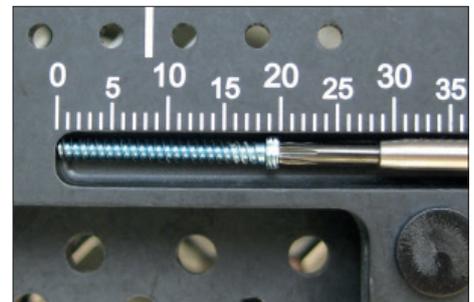
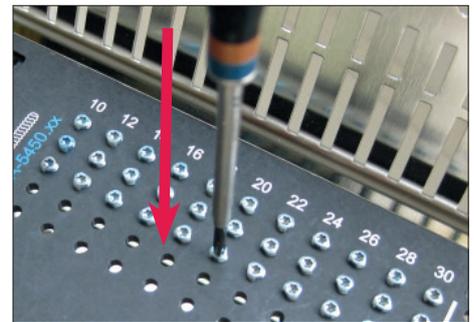
A-2070  
Handle with Quick Connector, AO



A-2073  
Cannulated Handle with Quick Connector, AO



A-2013  
2.5/2.8 Screwdriver Blade, HD7, AO



## Aiming Device (A-2096) for Distal Humerus Plates

The aiming device (A-2096) facilitates the placement of the screws in the region of the articulation, in particular in the case of long screws between the epicondyles, because the exit point of the screws is precisely fixed before drilling. The device is designed in a way that the drilling stops when the drill bit (A-3837) arrives at the target tip at the second cortex of the bone.

The length of the bicortical screw hole can be read on the scale of the axle of the aiming device.

Position the target tip of the aiming device at the place where the screw should exit. Now position the drill guide of the aiming device onto the screw hole in which the screw should be inserted by gripping the trigger handle. This reduces the distance between the target tip and the drill guide until both are in contact with the bone or the plate, respectively.

The device also exerts a slight compression on the fracture.

By gripping the trigger handle, the distance between the target tip and the drill guide is reduced.

By pushing the «Release» handle, the distance is increased.

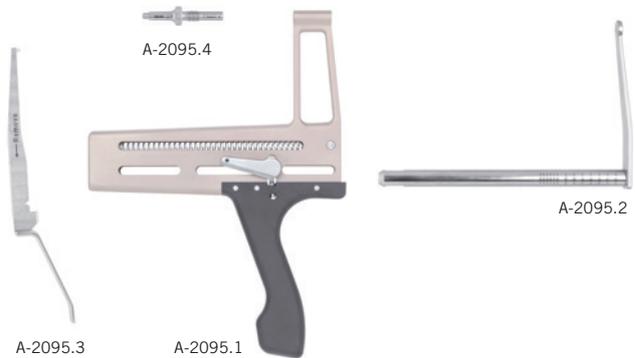
Insert the drill bit (A-3837) into the drill guide of the aiming device and drill the hole. The drill bit stops automatically just before it reaches the target tip.

When the device is in position on the bone and the plate, the screw length can be read on the scale on the axle.



**Assembly of the aiming device**

The aiming device (A-2096) consists of the components A-2095.1–4 which are stored individually in the container module in order to assure an optimal sterilization.



**Article numbers of the components**

- A-2095.1 Frame with handle
- A-2095.2 Axle with drill stop
- A-2095.3 Trigger with target tip
- A-2095.4 Drill guide 2.8



**Step 1**

Insert the drill guide 2.8 (A-2095.4) into the frame with handle (A-2095.1).

**Notice**

Left-handed thread!

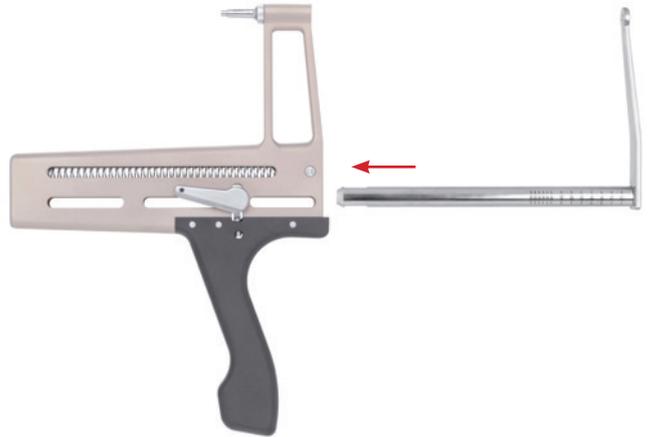


**Step 2**

Insert the axle with drill stop (A-2095.2).

**Notice**

Slightly lift the handle «Release».



**Step 3**

Insert the trigger with target tip (A-2095.3).

**Notice**

The axle with drill stop must be completely inserted until it sits flush. A slight click should be heard at the end of the insertion.



Also refer to «Assembly/Disassembly Instructions» at [www.medartis.com](http://www.medartis.com).

# Surgical Techniques Plates

## Radial Head Plates

Choose the radial head rim plate (A-4656.68) or the radial head buttress plate (A-4656.69) depending on the fracture pattern.

Reduce the fracture and apply the plate temporarily in order to evaluate the necessity of bending of the plate. Position the plate whenever possible in the «Safe Zone».

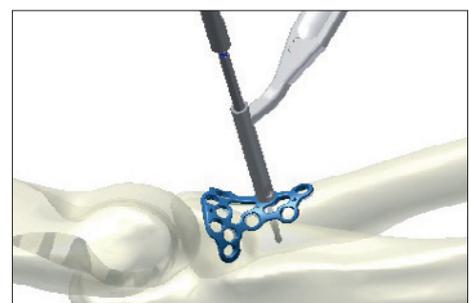
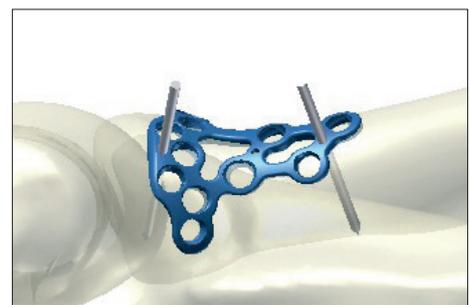
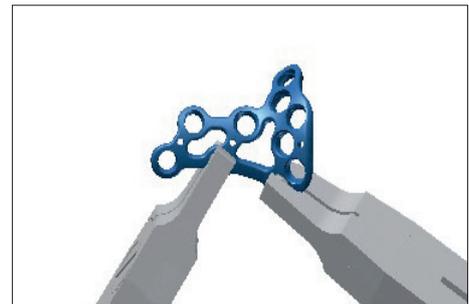
If necessary, bend the plates with the bending pliers (A-2040 or A-2047) to achieve an adequate fit to the individual form of the bone.

Especially in the case of the buttress plate (A-4656.69), the bending of the plate bars in the neck region can adjust the plate position more or less distally from the joint surface depending on the fracture pattern and the individual anatomy.

If needed, the plate can be fixed temporarily with 1.2 mm K-wires.

Place a first cortical screw (A-5400.xx) in the shaft region. This screw allows to pull the plate against the bone in order to establish a close contact.

For this, drill a core hole with the help of the drill guide (A-2620) and the core hole drill bit (A-3434, one blue ring) through the corresponding screw hole.



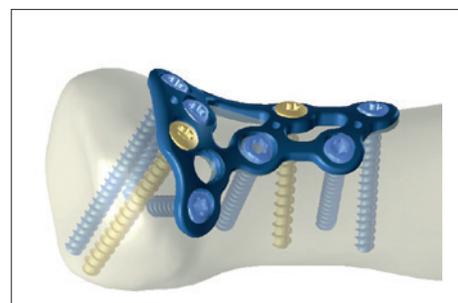
Determine the screw length with the help of the depth gauge (A-2032).



Pick up a cortical screw (A-5400.xx) of the determined length with the help of the screw driver (A-2610) and insert it into the drilled hole.



Correspondingly, fill the remaining screw holes with TriLock screws (A-5450.xx) or with cortical screws (A-5400.xx) wherever the fracture pattern requires it. Place at least three screws in the shaft and the head part of the plate in order to achieve a sufficient stability. A distribution of the screws into the head utilizing both proximal screw rows increases the stability of the fixation.



The choice of angular stable screws generally results in a higher construct stability, especially in the case of comminution or compromised bone quality. A non angular stable screw enables to pull a fragment against the plate.

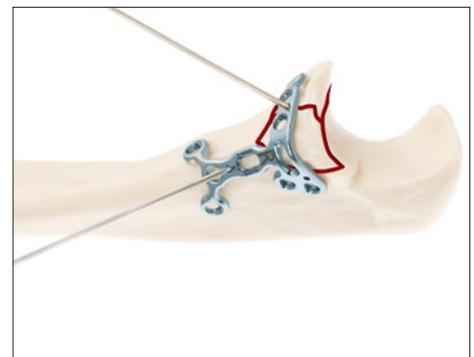
It is important, due to the natural convergence of the screws in the plate around the round radial head, to take advantage of the multi-directionality of the locking ( $\pm 15^\circ$ ) and non locking screws in order to avoid screw collisions.

## Coronoid Plates

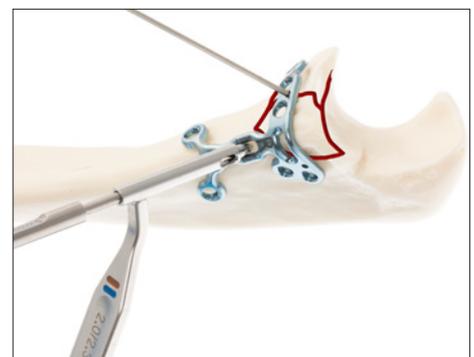
If necessary, bend the plate with the bending pliers (A-2040 or A-2047) to achieve an adequate fit to the individual form of the bone.



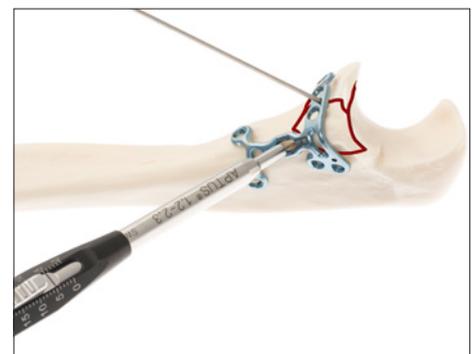
If needed, the plate can be temporarily fixed with 1.2 mm K-wires. Position the coronoid plate as proximal as possible. This allows for a subchondral fixation of the articular fragment by inserting screws in the proximal screw row.



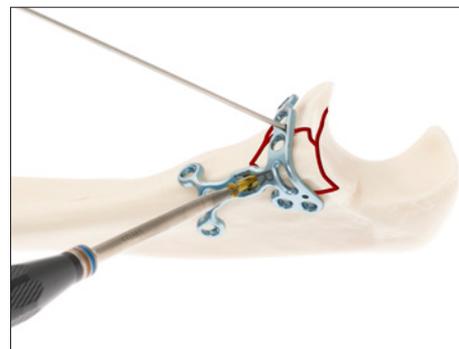
Insert a cortical screw (A-5400.xx) in the center of the distal oblong hole. To do so, pre-drill the core hole through the oblong hole using the drill guide (A-2620) and the twist drill (A-3434, one blue ring).



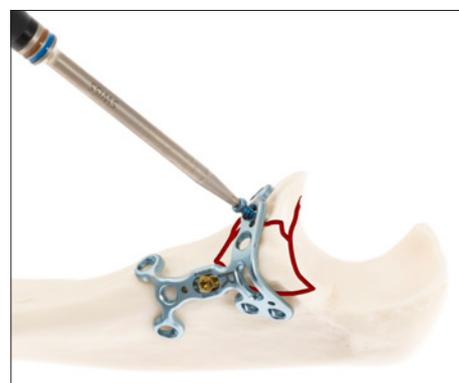
Determine the screw length with the help of the depth gauge (A-2032).



Pick up a cortical screw of the determined length with the help of the screwdriver (A-2610) and insert it into the drilled hole. Do not completely tighten the screw. It is thus possible to slightly adjust the plate position for further distal or proximal final plate positioning.



Fill the remaining screw holes with TriLock screws (A-5450.xx) or cortical screws (A-5400.xx) depending on the fracture pattern.



**Recommendation**

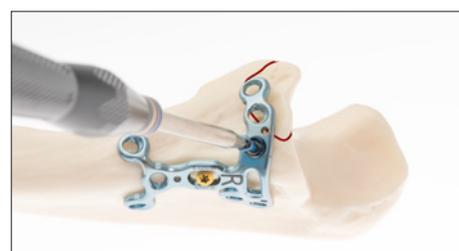
Depending on an anteromedial or medial Hotchkiss approach, either the anterior or the medial plate hole in the distal region can be used.



Check the subchondral position of the screws by X-ray.

**Recommendation**

If insertion of a screw is not possible and the fracture allows for it, the proximal anterior arm can be used for buttressing of the fragment.



## Olecranon Tension Plate

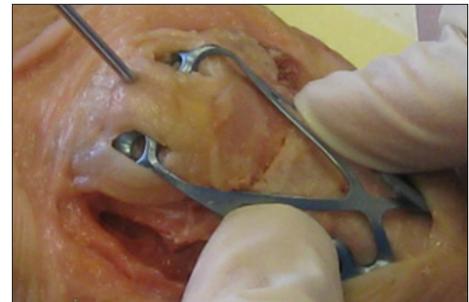
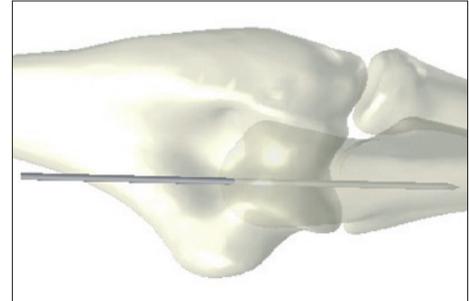
The olecranon tension plate can be used in the case of simple fractures or osteotomies with good inter-fragmentary support.

Reduce the fracture/osteotomy with positioning forceps and fix the fracture temporarily with a K-wire in axial direction. This K-wire will also help later as a mechanical guide when the fracture/osteotomy is compressed with the help of the first lag screw.

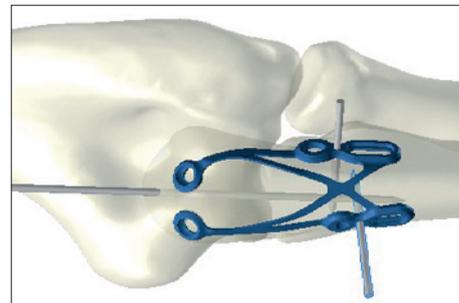
Contour the plate by hand so that the two proximal holes fit around the tip of the olecranon and that the distal holes come to lie on both sides laterally to the dorsal rim of the proximal ulna.

Make two small incisions into the triceps tendon on the olecranon in order to be able to place the two proximal screw holes in direct contact with the bone of the proximal fragment. These incisions should be parallel to the muscle fibres.

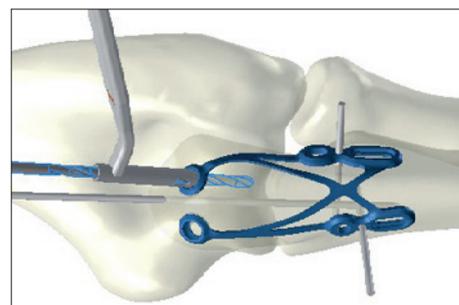
Make sure that the plate lies tightly and symmetrically on the dorsal rim of the proximal ulna.



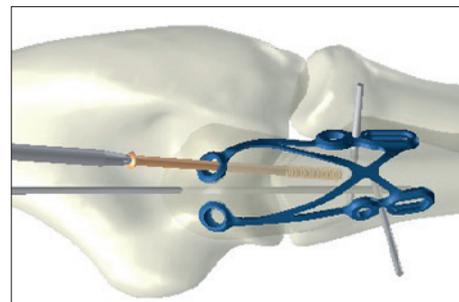
Temporarily fix the plate with two K-wires ( $\varnothing=1.6$  mm) through the K-wire holes. This ensures that the plate remains centered on the dorsal edge of the ulna while inserting the long lag screws in the next steps.



Drill a fracture-crossing core hole with the help of the drill guide (A-2021) and the core hole drill bit (A-3832, one orange ring) through the first proximal screw hole. The direction of this screw hole should be subchondral to the trochlear notch of the ulna (similar to the direction of the K-wires in classical tension band wiring) so as to enable the placement of the two parallel fracture-crossing screws. These screws should be bicortical.

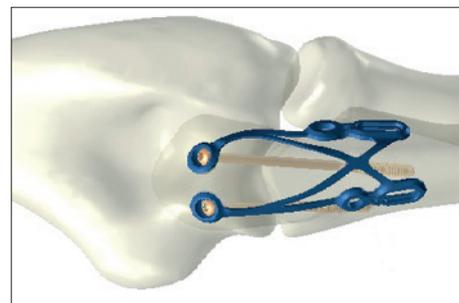


Assign the screw length using the depth gauge (A-2836). Insert a lag screw (A-5830.xx) of the assigned length through this hole without tightening it. Repeat the procedure with the second proximal screw hole and a second lag screw.



Remove the two K-wires from the plate.

Close the fracture gap by carefully tightening the two fracture-crossing lag screws and exert a slight compression on the fracture so as to complete the reduction.



Ensure by contouring the plate with your fingers that the plate lies tightly on the dorsal part of the proximal ulna.

#### Notice

**Only when the plate lies truly tightly on the bone, the function of the tension relief is secured.**

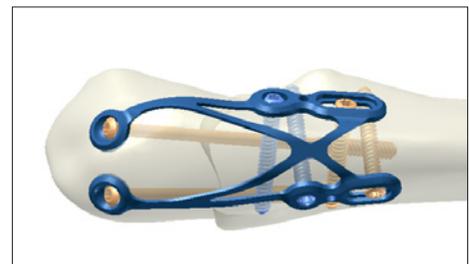
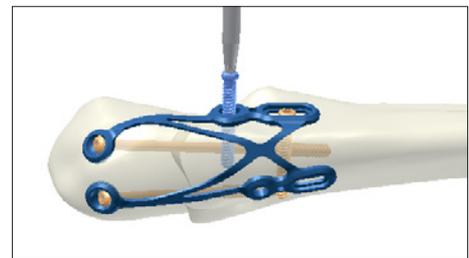
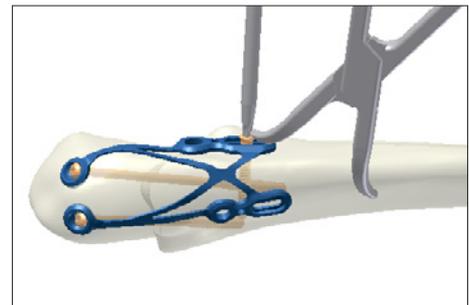
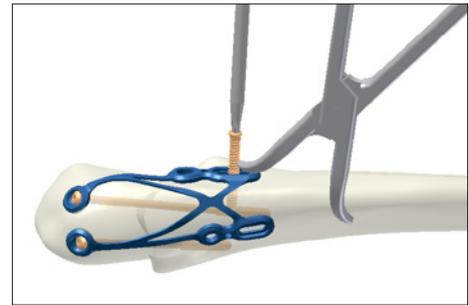
Drill a core hole using the drill guide (A-2021) and the twist drill (A-3832, one orange ring) through the center of one of the oblong holes. Assign the screw length with the depth gauge (A-2836) and insert a cortical screw (A-5800.xx) of appropriate length in this hole. Do not tighten the screw yet.

To tighten the plate, hook the pointed reduction forceps (A-7003) in the distal part of the oblong hole and engage the forceps crosswise on the other side of the dorsal rim of the ulna. Tighten the reduction forceps until the longitudinal plate bar lies flat on the ulna. Then tighten the screw.

Drill another core hole through the neighbouring screw hole and insert a TriLock or cortical screw of appropriate length. A locking screw will provide more stability. Tighten the screw.

Repeat these steps on the other side of the plate, completing the fixation of the plate. Take advantage of the multi-directionality of the screws to avoid screw collisions.

The small incisions in the triceps can be closed over the proximal screw holes.

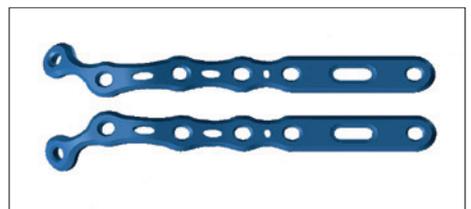


## Olecranon Double Plates

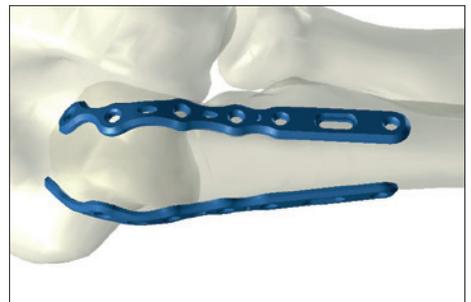
The olecranon double plates (A-4856.10/13 and A-4856.11/14) are intended for fractures being so proximal that the plates must come to lie around the tip of the olecranon in order to enable the placement of at least two screws in the proximal fragment.



The two plates should be placed whenever possible as shown in the figure.



Reduce the fracture. The plates can be fixed temporarily with K-wires of 1.6 mm.



Identify the optimal plate positions and make two incisions into the triceps tendon on the olecranon in order to be able to place the proximal part of the two plates on the proximal fragment. The plates should lie laterally to the dorsal rim of the proximal ulna and surround the olecranon tip without touching each other. Open the muscle insertions on the distal fragment in order to be able to place the plates laterally on both sides of the ulna. The position of the plates should be lateral to the dorsal rim of the proximal ulna, not too dorsal in order to spare the dorsal rim and not too ventral in order to avoid an excessive detachment of muscles and the contact with the ulnar and radial nerves.



If necessary, bend the plates with the bending pliers (A-2047) in order to achieve an adequate fit to the individual form of the bone.

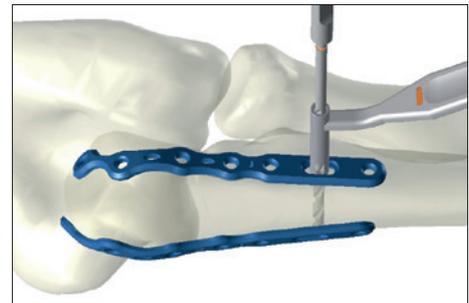
**Notice**

The plate bending pliers must be held at the plate holes so that the inscription «F» for «FLAT» is legible from above.

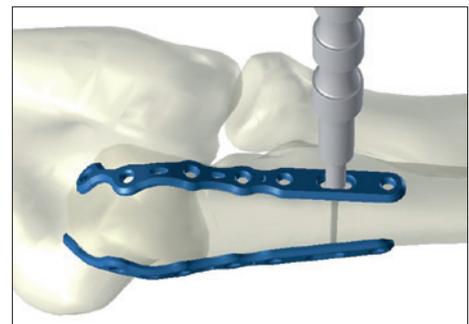


Temporarily fix each plate using a cortical screw (A-5800.xx) in the oblong hole. This allows to later adapt the plate position longitudinally by temporarily loosening these screws. Pull the contoured plate against the bone.

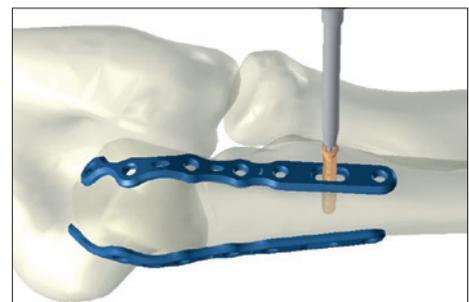
To do so, drill a core hole through the oblong hole with the help of the drill guide (A-2021) and the twist drill (A-3832, one orange ring).



Determine the screw length using the depth gauge (A-2836).



Pick up a cortical screw (A-5800.xx) of the determined length with the screwdriver blade (A-2013) and the corresponding handle (A-2070 or A-2073) and insert the screw into the drilled hole.



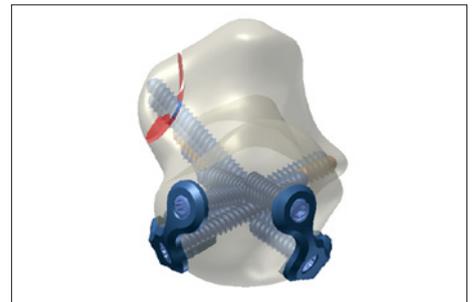
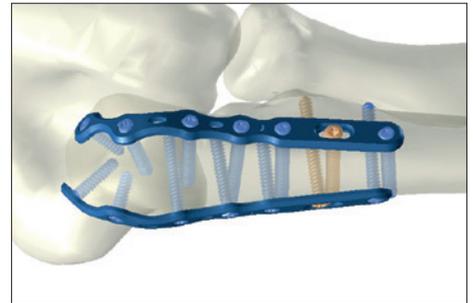
Fill the remaining screw holes with TriLock screws (A-5850.xx) or cortical screws (A-5800.xx) screws wherever indicated by the fracture pattern.

For each plate, set at least two TriLock screws distally and proximally to the fracture so as to ensure sufficient stability.

Take care that the screws in the proximal part are short enough to not protrude into the joint surface. The other screws can be placed bicortically for increased stability.

In the case of a fracture of the coronoid process with involvement of the medial collateral ligament, one or two screws depending on the fragment size can be placed into the tuberculum subliminum.

If possible, close the incisions of the muscle insertions again by sutures over the plates in order to restore the function of the muscle and to cover the plates with muscle tissue.



## Proximal Ulna Double Plates

The proximal ulna double plates (A-4856.12/15) are intended for fractures that lie sufficiently distal that per plate at least two screws can be placed in the proximal fragment without the necessity to go around the tip of the olecranon with the plates.

For the detailed surgical technique, please refer to chapter «Olecranon Double Plates».



## Distal Humerus Plates

Reduce the fracture. All plates can be temporarily fixed with 1.8 mm K-wires on the bone and provide a compression hole which can be used to exert compression on the fracture.

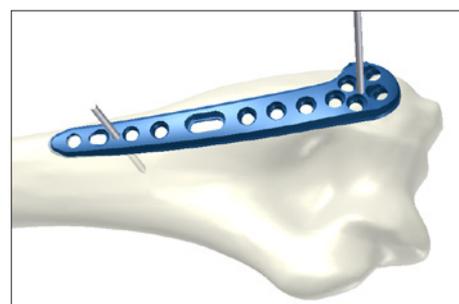
In both cases of 90° or 180° configuration, place a medial plate strictly laterally on the medial side of the distal humerus.



If necessary, contour the plate with the bending iron (A-2090) in order to achieve an optimal fit to the individual anatomy of the bone. If needed, the plate can be fixed temporarily with 1.8 mm K-wire.



In the case of a 90° configuration, place a posterolateral plate on the posterior side of the lateral column of the distal humerus. If necessary, also contour the plate with the bending iron (A-2090) in order to achieve an optimal fit to the individual anatomy of the bone and fix it temporarily with 1.8 mm K-wires.



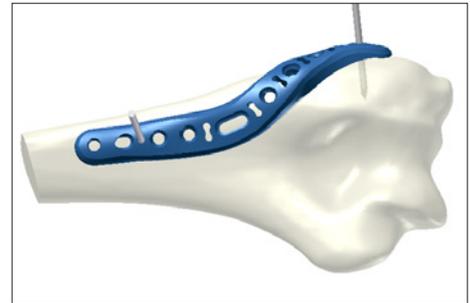
If necessary, contour the flap of the plate with the help of the plate bending pliers (A-2047) so that it fits the lateral epicondyle. If this flap is not used, it can be removed using cutting pliers.



### Notice

The plate bending pliers must be held at the plate holes so that the inscription «F» for «FLAT» is legible from above.

In the case of a 180° configuration, place a lateral plate additionally to the medial plate. The lateral plate is designed to lie truly laterally on the lateral epicondyle, but has a twist that brings it proximally in the shaft region on the posterior side of the humerus. If necessary, contour the plate to the bone by using the plate bending iron (A-2090) and fix it temporarily with 1.8 mm K-wires.

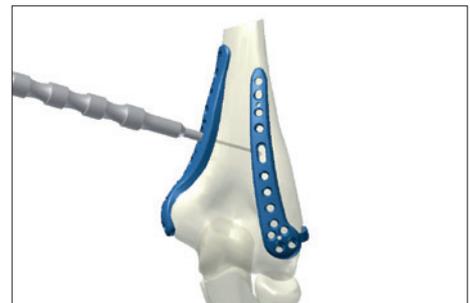


The use of the oblong hole enables the temporary fixation of the plate on the bone and provides the option to subsequently adjust the plate position in axial direction.

For this, drill a core hole through the oblong hole using the drill guide (A-2021) and the twist drill (A-3832, one orange ring).



Determine the screw length using the depth gauge (A-2836).



Pick up a cortical screw (A-5800.xx) of the determined length with the screwdriver blade (A-2013) and the corresponding handle (A-2070 or A-2073) and insert the screw into the drilled hole.

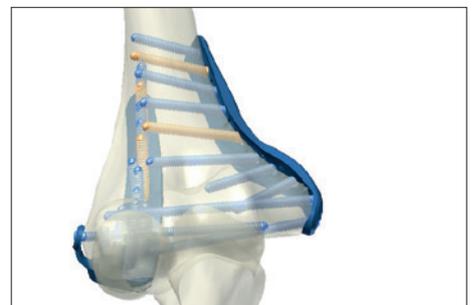
If necessary, the plate position can be adjusted longitudinally after removal of the K-wires by temporarily loosening the cortical screw.



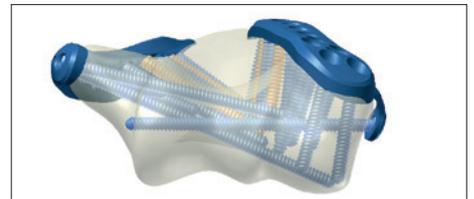
Fill the remaining screw holes with TriLock screws (A-5850.xx) or cortical screws (A-5800.xx) wherever indicated by the fracture pattern. If a fragment is to be reduced against the plate, a cortical screw is necessary. Otherwise, a locking screw is recommended to achieve greater stability of the fixation.



Take advantage of the multi-directionality of the locking and non locking screws in order to fix the different fragments against the plate where appropriate and to avoid screw collisions, especially in the case of bicortical screw placement.



In the case of distal fractures in the joint block, it is generally advantageous to direct two long subchondral screws from each epicondyle to the other side. Try to direct the screw exit points in direction of the bone next to the joint surfaces of the trochlea or the capitulum, respectively.



To facilitate the placement of these long screws, the aiming device (A-2096) can be used.



#### Angulated distal screw holes of the posterolateral plates

The two most distal screw holes of the posterolateral plates are angulated in a distal direction for the following reasons:

- Even very small distal fragments of the capitulum can be reached and fixed against the plate.
- The passage of the long subchondral screws from the flap in direction of the opposite epicondyle is made possible.



**Use of the compression hole**

Each distal humerus plate has a compression hole (second most proximal screw hole). It can be used if compression is to be exerted on the fracture.

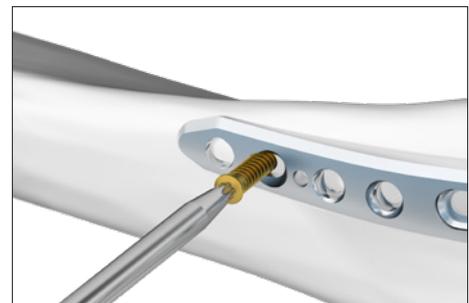
Make sure that the fragments distal to the fracture line are securely fixed against the plate.

Drill a core hole using the drill guide (A-2021) and the twist drill (A-3832, one orange ring) in the proximal part of the eccentric compression hole.



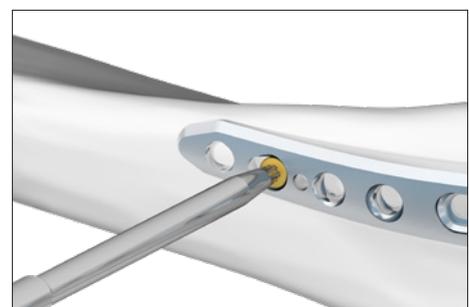
Determine the screw length using the depth gauge (A-2836).

Pick up a cortical screw (A-5800.xx) of the determined length with the screwdriver blade (A-2013) and the corresponding handle (A-2070 or A-2073) and insert it into the compression hole without tightening it.



Untighten the screw in the oblong hole and remove all temporary K-wires and screws in the proximal part of the plate. Then tighten the screw in the compression hole.

During the tightening of the screw in the compression hole, the screw head glides from the proximal part into the distal part of the eccentric hole, which moves the plate in proximal direction and exerts compression on the fracture.



# TriLock<sup>®</sup> Locking Technology

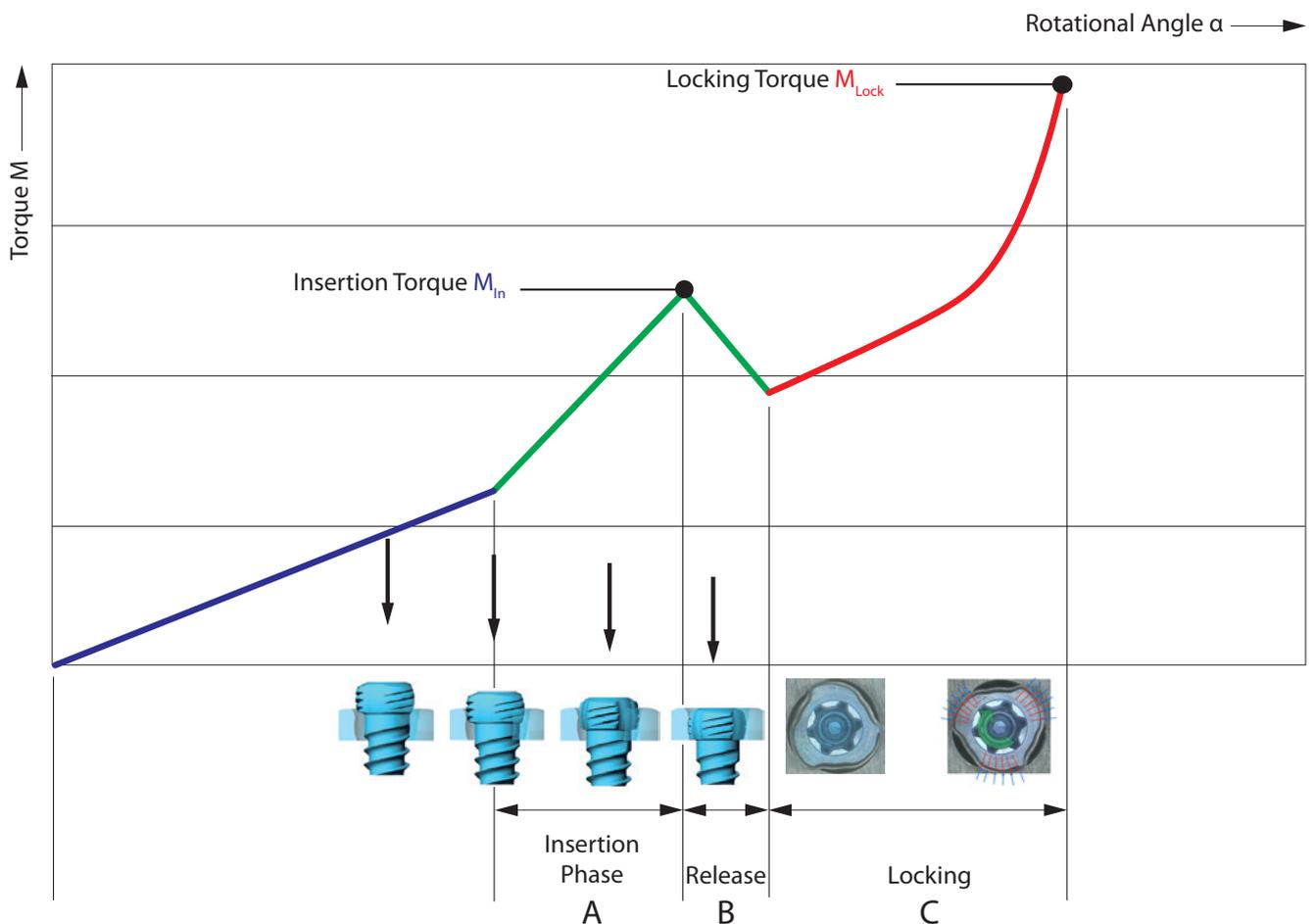
## Correct Application of the TriLock Locking Technology

The screw is inserted through the plate hole into a pre-drilled canal in the bone. An increase of the tightening torque will be felt as soon as the screw head gets in contact with the plate surface.

This indicates the start of the «Insertion Phase» as the screw head starts entering the locking zone of the plate (section «A» in the diagram). Afterwards, a drop of the tightening

torque occurs (section «B» in the diagram). Finally the actual locking is initiated (section «C» in the diagram) as a friction connection is established between screw and plate when tightening firmly.

The torque applied during fastening of the screw is decisive for the quality of the locking as described in section «C» of the diagram.



## Correct Locking ( $\pm 15^\circ$ ) of the TriLock Screws in the Plate

Visual inspection of the screw head projection provides an indicator of correct locking. Correct locking has occurred only when the screw head has locked flush with the plate surface (figures 1 + 3).

However, if there is still a noticeable protrusion (figures 2 + 4), the screw head has not completely entered the plate and reached the locking position. In this case, the screw has to

be retightened to obtain full penetration and proper locking. In case of poor bone quality a slight axial pressure might be necessary to achieve proper locking. Due to the system characteristics, a screw head protrusion of around 0.2 mm exists when using plates with 1.0 mm thickness.

**Do not overtighten the screw, otherwise the locking function cannot be guaranteed anymore.**

Correct: LOCKED

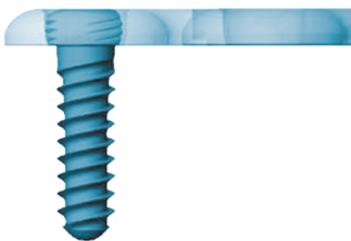


Figure 1

Incorrect: UNLOCKED

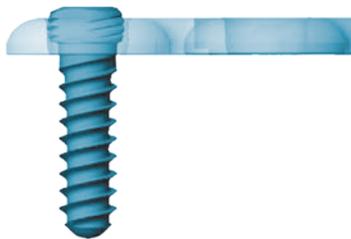


Figure 2

Correct: LOCKED

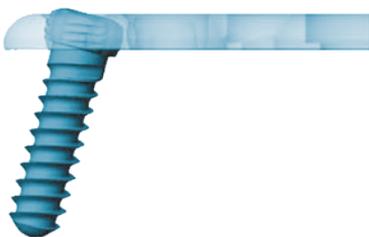


Figure 3

Incorrect: UNLOCKED

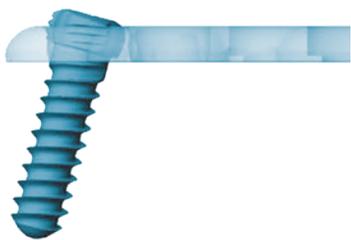


Figure 4

# Appendix

## Implants and Instruments

For detailed ordering information, please refer to the APTUS Ordering Catalog, also available at [www.medartis.com](http://www.medartis.com)

### Plates

### Screws, K-Wires

Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.	Art. No.
A-4656.68	A-4856.31	A-5040.21	A-5400.10/1	A-5400.21	A-5450.09/1S	A-5450.26/1	A-5500.13	A-5500.23/1S
A-4656.68S	A-4856.31S	A-5040.21/2S	A-5400.10/1S	A-5400.21/1	A-5450.10	A-5450.26/1S	A-5500.13/1	A-5500.24
A-4656.69	A-4856.32	A-5040.41	A-5400.11	A-5400.21/1S	A-5450.10/1	A-5450.28	A-5500.13/1S	A-5500.24/1
A-4656.69S	A-4856.32S	A-5040.41/2S	A-5400.11/1	A-5400.22	A-5450.10/1S	A-5450.28/1	A-5500.14	A-5500.24/1S
A-4656.80	A-4856.33	A-5040.51	A-5400.11/1S	A-5400.22/1	A-5450.11	A-5450.28/1S	A-5500.14/1	A-5500.26
A-4656.80S	A-4856.33S	A-5040.51/2S	A-5400.12	A-5400.22/1S	A-5450.11/1	A-5450.30	A-5500.14/1S	A-5500.26/1
A-4656.81	A-4856.34	A-5042.21	A-5400.12/1	A-5400.23	A-5450.11/1S	A-5450.30/1	A-5500.15	A-5500.26/1S
A-4656.81S	A-4856.34S	A-5042.21/2S	A-5400.12/1S	A-5400.23/1	A-5450.12	A-5450.30/1S	A-5500.15/1	A-5500.28
A-4700.70	A-4856.39	A-5042.41	A-5400.13	A-5400.23/1S	A-5450.12/1	A-5500.05	A-5500.15/1S	A-5500.28/1
A-4700.70/1	A-4856.39S	A-5042.41/2S	A-5400.13/1	A-5400.24	A-5450.12/1S	A-5500.05/1	A-5500.16	A-5500.28/1S
A-4700.70/1S	A-4856.40	A-5042.51	A-5400.13/1S	A-5400.24/1	A-5450.13	A-5500.05/1S	A-5500.16/1	A-5500.30
A-4750.70	A-4856.40S	A-5042.51/2S	A-5400.14	A-5400.24/1S	A-5450.13/1	A-5500.06	A-5500.16/1S	A-5500.30/1
A-4750.70/1	A-4856.41	A-5400.04	A-5400.14/1	A-5400.26	A-5450.13/1	A-5500.06/1	A-5500.17	A-5500.30/1S
A-4750.70/1S	A-4856.41S	A-5400.04/2S	A-5400.14/1S	A-5400.26/1	A-5450.14	A-5500.06/1S	A-5500.17/1	A-5500.32
A-4856.01	A-4856.42	A-5400.04/1	A-5400.15	A-5400.26/1S	A-5450.14/1	A-5500.07	A-5500.17/1S	A-5500.32/1
A-4856.01S	A-4856.42S	A-5400.04/1S	A-5400.15/1	A-5400.28	A-5450.14/1S	A-5500.07/1	A-5500.18	A-5500.32/1S
A-4856.10	A-4856.43	A-5400.05	A-5400.15/1S	A-5400.28/1	A-5450.16	A-5500.07/1S	A-5500.18/1	A-5500.34
A-4856.10S	A-4856.43S	A-5400.05/1	A-5400.16	A-5400.28/1S	A-5450.16/1	A-5500.08	A-5500.18/1S	A-5500.34/1
A-4856.11	A-4856.44	A-5400.05/1S	A-5400.16/1	A-5400.30	A-5450.16/1S	A-5500.08/1	A-5500.19	A-5500.34/1S
A-4856.11S	A-4856.44S	A-5400.06	A-5400.16/1S	A-5400.30/1	A-5450.18	A-5500.08/1S	A-5500.19/1	A-5800.08
A-4856.12	A-4856.49	A-5400.06/1	A-5400.17	A-5400.30/1S	A-5450.18/1	A-5500.09	A-5500.19/1S	A-5800.08/1
A-4856.12S	A-4856.49S	A-5400.06/1S	A-5400.17/1	A-5450.06	A-5450.18/1S	A-5500.09/1	A-5500.20	A-5800.08/1S
A-4856.13	A-4856.50	A-5400.07	A-5400.17/1S	A-5450.06/1	A-5450.20	A-5500.09/1S	A-5500.20/1	A-5800.10
A-4856.13S	A-4856.50S	A-5400.07/1	A-5400.18	A-5450.06/1S	A-5450.20/1	A-5500.10	A-5500.20/1S	A-5800.10/1
A-4856.14	A-4856.51	A-5400.07/1S	A-5400.18/1	A-5450.07	A-5450.20/1S	A-5500.10/1	A-5500.21	A-5800.10/1S
A-4856.14S	A-4856.51S	A-5400.08	A-5400.18/1S	A-5450.07/1	A-5450.22	A-5500.10/1S	A-5500.21/1	A-5800.12
A-4856.15	A-4856.52	A-5400.08/1	A-5400.19	A-5450.07/1S	A-5450.22/1	A-5500.11	A-5500.21/1S	A-5800.12/1
A-4856.15S	A-4856.52S	A-5400.08/1S	A-5400.19/1	A-5450.08	A-5450.22/1S	A-5500.11/1	A-5500.22	A-5800.12/1S
A-4856.29	A-4856.53	A-5400.09	A-5400.19/1S	A-5450.08/1	A-5450.24	A-5500.11/1S	A-5500.22/1	A-5800.14
A-4856.29S	A-4856.53S	A-5400.09/1	A-5400.20	A-5450.08/1S	A-5450.24/1	A-5500.12	A-5500.22/1S	A-5800.14/1
A-4856.30	A-4856.54	A-5400.09/1S	A-5400.20/1	A-5450.09	A-5450.24/1S	A-5500.12/1	A-5500.23	A-5800.14/1S
A-4856.30S	A-4856.54S	A-5400.10	A-5400.20/1S	A-5450.09/1	A-5450.26	A-5500.12/1S	A-5500.23/1	A-5800.16

| Art. No.     |
|--------------|--------------|--------------|--------------|--------------|
| A-5800.16/1  | A-5800.38    | A-5830.50/1S | A-5850.22    | A-5850.45/1S |
| A-5800.16/1S | A-5800.38/1  | A-5830.55/1  | A-5850.22/1  | A-5850.50    |
| A-5800.18    | A-5800.38/1S | A-5830.55/1S | A-5850.22/1S | A-5850.50/1  |
| A-5800.18/1  | A-5800.40    | A-5830.60/1  | A-5850.24    | A-5850.50/1S |
| A-5800.18/1S | A-5800.40/1  | A-5830.60/1S | A-5850.24/1  | A-5850.55    |
| A-5800.20    | A-5800.40/1S | A-5830.65/1  | A-5850.24/1S | A-5850.55/1  |
| A-5800.20/1  | A-5800.45    | A-5830.65/1S | A-5850.26    | A-5850.55/1S |
| A-5800.20/1S | A-5800.45/1  | A-5830.70/1  | A-5850.26/1  | A-5850.60    |
| A-5800.22    | A-5800.45/1S | A-5830.70/1S | A-5850.26/1S | A-5850.60/1  |
| A-5800.22/1  | A-5800.50    | A-5830.75/1  | A-5850.28    | A-5850.60/1S |
| A-5800.22/1S | A-5800.50/1  | A-5830.75/1S | A-5850.28/1  | A-5850.65    |
| A-5800.24    | A-5800.50/1S | A-5850.08    | A-5850.28/1S | A-5850.65/1  |
| A-5800.24/1  | A-5800.55    | A-5850.08/1  | A-5850.30    | A-5850.65/1S |
| A-5800.24/1S | A-5800.55/1  | A-5850.08/1S | A-5850.30/1  | A-5850.70    |
| A-5800.26    | A-5800.55/1S | A-5850.10    | A-5850.30/1S | A-5850.70/1  |
| A-5800.26/1  | A-5800.60    | A-5850.10/1  | A-5850.32    | A-5850.70/1S |
| A-5800.26/1S | A-5800.60/1  | A-5850.10/1S | A-5850.32/1  | A-5850.75    |
| A-5800.28    | A-5800.60/1S | A-5850.12    | A-5850.32/1S | A-5850.75/1  |
| A-5800.28/1  | A-5800.65    | A-5850.12/1  | A-5850.34    | A-5850.75/1S |
| A-5800.28/1S | A-5800.65/1  | A-5850.12/1S | A-5850.34/1  |              |
| A-5800.30    | A-5800.65/1S | A-5850.14    | A-5850.34/1S |              |
| A-5800.30/1  | A-5800.70    | A-5850.14/1  | A-5850.36    |              |
| A-5800.30/1S | A-5800.70/1  | A-5850.14/1S | A-5850.36/1  |              |
| A-5800.32    | A-5800.70/1S | A-5850.16    | A-5850.36/1S |              |
| A-5800.32/1  | A-5800.75    | A-5850.16/1  | A-5850.38    |              |
| A-5800.32/1S | A-5800.75/1  | A-5850.16/1S | A-5850.38/1  |              |
| A-5800.34    | A-5800.75/1S | A-5850.18    | A-5850.38/1S |              |
| A-5800.34/1  | A-5830.40/1  | A-5850.18/1  | A-5850.40    |              |
| A-5800.34/1S | A-5830.40/1S | A-5850.18/1S | A-5850.40/1  |              |
| A-5800.36    | A-5830.45/1  | A-5850.20    | A-5850.40/1S |              |
| A-5800.36/1  | A-5830.45/1S | A-5850.20/1  | A-5850.45    |              |
| A-5800.36/1S | A-5830.50/1  | A-5850.20/1S | A-5850.45/1  |              |

### RCI

Art. No.
A-3411
A-3411S
A-3413
A-3413S
A-3414
A-3414S
A-3421
A-3421S
A-3424
A-3424S
A-3431
A-3431S
A-3434
A-3434S
A-3610
A-3610S
A-3832
A-3832S
A-3834
A-3834S
A-3835
A-3835S
A-3837
A-3837S
A-3839

### Instruments

Art. No.	Art. No.
A-2013	A-4856.12TP
A-2020	A-4856.13TP
A-2021	A-4856.14TP
A-2022	A-4856.15TP
A-2031	A-7001
A-2031.1	A-7002
A-2032	A-7003
A-2032.1	A-7004
A-2039	A-7005
A-2040	A-7006
A-2045	A-7007
A-2046	A-7008
A-2047	A-7009
A-2050	A-7010
A-2060	A-7011
A-2070	A-7012
A-2071	A-7013
A-2073	A-7014
A-2090	A-7015
A-2095.1	A-7016
A-2095.2	A-7017
A-2095.3	A-7018
A-2095.4	
A-2096	
A-2610	
A-2620	
A-2650	
A-2810	
A-2820	
A-2836	
A-4856.10TP	
A-4856.11TP	

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